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(On Behalf of Turkish Physiotherapy Association)
Tülin DÜGER

Editör ve Yazı İşleri Müdürü
(Editor in Chief and Managing Editor)
H. Serap İNAL

TÜRKİYE FİZYOTERAPİSTLER DERNEĞİ'nin bilimsel yayın organı ve yaygın süreli yayınıdır.
(The official scientific journal of Turkish Physiotherapy Association)

"Türk Fizyoterapi ve Rehabilitasyon Dergisi"; Web of Science (WOS)-Emerging Sources Citation Index (ESCI), Cumulative Index to Nursing and Allied Health Literature (CINAHL), EBSCO, Excerpta Medica (EMBASE), Google Scholar, Türkiye Atıf Dizini ve Ulakbim Türk Tıp Dizini (TR Dizin)'nde yer almaktadır.

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"Açık Erişim Dergi" yılda 3 kez (Nisan, Ağustos, Aralık) yayınlanır.
"Open Access Journal" published 3 times (April, August, December) a year.

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YAZARLARIN DİKKATİNE
Genel Bilgiler

Genel Bilgiler

Türkiye Fizyoterapistler Derneği'nin resmi yayın organı olan Türk Fizyoterapi ve Rehabilitasyon Dergisi, bağımsız, tarafsız ve çift kör hakemlik ilkelerine uygun bir şekilde elektronik ve basılı olarak yayımlanan açık erişimli, ücretsiz, bilimsel bir yayın organıdır. Dergi, Nisan, Ağustos ve Aralık olmak üzere yılda 3 kez yayımlanır. Yazım dili Türkçe ve İngilizcedir. Bununla birlikte İngilizce gönderilen makalelere yayımlanma aşamasında öncelik verilecektir. Dergi, özgün araştırmalar, çağrılı derlemeler, sistematik derleme ve meta-analiz çalışmaları, ilginç olgu sunumları ve editöre mektupları yayımlamaktadır.

Derginin amacı fizyoterapi ve rehabilitasyon ile ilgili en yüksek bilimsel, etik ve klinik değere sahip orijinal çalışmaları yayımlamaktır. Türk Fizyoterapi ve Rehabilitasyon Dergisi, yayımladığı makalelerin daha önce başka bir yerde yayımlanmamış veya yayımlanmak üzere gönderilmemiş olması, ticari kaygılarda olmaması şartını gözetmektedir. Yayımlanacak makalenin tüm yazarlar tarafından ve çalışmanın yapıldığı yerdeki sorumlu kişi tarafından dolaylı olarak veya açık bir şekilde onaylandığını ve kabul edilmesi halinde aynı biçimde Türkçe, İngilizce veya başka bir dilde başka bir yerde yayımlanmayacağını taahhüt eder. Dergi, bilimsel kalitesi yüksek ve atıf potansiyeline sahip bir yazının yayına kabul edilmesi için en önemli kriter olan özgünlük ilkesini benimsemektedir.

Derginin yazım kuralları Uniform Requirements for Manuscripts Submitted to Biomedical Journals - International Committee of Medical Journal Editors (http://www.icmje.org) ve Committee on Publication Ethics (COPE) (https://publicationethics.org) tarafından yayımlanan rehberler ve politikalar dikkate alınarak hazırlanmıştır.

Türk Fizyoterapi ve Rehabilitasyon Dergisi (Türk Fizyoter Rehabil Derg / Turk J Physiother Rehabil), dünyanın her yerinden makaleler yayımlamaktadır ve aşağıdaki özelliklere sahip makalelere öncelik vermektedir:

- Fizyoterapi ve rehabilitasyon uygulamaları üzerinde etkisi olacak önemli araştırma sorularını ele alan ve hipotezleri güçlü yöntem ve araştırma tasarımı ile test eden özgün çalışmalar
- Klinik veya saha uygulamaları için temel teşkil edebilecek laboratuvar tabanlı çalışmalar
- Rehabilitasyon uygulamaları, politikaları, eğitimleri veya araştırmalarda karar vermeyi kolaylaştırmaya ve geliştirmeye yardımcı olabilecek çalışmalar.

ETİK SORUMLULUK

Editör ve Alan Editörleri

Editör ve alan editörleri, açık erişim olarak Committee on Publication Ethics (COPE) tarafından yayımlanan "COPE Code of Conduct and Best Practice Guidelines for Journal Editors" ve "COPE Best Practice Guidelines for Journal Editors" rehberleri temelinde etik görev ve sorumluluklara sahiptirler. Editörler ve alan editörleri:

- Dergide yayımlanan her makalenin dergi yayın politikaları ve uluslararası standartlara uygun olarak yayımlanmasından,
- Derginin kalitesini, özgünlüğünü ile okunurluğunu geliştirmekten,
- Fikri mülkiyet hakları ile etik standartlardan taviz vermeden şeffaf bir şekilde iş süreçlerini yürütmekten,
- Makalelerin tarafsız ve bağımsız olarak değerlendirme süreçlerinin tamamlanması için yazarlar, hakemler ve üçüncü kişiler arasında oluşabilecek çıkar ilişkisi ve çatışmalarına karşı önlem almaktan sorumludurlar.

Editörler, çalışmaların önemi, özgün değeri, geçerliliği, anlatımın açıklığı ve derginin amaç ve hedeflerine dayanarak olumlu ya da olumsuz karar verirler. Dergi yayın politikalarında yer alan "Kör Hakemlik ve Değerlendirme Süreci" politikalarını uygulamaktadırlar. Bu bağlamda editörler her çalışmanın değerlendirme sürecinin çıkar çatışması olmadan, adil, tarafsız ve zamanında tamamlanmasını sağlarlar.

Derginin editör veya editör kurulu üyelerinin yazar oldukları makalelerin değerlendirme süreçlerinin yönetilmesi için dışarıdan bağımsız bir editör davet edilebilir.

Hakemler

Türk Fizyoterapi ve Rehabilitasyon Dergisi'ne gönderilen yazılar çift kör hakem değerlendirme sürecinden geçer. Tarafsız bir değerlendirme sürecini sağlamak için her gönderi, alanlarında uzman olan en az iki bağımsız hakem tarafından incelenir. Hakemler yazıya ilişkin bilgileri gizli tutmakla yükümlüdür. Hakemler, çıkar çatışması olması halinde bu konu hakkında Türk Fizyoterapi ve Rehabilitasyon Dergisi'ne bildirimde bulunur.

Hakemler kendilerine gönderilen çalışmayı değerlendirme süreci tamamlanıncaya ve yayına verilinceye kadar herhangi bir amaç için kullanamaz. Hakemler makaleyi değerlendirirken nazik ve yapıcı bir dil kullanmalı, kötü yorum ve ifadelerden kaçınmalıdırlar. Hakemler makaleyi zamanında ve etik kurallara dikkat ederek değerlendirmekle sorumludurlar.

Yazarlar

Yazıların bilimsel içeriği ve etik kurallara uygunluğu yazar/yazarların sorumluluğundadır. Deneysel ve klinik çalışmalar ile olgu sunumlarının araştırma protokollerinin uluslararası anlaşmalara (World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects" www.wma.net) uygun olarak, etik kurul tarafından onaylanması gerekmektedir. Dergiye, etik kurul onayı almış ve Helsinki Bildirgesi'nin en güncel versiyonuna uygun yürütülmüş araştırmalar kabul edilir. Yazarlar, insan öğesi ile yapılmış çalışmalarda makalenin "YÖNTEM" bölümünde bu prensiplere uygun olarak çalışmayı yaptıklarını, kurumlarının etik kurullarından ve çalışmaya katılmış insanlardan "bilgilendirilmiş olur veya onam formlarını" (informed consent) aldıklarını belirtmek zorundadırlar. Yazarlar gerektiğinde hastalara veya katılımcılara ait bilgilendirilmiş olur veya onam formlarını belgeleyebilmelidir. Katılımcının onayı ile ilgili bilgiler, etik kurulun adı ve etik komite onay numarası da yazının "YÖNTEM" bölümünde belirtilmelidir. Etik kurul onayı gerekmeyen çalışmalar için çalışmanın tasarımı ve içeriğine uygun etik kurullardan alınan muafiyet belgesi veya sorumlu yazar tarafından yazılan bilgi amaçlı bir beyanın (meta-analiz, sistematik derleme, çağrılı derleme için) sisteme yüklenmesi gerekir. Çalışmada hayvan öğesi kullanılmış ise yazarlar, makalenin "YÖNTEM" bölümünde Guide for the Care and Use of Laboratory Animals (http://www.nap.edu/catalog/5140.html) prensipleri doğrultusunda çalışmalarında hayvan haklarını koruduklarını ve kurumlarının etik kurullarından onay aldıklarını belirtmek zorundadır.

Yazar olarak listelenen her kişi, International Committee of Medical Journal Editors (ICMJE-www.icmje.org) tarafından önerilen ve aşağıda gösterilen yazarlık kriterlerinin dördünü de karşılamalıdır:

- Çalışmanın planlanmasına, verilerin toplanmasına veya verilerin analizine ve yorumlanmasına katkısı olmalıdır,
- Makale taslağının hazırlanması veya revize edilmesine katkıda bulunmalıdır,
- Makalenin dergiye gönderilecek ve yayınlanacak son halini okuyup kabul etmelidir,
- Çalışmanın herhangi bir bölümünün doğruluğu veya bütünlüğü ile ilgili soruların uygun bir şekilde araştırıldığı ve çözümlendiği konusunda diğer yazarlarla hemfikir olmalı ve çalışmadan tüm yönleriyle sorumlu olmalıdır.

Makalelerin bilimsel içeriği ve etik kurallara uygunluğu yazarların sorumluluğundadır. Tüm çalışmalar lisanslı bir benzerlik tespit yazılımı (CrossCheck tarafından iThenticate/Turnitin vb.) tarafından taranıp ilgili rapor belge olarak başvuru sırasında sisteme yüklenmelidir. Kaynaklar, tablo ve şekil içerikleri haricindeki yazının içeriğinde benzerlik oranı %20 'nin üzerinde olmamalı ve yazarların önceki çalışmalarıyla bir benzerliği bulunmamalıdır. Benzerlik oranı %20'nin üzerindeki makaleler hakeme gönderilmeden reddedilir. İntihal, alıntı manipülasyonu ve veri sahteciliği/uydurma gibi durumlardan şüphelenilmesi veya tespit edilmesi halinde yayın kurulu COPE yönergelerini izleyecek ve bunlara göre hareket edecektir.

İletişimden sorumlu yazar makalenin sunum aşamasından basımına kadar olan süreçlerde her türlü yazışmaları gerçekleştiren yazardır. İletişimden sorumlu yazar:

- Etik kurul onay belgesi,
- Telif hakkı devir formu (e-imza veya ıslak imzalı olmalıdır. Bu formda imzası bulunanlar dışında sonradan yazar ismi eklenemez ve yazar sırası değiştirilemez.)
- Yazar katkı formu
- Çıkar çatışması formu belgelerini sisteme taratıp yüklemelidir.

Makalede, kitaplarda veya dergilerde daha önce yayımlanmış alıntı yazı, tablo, şekil vb. mevcutsa, yazarlar ilgili yazı, tablo, şekil, anket ve ölçeğin (geçerlilik, güvenirlik çalışmaları ile kullanımı için özel izin, sertifika istenen anket/ölçekler) telif hakkı sahibinden ve yazarlarından yazılı izin almak; izin yazısını makale ile birlikte göndermek ve bunu makalede belirtmek zorundadır. Hastaların kimliğini açığa çıkarabilecek fotoğraflar için hasta veya yasal temsilcisinin imzalı izinleri eklenmeli ve "YÖNTEM" bölümünde bu izinlerin alındığı ifade edilmelidir. Bilimsel toplantılarda sunulan bildiler özet şeklinde daha önce sunulmuş ve/veya basılmış ise başlık sayfasında mutlaka belirtilmelidir.

Yazım Kuralları

Makaleler, ICMJE -Recommendations for the Conduct, Reporting, Editing and Publication for Scholarly Work in Medical Journals (updated in December 2019 - http://www.icmje.org/icmje-recommendations.pdf) uyarınca hazırlanmalıdır. Yazarların CONSORT'a uygun olarak makale hazırlaması gerekmektedir. Orijinal araştırma çalışmaları için STROBE kılavuzları, sistematik incelemeler ve meta-analiz için PRISMA yönergeleri, deneysel hayvan çalışmaları için ARRIVE yönergeleri kullanılmalıdır.

Türkçe makalelerde Türk Dil Kurumu'nun Türkçe Sözlüğu esas alınmalıdır. İngilizce makaleler ve İngilizce özetlerin, dergiye gönderilmeden önce dil uzmanı tarafından değerlendirilmesi gerekmektedir. Editör veya alan editörleri gerekli gördükleri hallerde İngilizce makale veya İngilizce özet için redaksiyonun sertifikasını talep edebilirler.

Özgün Makale: Güncel ve önemli bir konuda temel veya klinik bilgi sunan, önceki çalışmaları genişletip ilerleten veya klasik bir konuda yeni bir yaklaşım getiren türde araştırmalardan oluşur. Özgün makaleler 4000 kelimeyi ve kaynak sayısı 40'ı aşmamalıdır.

Olgu Sunumu: İlginç olguları, yeni fikirleri ve teknikleri tanımlamaktadır. Şekiller, tablolar ve kaynaklar yazıyı açıklamaya ve desteklemeye yetecek en az sayıda olmalıdır. Kelime sayısı 2000'i, kaynak sayısı 20'yi geçmemelidir.

Editöryal Yorum: Editörler Kurulu, eğitim ve klinik uygulamalar konusunda uzman bir yazarı belli bir konuda bilgilendirici bir yazı yazmak veya yorum yapmak üzere davet edebilir. Kelime sayısı 1000'i, kaynak sayısı 10'u geçmemelidir.

Çağrılı Derleme/Sistematik Derleme/Meta-Analiz: Sistematik derleme ve meta-analizler doğrudan, çağrılı derlemeler ise davet edilen yazarlar tarafından hazırlanmaktadır. Fizyoterapi ve rehabilitasyon bilimi ve klinik uygulamaları hakkında olabilecek her türlü konu için güncel literatürü de içine alacak şekilde hazırlanmalıdır. Yazarların o konu ile ilgili basılmış yayınlarının olması özellikle tercih nedenidir. Kelime sayısı 6000'i, kaynak sayısı 100'ü geçmemelidir.

Editöre Mektup: Editörler Kurulunun onayı ile yayımlanmaktadır. Mektup, dergide yayımlanmış bir makaleye yorum niteliğinde ise hangi makaleye (sayı, tarih verilerek) ithaf edildiği kaynak olarak belirtilmelidir. Mektuba cevap, editör veya makalenin yazar (ları) tarafından, yine dergide yayımlanarak verilir. Mektuplarda kelime sayısı 500, kaynak sayısı beş ile sınırlıdır.

Dergide yayımlanmak üzere gönderilen makaleler;

- Yazım sayfası A4 boyutunda olacak şekilde, PC uyumlu Microsoft Word programı ile yazılmalıdır.
- "Times New Roman" yazı tipi kullanılarak 12 punto ve makalenin tüm bölümleri 1,5 satır aralıklı yapılmalıdır.
- Sayfanın her kenarında en az 2,5 cm boşluk bırakılmalıdır.
- Sayfalar (sağ alt köşede) ve satırlar numaralandırılmalıdır.
- Makalenin ana başlıkları (Giriş, Yöntem, Sonuçlar, Tartışma, Kaynaklar) büyük harf kullanılarak ve koyu olarak belirtilmelidir.
- Alt başlıklar ise baş harf büyük ve koyu renk olacak şekilde yazılmalıdır.
- Metin içinde verilen sayısal değerlerde Türkçe makalelerde virgül (,); İngilizce makalelerde nokta (.) kullanılmalıdır. Verilen bu sayısal değerlerde virgül veya noktadan sonra p ve r değerleri hariç sayının iki basamağı daha verilmeli (Örnek: 13.31 veya 15,21); p ve r değerleri ise virgülden/noktadan sonra üç basamak olacak şekilde yazılmalıdır.
- Kısaltmalar, kelimenin ilk geçtiği yerde parantez içinde verilir ve tüm metin boyunca o kısaltma kullanılır. Uluslararası kullanılan kısaltmalar için 'Bilimsel Yazım Kuralları" kaynağına başvurulabilir.

Başlık Sayfası

Makalenin başlığı kısa fakat içeriği tanımlayıcı ve amaçla uyumlu olmalıdır. Başlıkta kısaltma kullanılmamalıdır. Makale başlığı Türkçe ve İngilizce yazılmalıdır. Türkçe ve İngilizce başlıkların tamamı büyük harfler ile koyu olarak yazılmalıdır. Ayrıca yazının 40 karakterlik kısa bir başlığı da Türkçe ve İngilizce olarak başlık sayfasında belirtilmelidir. Makalenin kelime sayısı (başlık sayfası, kaynaklar, tablolar, şekiller hariç) yazılmalıdır. Tüm yazarların açık adları, soyadları (büyük harf ile yazılacak) ve akademik unvanları, çalıştıkları kurum,

iletişim bilgileri, Open Researcher and Contributor ID (ORCID) numaraları, çalışmanın yürütüldüğü kurumun veya kurumların açık adı ve adresi belirtilmelidir. Her yazar için üst numaralandırma kullanılmalıdır. İletişimden sorumlu yazarın iletişim bilgileri ayrıca sunulmalıdır. Başlık sayfası her yazarın iletişim bilgilerini, adres, güncel e-posta adresi ve iş telefon numarasını içermelidir.

Özetler

Her makale Türkçe ve İngilizce özet içermelidir.

Türkçe Özet ve Anahtar Kelimeler

Türkçe özet ayrı bir sayfadan başlamalı ve 250 kelimeden fazla olmamalıdır. Türkçe özet bölümü çalışmanın amacını, uygulanan yöntemi, en önemli bulguları ve sonucu içermelidir. Özet, "Öz" başlığını taşımalı ve "Amaç", "Yöntem", "Sonuçlar" ve "Tartışma" alt başlıklarına ayrılmalıdır. "Sonuçlar" kısmında p değeri belirtilmelidir. Türkçe makale özetlerinde ondalık sayılarda virgül (,) kullanılmalıdır.

Anahtar kelimeler 3'ten az, 5'ten çok olmamalıdır. Anahtar kelimeler "Türkiye Bilim Terimleri" listesinden (http://www.bilimterimleri.com) seçilmelidir. Bu listede henüz yer almayan yeni bir kavram için liste dışı kelimeler kullanılabilir. Anahtar kelimelerin her biri büyük harf ile başlamalı; virgül ile birbirinden ayrılmalı ve alfabetik sıraya göre yazılmalıdır. Makale Türkçe ise İngilizce özet kısmındaki anahtar kelimeler (keywords) Türkçe anahtar kelimelerin alfabetik sıralamasına uygun sıralanmalıdır.

İngilizce Özet (Abstract) ve Anahtar Kelimeler (Keywords)

İngilizce özet ayrı bir sayfadan başlamalı ve 250 kelimeden fazla olmamalıdır. İngilizce özette ondalık sayılarda nokta (.) kullanılmalıdır. İngilizce özet "Purpose", "Methods", "Results" ve "Conclusion" alt başlıklarına ayrılmalıdır. İngilizce özet ve anahtar kelimeler, Türkçe özet ve anahtar kelimelerin birebir aynısı olmalıdır. Anahtar kelimeler "MeSH (Medical Subject Headings)" terimlerinden seçilmiş olmalıdır. MeSH listesinde henüz yer almamış yeni bir kavram için liste dışı kelimeler kullanılabilir. Anahtar kelimelerin her biri büyük harf ile başlamalı; virgül ile birbirinden ayrılmalı ve alfabetik sıraya göre yazılmalıdır. Makale İngilizce ise İngilizce anahtar kelimelerin (keywords) alfabetik sıralamasına göre, Türkçe anahtar kelimeler sıralanacaktır.

Araştırma Makalesinin Bölümleri

Makale metni Türkçe makalelerde "Giriş", "Yöntem", "Sonuçlar" ve "Tartışma" bölümlerinden oluşur. İngilizce makalelerde ise "Introduction", "Methods", "Results" ve "Discussion" bölümleri yer alır. Metin içinde beş defadan fazla tekrar eden ifadeler için standart kısaltmalar kullanılabilir. Kısaltmanın açıklaması metinde ilk geçtiği yerde belirtilmelidir.

Giriş

Çalışma konusuyla ilgili önceki yayınlardan elde edilen temel bilgilerin özetini içermelidir. Çalışmanın yapılmasındaki gereklilik ve amaç kısaca belirtilmelidir.

Yöntem

Çalışmadaki klinik, teknik veya deneysel yöntemler açıkça belirtilmelidir. Yöntem için uygun kaynaklar verilmelidir. Bu bölümde yazarlar, insanlar üzerinde yapmış oldukları çalışmaları Helsinki Bildirgesi prensiplerine uygun olarak yürüttüklerini, ilgili etik kuruldan onay aldıklarını (etik kurulun adı, tarih ve protokol numarası yazılmalıdır) ve katılımcılardan bilgilendirilmiş onam alındığını belirtmek zorundadır. Yöntem bölümü "İstatistiksel analiz" alt başlığını içermelidir. Çalışmada hayvan ögesi kullanılmış ise yazarlar, Guide for the Care and Use of Laboratory Animals (http://www.nap.edu/catalog/5140.html) prensipleri doğrultusunda hayvan haklarını koruduklarını ve ilgili etik kuruldan onay aldıklarını belirtmek zorundadırlar. Katılımcıların kimliğini açığa çıkarabilecek fotoğraflar için yayın onayı alındığına yönelik bir ifade bu bölümde yer almalıdır.

İstatistiksel analiz için herhangi bir istatistik programı kullanılmış ise kullanılan yazılım programının adı, sürüm numarası, yer, tarih ve firma bilgileri yazılmalıdır. İstatistiksel analiz yöntemleri ve örneklem büyüklüğünün hesaplanması ile ilgili bilgiler gerekçeleri ile birlikte sunulmalı, gerektiğinde kaynaklarla desteklenmelidir.

Sonuçlar

Sonuçlar sayısal verilere dayanmayan herhangi bir yorum içermemelidir. Tablolarda sunulan verilerin, metin içinde tekrar edilmesinden kaçınılmalı, en önemli sonuçlar vurgulanmalıdır.

Tartışma

Tartışma, çalışmada elde edilen en önemli sonuçlara ait bilgiler ile başlamalıdır. Çalışmadan elde edilen sonuçlar yorumlanmalı ve önceki çalışmaların sonuçları ile ilişkilendirilmelidir. Tartışmada çalışmanın kısıtlılıkları, literatüre ve klinik uygulamalara olan katkısı belirtilmelidir. "Sonuçlar" bölümünde ve tablolarda yer alan bulguların, detayları ile tartışma bölümünde tekrar edilmesinden kaçınılmalıdır. Araştırmada elde edilmeyen veriler tartışılmamalıdır.

Aşağıdaki başlıklar tartışma kısmından sonra açıklamalarıyla beraber eklenmelidir:

- *Destekleyen Kuruluş:* Destekleyen kuruluşlar varsa belirtilmelidir.
- *Çıkar Çatışması:* Çıkar çatışması varsa belirtilmelidir.
- *Yazar Katkıları:* Yazarların makaleye yönelik katkıları belirtilmelidir. Katkılar fikir/kavram, tasarım, denetleme/ danışmanlık, kaynaklar ve fon sağlama, materyaller, veri toplama ve/veya işleme, analiz ve/ veya yorumlama, literatür taraması, makale yazımı, eleştirel inceleme başlıkları altında toplanmalıdır.
- *Açıklamalar:* Yazı özet ve/veya bildiri şeklinde daha önce sunulmuş ise, sunulduğu bilimsel toplantı, sunum yeri, tarihi ve basılmışsa basımı yapılan yayın organına ilişkin bilgiler "Açıklamalar" kısmında belirtilmelidir.
- *Teşekkür:* Yazar olma kriterlerini karşılamayan ancak araştırma sırasında destek sağlayan (makaleyi okuma, yazma, teknik destek, dil ve istatistik desteği vb.) bireylere ve/veya kuruluşlara ilişkin bilgiler olabildiğince kısa ve öz bir şekilde "Teşekkür" kısmında belirtilmelidir.

Kaynaklar

Kaynaklar makale ana metinden hemen sonra yer almalıdır. Kaynaklar metinde geçiş sırasına göre, cümle sonunda (noktadan önce), Arabik rakamlarla, parantez içine alınarak numaralandırılmalıdır [Örnek: ..... meydana geldiği bulunmuştur (21).]. Kaynak sayısının 40'ı aşmamasına ve 10 yıldan eski tarihli kaynak kullanımının toplam kaynak sayısının % 15'ini geçmemesine özen gösterilmelidir. Gerekmedikçe kitapların, web sayfalarının, yayınlanmamış gözlem ve kişisel görüşmelerin kaynak olarak kullanımından kaçınılmalıdır. Birden çok kaynağa atıf varsa kaynaklar arasına virgül konulmalı ve virgülden önce ya da sonra boşluk bırakılmamalıdır. Örnek olarak (3,7,15–19) verilebilir; burada "15–19", 15. kaynaktan 19. kaynağa kadar olan beş yayını kapsamaktadır. Ana metin içinde isim belirtilerek referans gösterilmesi gerektiğinde, makalenin yazım dili İngilizce ise "Yazar adı et al." (Örnek: Burtin et al.); makalenin yazım dili Türkçe ise "Yazar adı ve diğ." (Örnek: Burtin ve diğ.) şeklinde yazılmalıdır.

Dergi adları Index Medicus'a göre kısaltılmış olarak sunulmalıdır. Standart dergide yayınlanmış bir makalede, yazar sayısı 6 ve daha az ise tüm yazarların adı yazılmalıdır. Yazar sayısı 6'dan çok ise, ilk 6 yazar yazılmalı, diğer yazarlar Türkçe makaleler için "ve diğ.", İngilizce makaleler için "et al." olarak belirtilmelidir. Endnote, Mendeley gibi program kullanacak yazarlar programların içerisinde bulunan "VANCOUVER" stilini kullanmalıdır. Vancouver stilinde verilen bir referansta mutlaka olması gereken bilgiler aşağıda belirtilmiştir: - Yazar(lar) ad(ları), - Makale adı, - Dergi adı (Index Medicus'a göre kısaltılmış), - Basım yılı, - Dergi volümu ve sayısı, - Sayfa aralığı (Örnek:10-5).

Kaynak yazım örnekleri aşağıdaki gibidir:

- *Makaleler;* Burtin C, Saey D, Saglam M, Langer D, Gosselink R, Janssens W, et al. Effectiveness of exercise training in patients with COPD: the role of muscle fatigue. Eur Respir J. 2012;40(2):338-44.
- *Dergi ilavesinde yayımlanan çalışmalar;* Hielkema T, Hadders Algra M. Motor and cognitive outcome after specific early lesions of the brain–a systematic review. Dev Med Child Neurol. 2016;58(Suppl 4):46-52.
- *Kitap;* Murtagh J. John Murtagh's general practice. 4th ed. Sydney: McGraw-Hill Australia Pty Ltd; 2007.
- *Kitap b*ölümü; Cerulli G. Treatment of athletic injuries: what we have learned in 50 years. In: Doral MN, Tandogan RN, Mann G, Verdonk R, eds. Sports injuries. Prevention, diagnosis, treatment and rehabilitation. Berlin: Springer-Verlag; 2012: p. 15-9.
- *Kongre Bildirisi;* Callaghan MJ, Guney H, Bailey D, Reeves N, Kosolovska K, Maganaris K, et al. The effect of a patellar brace on patella position using weight bearing magnetic resonance imaging. 2014 World Congress of Osteoarthritis Research Society International, April 24-27, 2014, Paris. Osteoartr Cartilage; 2014;22(Suppl):S55.
- *Web sayfası;* Diabetes Australia. Gestational diabetes [Internet]. Canberra (AU): Diabetes Australia; 2015 [updated 2015; cited 2017 Nov 23]. Available from: https://www.diabetesaustralia.com.au/gestational-diabetes.

Tablolar

Tablolar, Microsoft Word dosyası formatında hazırlanmalı, her biri ayrı sayfalarda olacak şekilde makalenin sonunda yer almalı ve ana metinde geçtikleri sıraya göre numaralandırılmalıdır. Toplam tablo ve şekil sayısı en fazla 6 olmalıdır. Tablolarda her sütun başlığına kısa bir başlık yazılmalıdır. Tabloların sütunlarında her kelimenin ilk harfi büyük olmalıdır. Tablo numara ve başlığı tablonun üst kısmında yer almalı; tablo numarası koyu renk ile yazılmalı, tablo başlığından nokta (.) ile ayrılmalıdır (Örnek: **Tablo 1.** Katılımcıların Sosyodemografik Özellikleri). Tablolarda dikey çizgi kullanılmamalı sadece ilk satır üstünde, altında ve son satırın altında yatay çizgiler olmalıdır. Tabloda yer alan p değerleri *, ** ile gösterilmelidir. Notlar ve tabloda kullanılan kısaltmaların açıklamaları tablonun alt kısmında yazılmalıdır. Kısaltmaların açıklamasının yazımında önce kısaltma yazılmalı, iki nokta üst üste (:) işaretinden sonra kısaltmanın açık hali yazılmalıdır. Kısaltmalar birbirinden virgül ile ayrılmalıdır. Tabloda kullanılan değişkenlerin birimleri parantez içinde belirtilmelidir. Belirli bir aralığı kapsayan birimler aralık dilimi ile sayısal olarak ifade edilmelidir. Tabloda verilen ondalık sayılarda, Türkçe makalelerde virgül (,); İngilizce makalelerde nokta (.) kullanılmalıdır. Tablolarda verilen ondalık sayılarda virgül veya noktadan sonra iki basamak yazılmalıdır (Örnek: 31,12 veya 20.10). Ortalama, yüzde ve ortanca değerleri dışındaki değerler (p, r, vb.) virgülden/noktadan sonra üç basamak olarak yazılmalıdır. Tablo örneği aşağıda bulunmaktadır.

Tablo 1. Grupların Bilgi Testi Sonuçları

Bilgi Testi	TU Grubu (n=20)	SH Grubu (n=20)	TU-SH Grubu (n=20)	t	p§
Ön Test	60,50±13,17	69,05±14,11	67,14±14,54	0,002	0,051
Son Test	83,00±14,18	73,50±9,33	83,33±10,17	0,002	**0,001**

*p<0,05. §Kruskal Wallis Analizi. TU: Teorik/uygulamalı ders grubu, SH: Simüle hasta grubu, TU-SH: Teorik/uygulamalı ders ve simüle hasta grubu.

Şekiller

Şekil başlıkları tablolardan sonra ayrı bir sayfada yer almalıdır. Şekiller ise ayrı bir dosya olarak JPEG, TIFF, PNG formatında yüksek kalitede yüklenmelidir. Makale içinde kullanılan fotoğraflar net olmalıdır. Fotoğraf ve şekiller metin içinde geçiş sırasına göre numaralandırılmalıdır. Yazarlar, insan öğesinin bulunduğu fotoğraflarda, kişiden yazılı izin ve kimliğini gizleyecek önlemler almalıdırlar. İzin metni makale ile birlikte dergiye gönderilmelidir. "YÖNTEM" bölümünün ilk paragrafında yayın onayı alındığına dair bilgi verilmelidir.

Makale Gönderme Formatı

Makaleler Microsoft Office Word dosyası formatında hem yazar isimleri olan hem de yazar isimleri içermeyen iki kopya şeklide DergiPark (http://dergipark.gov.tr/tjpr) sistemine kullanıcı olarak kayıt olunduktan sonra yüklenecektir. Yazar isimlerinin bulunmadığı Word dosyasında adı geçen tüm kurumların (etik kurul onayın alındığı kurum da dahil olmak üzere) "X" ile kapatılması gerekmektedir.

Makale Değerlendirme Süreci: Derginin yayın süreci, Uluslararası Tıbbi Dergi Editörleri Komitesi (ICMJE), Dünya Tıbbi Dergi Editörleri Birliği (WAME), Bilim Editörleri Konseyi (CSE), Yayın Etiği Komitesi (COPE), Avrupa Bilim Editörleri Birliği (EASE) ve Ulusal Bilgi Standartları Organizasyonu (NISO) kılavuzları ile uyumludur. Yazar makalenin değerlendirme sürecini DergiPark (http://dergipark.gov.tr/tjpr) sisteminden takip edebilmektedir. Dergiye gönderilen yazılar ilk olarak, teknik editör tarafından yazının dergi yönergelerine uygunluğu açısından değerlendirilecektir. Derginin yönergelerine uymayan yazılar, teknik düzeltme talepleriyle birlikte yazara tekrar gönderilecektir. Makaleler ilgili alanda uzman en az iki dış hakem tarafından değerlendirmeye tabi tutulacak ve hakem raporları, iletişimden sorumlu yazara bildirilecektir. Revizyon gerektiren makalelerde yazarın hakem yorumlarını birebir yanıtlaması ve makalenin revize edilmiş versiyonunu yüklemesi gerekir. Bu süreç, yayın kurulu makaleye onay verene kadar tekrarlanır.

Telif Hakkı

Dergimizde yayınlanan yazıların tüm telif hakları Türkiye Fizyoterapistler Derneği'ne aittir.

Sorumluluk Reddi

Türk Fizyoterapi ve Rehabilitasyon Dergisi'nde yayımlanan yazılardaki ifadeler veya görüşler, editörlerin, yayın kurulunun veya yayıncının görüşlerini değil yazarların görüşlerini yansıtmaktadır. Editörler, yayın kurulu ve yayıncı bu tür materyaller için herhangi bir sorumluluk veya yükümlülük kabul etmemektedir. Yayınlanan içerikle ilgili nihai sorumluluk yazarlara aittir.

Instructions for Authors

Turkish Journal of Physiotherapy and Rehabilitation is the official journal of the Turkish Physiotherapy Association. Turkish Journal of Physiotherapy and Rehabilitation is open-access, free, impartial, and employs a double-blind peer-review process published electronically and in print. It is published three times a year, in April, August, and December, in Turkish and English. The manuscripts submitted in English will be given priority in the publication process. We are pleased to receive articles reporting original scientific research, invited reviews, systematic reviews or meta-analyses, rare case studies, and letters to the editor.

The journal aims to publish original studies of the highest scientific, ethical, and clinical value on physiotherapy and rehabilitation. Submission of an article implies that the work described has not been published previously, that it is not under consideration for publication elsewhere, that it is not having commercial concerns. The publication of an article is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in Turkish, English or any other language. The journal adopts the principle of originality, which is the most important criterion for an article with high scientific quality and citation potential to be accepted for publication.

The editorial rules of the journal are based on the guidelines published by Uniform Requirements for Manuscripts Submitted to Biomedical Journals - International Committee of Medical Journal Editors (http://www.icmje.org) and Committee on Publication Ethics (COPE) (https://publicationethics.org).

Turkish Journal of Physiotherapy and Rehabilitation (Turk J Physiother Rehabil) publishes articles from all over the world and gives priority to articles with the following characteristics:

- Original studies that address important research questions that will have an impact on physiotherapy and rehabilitation practices and test hypotheses with a strong method and research design
- Laboratory-based studies that can be the basis for clinical or field applications
- Studies that can help facilitate and improve decision-making in rehabilitation practices, policies, education, or research.

ETHICAL RESPONSIBILITY

Editorial Board

Editors have ethical duties and responsibilities based on the "COPE Code of Conduct and Best Practice Guidelines for Journal Editors" and "COPE Best Practice Guidelines for Journal Editors" published by the Committee on Publication Ethics (COPE) as open access. **Editors:**

- Every article published in the journal is published by journal publication policies and international standards,
- To improve the quality, originality, and readability of the journal,
- To conduct processes transparently without compromising intellectual property rights and ethical standards,
- To complete the impartial and independent evaluation processes of the articles, they are responsible for taking precautions against conflicts of interest that may arise between the authors, reviewers, and third parties.

Editors make positive or negative decisions based on the importance, original value, and validity, clarity of the narrative, and the journal's goals and objectives. They apply the "Blind Peer-Review and Evaluation Process" policies included in the publication policies of the journal. In this context, the editors ensure that the evaluation process of each study is completed in a fair, impartial, and timely manner without conflict of interest.

An independent external editor may be invited to manage the evaluation processes of the articles in which the editorial board members are the authors.

Reviewers

Manuscripts submitted to the Turkish Journal of Physiotherapy and Rehabilitation go through a double-blind peer-review process. To ensure an unbiased review process, each submission is reviewed by at least two independent reviewers who are experts in their fields. The reviewers are obliged to keep the information about the article confidential. In case of a conflict of interest, the reviewers notify the Turkish Journal of Physiotherapy and Rehabilitation.

The reviewers cannot use the article sent to them for any purpose until the evaluation process is completed and it is published. Reviewers should use kind and constructive language while evaluating the article and avoid bad comments and expressions. The reviewers are responsible for evaluating the article on time and by paying attention to the ethical rules.

Authors

The scientific content of the manuscripts and their compliance with ethical principles are under the responsibility of the author(s). The ethics committee must approve research protocols of experimental and clinical studies and case reports following international agreements (World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects" www.wma.net). The journal accepts manuscripts which; have been approved by the relevant Ethical Committees and are by ethical principles stated in the Declaration of Helsinki. The authors must state that they conducted the study according to the abovementioned principles in the "METHOD" section for studies conducted on human subjects. They also must express ethical committee approval and obtain "informed consent forms" from volunteers who participated in the study. Authors should document informed consent or consent forms of patients or participants when necessary. Information about the approval of the volunteers, the name of the ethics committee, and the ethics committee approval number should also be stated in the "METHOD" section of the manuscript. For studies that do not require ethics committee approval, letter of an exemption from the ethics committee in accordance with the design and content of the study or an informative statement written by the responsible author (for meta-analysis, systematic review, or invited review) should be uploaded to the system. In studies involving "animals," the author(s) should state in the "Methods" section that they have protected the rights of the animals by the principles of "Guide for the Care and Use of Laboratory Animals" (http://www.nap.edu/catalog/5140.html) and obtained approval from the relevant Ethical Committees.

Each person listed as an author must meet the following 4 criteria for authorship recommended by the International Committee of Medical Journal Editors (ICMJE-www.icmje.org:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

The scientific content of the articles and their compliance with ethical principles are the responsibility of the authors. All studies must be checked by a licensed plagiarism detection software (iThenticate/Turnitin etc., by CrossCheck) and uploaded to the system as a supplementary document at the time of application.

The similarity rate in the content of the article should not be over 20% and should not have any similarity with the previous works of the authors except for the references, table, and figure contents. Articles with a more than 20% similarity rate are rejected without being sent to the referee. In case of suspected or detected plagiarism, citation manipulation, and data forgery/fabrication, the editorial board will follow the COPE guidelines and act accordingly.

The corresponding author carries out all kinds of correspondence from the presentation stage to the printing of the article. The corresponding author should scan and upload the following documents to the system.

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- Copyright transfer form (must be e-signed or original signed. Another author's name cannot be added later, and the order of authors cannot be changed, except for those whose signatures are on this form.)
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- Conflict of interest form
- Publication rights agreement form

Suppose there are cited articles, tables, and figures previously published in articles, books, or journals. In that case, the authors must obtain written permission from the copyright holder for the table, figure, survey, and scale (validity, reliability studies and special permission for its use, certificate/scales), send the permission letter together with the article, and indicate this in the article. In addition, the signed permission of the patient or his legal representative should be attached for the photographs that may reveal the identity of the patient, and it should be stated in the "METHOD" section. Finally, if the papers are presented in scientific meetings and presented and/or published in the abstracts book, authors must be stated on the title page.

Instructions for Authors

Articles should be prepared following ICMJE -Recommendations for the Conduct, Reporting, Editing, and Publication for Scholarly Work in Medical Journals (updated in December 2019 - http://www.icmje.org/icmje recommendations.pdf). In addition, authors are required to prepare an article in accordance with the Consolidated Standards of Reporting Trials (CONSORT) Statement. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement should be used for original research studies, Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement should be used for systematic reviews and meta-analysis, and Animal Research: Reporting of In Vivo Experiments (ARRIVE) Statement for experimental animal studies.

Turkish dictionary of Turkish Language Institution should be considered in Turkish manuscripts. A native speaker should edit the manuscripts and abstracts in English before being submitted to the journal. Editors or field editors may request proofreading for English articles or English abstracts if they deem necessary.

Original Article: It consists of research that provides basic or clinical information on a current and essential topic, extends, and advances previous studies, or introduces a new approach to a classic topic. Original articles should not exceed 4000 words, and the number of references should not exceed 40.

Case Report: It describes interesting cases, novel ideas, and techniques. Figures, tables, and references should be as minimal as possible to explain and support the text. The number of words should not exceed 2000, and the number of references should not exceed 20.

Editorial Comment: The Editorial Board may invite an author who is an expert in education and clinical practice to write an informative article or comment on a particular subject. The number of words should not exceed 1000, and the number of references should not exceed 10.

Invited Review/Systematic Review/Meta-Analysis: Systematic reviews and meta-analyses are prepared directly, while invited authors prepare invited reviews. They should also include the current literature for any subject about physiotherapy and rehabilitation science and clinical applications. It is especially preferred that the authors have published publications on that subject. The number of words should not exceed 6000, and the number of references should not exceed 100.

Editorial Letter: It is published with the approval of the Editorial Board. If the letter is a commentary on an article published in the journal, it should be stated as the source to which article (number, date) it is dedicated. The answer to the letter is given by the editor or the author(s) of the article, again by publishing it in the journal. The number of words in the letters is limited to 500, and the number of references is limited to five.

Articles submitted for publication in the journal;

- The writing page should be A4 size, with a PC-compatible Microsoft Word program.
- "Times New Roman" font with a 12-font size should be used, and all parts of the article should be written with 1.5 line spacing.
- At least 2.5 cm of space should be left on each side of the page.
- Pages (bottom right corner) and lines should be numbered.
- The main headings of the article (Introduction, Method, Results, Discussion, and References) should be written in capital letters and in bold.
- Sub-headings should begin with a capital letter as a sentence case and bold.
- In the numerical values given in the text, a comma (,) should be used in Turkish articles and a period (.) in English articles. In these numerical values given, two more digits of the number should be given after the comma or period, excluding p and r values (Example: 13.31 or 15.21); the p and r values should be written as three digits after the comma/period.
- Abbreviations are given in parentheses at the first occurrence of the word, and that abbreviation is used throughout the text. Reference can be made to the scientific spelling rules for internationally used abbreviations.

Title Page

The title of the manuscript should be brief but descriptive for the content and compatible with the purpose. Article title should be written in Turkish and English. The Turkish and English titles should be written in bold with capital letters. Besides, a short running title (not exceeding 40 characters) should be specified both in Turkish and English on the title page. The number of words (excluding title page, references, tables, and figures) of the article should be written. Full names, surnames (written in a capital letter), academic titles, institutions, and digital identifiers Open Researcher and Contributor ID (ORCID) of the authors, full name and address of the clinic, department, institute, hospital, or university which the study was conducted at should be declared using superscript numbers for each author. The contact information of the corresponding author should also be specified. The title page should include each author's contact information, address, current e-mail address, and business phone number.

Abstracts

Each manuscript should include both Turkish and English abstracts.

Turkish Abstract and Keywords

The Turkish abstract should begin from a separate page and not exceed 250 words. The Turkish summary section should include the purpose of the study, the methods, the primary findings, and the result. The abstract should be titled "Öz" and divided into subheadings of "Purpose," "Methods," "Results," and "Conclusion." The p-value must be specified in the "Results" section. A comma (,) should be used in decimal numbers in Turkish article summaries.

The number of keywords should not be less than 3 or more than 5. Keywords should be selected from the "Turkey Science Terms" list (http://www.bilimterimleri.com). The out-of-list terms may be used for a new concept. Each keyword begins with an uppercase letter, separated by a comma and written in alphabetical order. If the article is in Turkish, the keywords in the English abstract should be written in the alphabetical order of the Turkish keywords.

English Abstract and Keywords:

The English abstract should begin on a separate page and not exceed 250 words. A period (.) should be used in decimal numbers in the English summary. English abstract must be divided into subheadings of "Purpose," "Methods," "Results," and "Conclusion." The English abstract and keywords should be the same as the Turkish abstract and keywords. Keywords should be selected from "MeSH (Medical Subject Headings)" terms. The out-of-list terms may be used for a new concept that has not taken place in MeSH yet. Each keyword begins with an uppercase letter, separated by a comma and written in alphabetical order. If the article is in English, the keywords in the Turkish abstract should be sorted according to the alphabetical order of the English keywords.

Sections of the Original Research Articles

The sections of Turkish Article consist of "Giriş", "Yöntem", "Sonuçlar" and "Tartışma". In English articles, there are "Introduction," "Methods," "Results," and "Discussion" sections. Abbreviations can be used for the expressions repeated more than five times in the manuscript. The explanation of the abbreviation should be stated in the first place in the text.

Introduction

The introduction should summarize the basic knowledge obtained from previous studies related to the study topic. The rationale and purpose of the study should be described briefly.

Methods

The clinical, technical, or experimental methods in the study should be clearly stated. Appropriate references should be given for the method. In this section, the authors must state that they carried out their studies on humans in accordance with the principles of the Declaration of Helsinki, that they received approval from the relevant ethics committee (name of the ethics committee, date, and protocol number should be written) and informed consent was obtained. The method section should include the subtitle as "Statistical analysis." If an animal is used in the study, the authors should state that they protect animal rights in line with the principles of the Guide for the Care and Use of Laboratory Animals (http://www.nap.edu/catalog/5140.html) and have obtained approval from the relevant ethics committee. A statement that publication approval has been obtained for photographs that may reveal the identity of the participants should be included in this section.

If any statistical program is used, the name of the software program, version number, location, date and company information should be written. Information on statistical analysis methods and the calculation of sample size should be presented and supported with references when necessary.

Results

The results should not contain any interpretation that is not based on numerical data. In the text, repetition of the data presented in the tables should be avoided, and the most important results should be emphasized.

Discussion

The discussion should begin with information on the most important results obtained in the study. Results from the study should be interpreted and correlated with the results of previous studies. In the discussion, the limitations of the study, its contribution to the literature, and clinical practice should be stated. It should be avoided to repeat the findings in the "Results" section and the tables with their details in the discussion section. Data not obtained in the study should not be discussed.

The following titles should be added after the discussion section with their explanations:

- *Sources of Support:* If there are supporting organizations, it should be specified.
- *Conflict of Interest:* It should be stated if there is a conflict of interest.
- *Author Contributions:* Authors' contributions to the article should be stated. Contributions should be gathered under the headings of idea/concept, design, supervision/consulting, resources and funding, materials, data collection and/or processing, analysis and/or interpretation, literature review, article writing, critical review.
- *Explanations:* If the article has been presented in the form of an abstract and/or a conference proceeding before, information about the scientific meeting, place, and date of the presentation, and if published, the publication organ should be stated in the "Explanations" section.
- *Acknowledgement:* Information about individuals and/or organizations that do not meet the criteria for being an author but provided support during the research (reading the article, writing, technical support, language, and statistical support, etc.) should be stated in the "Acknowledgements" section as briefly and concisely as possible.

References

References should be placed after the main text. References should be numbered in the order of occurrence in the text, at the end of the sentence (before the point), with Arabic numerals, and in parentheses [Example: ..... it was found (21).]. The number of references should not exceed 40, and the use of references older than ten years should not exceed 15% of the total number of references. Unless necessary, the use of books, web pages, unpublished observations, and personal interviews as references should be avoided. If more than one reference is cited, a comma should be placed between them, and no spaces should be left before or after the comma. An example (3,7,15–19) can be given; "15–19" covers five publications from reference 15 to reference 19. If the article is in English, the references that the name will indicate in the text should be specified as "Author's name et al." (Example: Burtin et al.); if the text is in Turkish, the references that the name will indicate in the text should be specified as "Yazar adı ve diğ." (Example: Burtin ve diğ.).

Journal names should be presented in abbreviated form as in Index Medicus. All authors should be written if the number of authors is six or less in the standard journal. If the number of authors is more than 6, the first six authors should be written, and the other authors should be specified as "ve diğ." for Turkish articles and "et al." for English articles. Authors who will use programs such as Endnote, Mendeley should use the "VANCOUVER" style. The information that must be included in a reference given in Vancouver style is as follows:

- Author(s) name(s), - Article title, - Journal name (abbreviated as in Index Medicus), - Publication year, - Journal volume and issue, - Page range (Example:10-5).

Reference writing examples are as follows:

- *Article;* Burtin C, Saey D, Saglam M, Langer D, Gosselink R, Janssens W, et al. Effectiveness of exercise training in patients with COPD: the role of muscle fatigue. Eur Respir J. 2012;40(2):338-44.
- *Studies published as a supplement of the journal;* Hielkema T, Hadders Algra M. Motor and cognitive outcome after specific early lesions of the brain–a systematic review. Dev Med Child Neurol. 2016;58(Suppl 4):46-52.
- *Book;* Murtagh J. John Murtagh's general practice. 4th ed. Sydney: McGraw-Hill Australia Pty Ltd; 2007.
- *Book Section;* Cerulli G. Treatment of athletic injuries: what we have learned in 50 years. In: Doral MN, Tandogan RN, Mann G, Verdonk R, eds. Sports injuries. Prevention, diagnosis, treatment and rehabilitation. Berlin: Springer-Verlag; 2012: p. 15-9.
- *Congress Papers;* Callaghan MJ, Guney H, Bailey D, Reeves N, Kosolovska K, Maganaris K, et al. The effect of a patellar brace on patella position using weight bearing magnetic resonance imaging. 2014 World Congress of Osteoarthritis Research Society International, April 24-27, 2014, Paris. Osteoartr Cartilage; 2014;22(Suppl):S55.
- *Web page;* Diabetes Australia. Gestational diabetes [Internet]. Canberra (AU): Diabetes Australia; 2015 [updated 2015; cited 2017 Nov 23]. Available from: https://www.diabetesaustralia.com.au/gestational-diabetes.

Tables

Tables should be prepared in Microsoft Word file format, placed at the end of the article on separate pages, and numbered according to the order in which they occur in the main text. The total number of tables and figures should be at most 6. A short title should be written for each column heading in the tables. The first letter of each word in table columns must be capital. Table number and title should be at the top of the table; "table" should be written in bold, separated from the table title by (.) (Example: **Table 1.** Sociodemographic Characteristics of the Participants). Vertical lines should not be used in tables, and only horizontal lines should be used above and below the first line and below the last line of the table. The p values in the table should be indicated with *, **. Notes and explanations of abbreviations used in the table should be written at the bottom of the table. While writing the explanation of the abbreviations, the abbreviation should be written first, and the open version of the abbreviation should be written after the colon (:) sign. Abbreviations should be separated by commas. The units of the variables used in the table should be specified in parentheses. Units covering a certain range should be expressed numerically by the range segment. In decimal numbers given in tables, comma (,) in Turkish articles; point (.) in English articles should be used. In the decimal numbers given in the tables, two digits should be written after the comma or the point (Example: 31,12 or 20.10). Values other than a mean, percent, and median values (p, r, etc.) should be written as three digits after the comma/point (Please see the example table below).

Table 1. Knowledge Test Results of the Groups

Knowledge Test	Group TP (n=20)	Group SP (n=20)	Group TP-SP (n=20)	t	p§
Pre Test	60.50±13.17	69.05±14.11	67.14±14.54	0.002	0.051
Post Test	83.00±14.18	73.50±9.33	83.33±10.17	0.002	**0.001**

*p<0,05. §Kruskal Wallis Analysis. TP: Theoretical/practical course group, SP: Simulated patient group, TP-SP: Theoretical/practical course, and simulated patient group.

Figures

A list of figures should be placed on a page after the list of tables. The authors are expected to submit good quality figure(s) in JPEG, TIFF, or PNG versions as separate files. The photographs used in the manuscript should be clear. The photographs and figures should be numbered in the order in which they are referenced. If the manuscript involves humans, written consent of the participants should be collected, and precautions should be taken to disguise individuals' identities. The text of the consent form should be sent to the journal with the manuscript. It should be indicated in the first paragraph of the "METHOD" section that the written consent was collected from the participants.

Manuscript Submission

Two copies of the manuscript should be prepared for submission as Word files. One file must have all author details included, and the other must be anonymized. Both versions should include the title, abstract, body, and references. All institutions mentioned in the anonymous file (including the institution where the ethics committee approval was obtained) must be written as "X." Both copies will be uploaded (after registering as a user) in the DergiPark (http://dergipark.gov.tr/tjpr) system.

Peer Review Process: The editorial and publication process of the journal is shaped following the guidelines of the International Committee of Medical Journal Editors (ICMJE), World Association of Medical Journal Editors (WAME), Council of Science Editors (CSE), Committee on Publication Ethics (COPE), European Association of Science Editors (EASE), and National Information Standards Organization (NISO). The author(s) will be able to follow the evaluation process of the article from the DergiPark system (http://dergipark.gov.tr/tjpr). Manuscripts submitted to the journal will first go through a technical evaluation process where the editorial office staff will ensure that the manuscript has been prepared and submitted following the journal's guidelines. Submissions that do not conform to the journal's guidelines will be returned to the submitting author with technical correction requests. The articles will be evaluated by at least two external referees who are experts in the relevant field, and the referee reports will be sent to the corresponding author. If a revision is required, the author should respond to all referee comments and upload the revised version of the manuscript. This process will be repeated until the editorial board approves the manuscript.

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EDİTÖRDEN

Değerli Okurlarımız,

Dergimizin 2023 yılındaki son sayısında engelli çocuklar, kronik sistemik ve muskuloskeletal hastalığa sahip yetişkin ve yaşlılar, sağlık çalışanları ve sporcular üzerinde gerçekleştirilen fizyoterapi değerlendirmelerine; ülkemizdeki fizyoterapistlerin rotator manşet yaralanmalarındaki uygulamalarına, COVID-19 dönemindeki nörolojik rehabilitasyon deneyimlerine, mesleki tutum ile tükenmişliklerine, yatak seçiminde fizyoterapist danışmanlığına yönelik araştırma makalelerine ve de Pilates egzersizlerinin spor performansına etkisi konusundaki bir sistematik derlemeye yer verilmiştir. Çoğu karşılaştırmalı çalışma sonuçlarından oluşan bu makalelerde ele alınan konuların fizyoterapistlik mesleğine ve uygulama alanlarının gelişimine katkı sağlayacak özellikte olduğunu, güncel profesyonel görüş ve yaklaşımları içerdiğini, geniş bir okuyucu kitlesine hitap edebileceğini düşünmekteyiz. Birisi dışında tüm makalelerin İngilizce olarak yayımlanmış olması bu sayının sadece ülkemizde değil uluslararası fizyoterapi camiasında da geniş bir okuyucu kitlesine ulaşabilmesi açısından ayrıca önemlidir.

Her yıl olduğu gibi 2023 yılında da Dergimizde hakemlik yapmış değerli klinisyen ve akademisyenleri sizinle paylaşmaktan gurur duyuyor, Dergimizin bu seviyeye ulaşmasındaki büyük katkılarından dolayı kendilerine sonsuz teşekkürlerimizi sunuyoruz.

Bu sayımızda Konuk Editör olarak Dernek Başkanımız Sayın Prof. Dr. Tülin DÜGER yer almakta ve 9. Ulusal Fizyoterapi ve Rehabilitasyon Kongresinde sunulan bildiri özetleri ek sayı olarak yayınlanmaktadır. Bu bildirilerin ulusal ve uluslararası literatüre önemli katkılar getireceğine inanmaktayız.

Gerek okuyucu gerekse yazar olarak dergimize verdiğiniz desteğin yeni yılda da artarak devam etmesini ve 2024 yılında tüm iyilik ve güzelliklerin sizlerle olmasını dileriz.

Yayın Kurulu Adına,

Saygılarımla,

Prof. Dr. H. Serap İNAL

Baş Editör

EDİTÖRDEN

Sayın Okurlar,

Cumhuriyetimizin 100. yılında düzenlediğimiz ve Türkiye Fizyoterapistler Derneği olarak gurur duyduğumuz 9. Ulusal Fizyoterapi ve Rehabilitasyon Kongresi'ni tamamlamanın sevincini yaşıyoruz. Kongremizin ana teması olan "Cumhuriyetimizin 100. Yılında Fizyoterapi ve Rehabilitasyon" çerçevesinde, bilimsel gelişmeleri takip ederek mesleki birikimimizi artırma fırsatı bulduğumuz bu özel etkinlik, Cumhuriyetimizin 100. yılına yakışır bir şekilde bilim ve dayanışmanın bir araya geldiği bir platform olmuştur.

Kongremizde tartışılan pek çok konu arasında; afetlerde fizyoterapi rehabilitasyon, omurga sağlığı ve rehabilitasyonu, egzersizin temelleri, güncel mevzuat, kardiyopulmoner rehabilitasyon, elektrik stimulasyonu, engellerle yaşamak, sağlıklı yaşlanma, sağlık çalışanlarının sağlığı, romatizmal hastalıklarda rehabilitasyon, fizyoterapide teknoloji kullanımı, mental sağlık, nadir hastalıklar gibi önemli başlıklar işlenmiştir. Bu kapsamda tartışılan tüm konular, mesleğimizdeki gelişmeleri takip etmek isteyen meslektaşlarımız için gelecekte önemli birer referans kaynağı olacaktır.

Bu yazı ile birlikte, kongremizde sunulan değerli bilimsel çalışmaların, Türk Fizyoterapi ve Rehabilitasyon Dergisi'nde yer alacak olmasını memnuniyetle duyuruyoruz. Derneğimiz adına, kongremize katılan bilim insanlarına, araştırmacılara, katılımcılara ve emeği geçen herkese teşekkür ederim. Kongremizde sunulan bildirilerin, mesleğimizde ilerlemeye katkıda bulunmasını diliyor, bilimsel gelişmelerin ışığında sağlıklı bir gelecek temennisiyle sizleri Türk Fizyoterapi ve Rehabilitasyon Dergisi'nin bu sayısını incelemeye davet ediyorum.

Sağlıkla kalın,

Prof. Dr. Tülin Düger

Türkiye Fizyoterapistler Derneği Başkanı

EDİTÖRDEN

Dear Readers,

In the last issue of our Journal in 2023, research articles regarding physiotherapy evaluations carried out on disabled children, adults and elderly people with chronic systemic and musculoskeletal diseases, on healthcare professionals and athletes; practices of Turkish physiotherapists about rotator cuff injuries, their neurological rehabilitation experiences during the COVID-19 period, and their current status of professional attitude and burnout, physiotherapist consultancy in mattress selection; as well as a systematic review on the effect of Pilates exercises on sports performance, are included. We believe that the topics discussed in these articles, most of which consist of comparative study results, will contribute to the physiotherapy profession and the development of its application areas, include current professional views and approaches, and can appeal to a wide readership. The fact that all articles except one are published in English is also important for this issue to reach a wide readership not only in our country but also in the international physiotherapy community.

We are proud to share with you the valuable clinicians and academicians who served as referees in our Journal in 2023, as every year, and we would like to express our endless gratitude to them for their great contributions to our Journal reaching this level.

In this issue, the President of the Turkish Physiotherapy Association, Tülin DÜGER, PT. PhD. Prof., is the Guest Editor, and the abstracts of the papers presented at the 9th National Physiotherapy and Rehabilitation Congress are published as supplementary issues. We believe that these papers will make significant contributions to national and international literature.

We hope that your support for our Journal, both as readers and authors, will continue to increase in the new year and that all the goodness and beauty will be with you in 2024.

On behalf of the Editorial Board,

Sincerely,

H. Serap İNAL, Prof, PT

Editor in Chief

EDİTÖRDEN

Dear Readers,

We take great pride in concluding the 9th National Physiotherapy and Rehabilitation Congress, organized on the occasion of the 100th anniversary of our Republic, as the Turkish Physiotherapy Association. Celebrating the completion of this special event, where we had the opportunity to enhance our professional knowledge by keeping abreast of scientific developments, we find satisfaction in creating a platform where science and solidarity come together in a manner befitting the 100th year of our Republic.

Within the framework of the congress's main theme, "Physiotherapy and Rehabilitation in the 100th Year of Our Republic," this unique event has become a space for the convergence of science and camaraderie. Among the various topics discussed at the congress are physiotherapy rehabilitation in disasters, spine health and rehabilitation, fundamentals of exercise, current legislation, cardiopulmonary rehabilitation, electrical stimulation, living with disabilities, healthy aging, the health of healthcare workers, rehabilitation in rheumatic diseases, technology use in physiotherapy, mental health, rare diseases, and other significant subjects. All these discussed topics will serve as important reference sources for colleagues seeking to keep track of developments in our profession in the future.

With this message, we are pleased to announce that the valuable scientific studies presented at the congress will be featured in the Turkish Journal of Physiotherapy and Rehabilitation. On behalf of our association, I extend my gratitude to the scientists, researchers, participants, and everyone involved in the congress. We hope that the presentations made at the congress contribute to the advancement of our profession and invite you to explore this issue of the Turkish Journal of Physiotherapy and Rehabilitation in the light of scientific developments.

Wishing you a healthy future,

Prof. Dr. Tülin Düger

President of Turkish Physiotherapy Association

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Turkish Journal of Physiotherapy and Rehabilitation

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Sefa UNES, PT, PhD[1]
Gursoy COSKUN, PT, PhD[1]

AN ICF CORE SET BASED INVESTIGATION OF THE EFFECTS OF GROSS MOTOR FUNCTIONS ON HEALTH IN CHILDREN WITH CEREBRAL PALSY

ORIGINAL ARTICLE

ABSTRACT

Purpose: The Gross Motor Function Measure (GMFM) is commonly used to assess gross motor functions in children with cerebral palsy (CP). Our aim was to investigate the relationship between gross motor function and health status in children with CP based on clinical types and functional levels.

Methods: This cross-sectional study included 75 children with CP (mean age ± SD 7.59 ±3.86 years). The 66-item Gross Motor Function Measure (GMFM-66) was used to measure the gross motor functions of children. The International Classification of Functioning, Disability and Health (ICF) CP Core Set was used to assess the general health status of children including body functions and structures, activity and participation, and environmental factors for obtaining a holistic framework.

Results: Of the children, 61 (81.3%) were spastic and 14 (18.7%) were dyskinetic. Children were divided into 3 groups based on the Gross Motor Function Classification System (GMFCS) level as mild (levels 1-2, n=28), moderate (level 3, n=16), and severe (levels 4-5, n=31). The GMFM-66 had moderate to strong correlations with body functions and structures ($r=-0.811$, $p<0.001$) and activity and participation ($r=-0.862$, $p<0.001$) domains of the ICF in severely affected children with CP although it had no strong correlation in any of the ICF domains in mildly or moderately affected children.

Conclusion: Although gross motor functions may reflect the health status holistically in severely affected children with CP, it seems not sufficient to reflect the health status in mildly or moderately affected children with CP.

Keywords: Cerebral palsy, Gross motor function, Health status, ICF

SEREBRAL PALSİLİ ÇOCUKLARDA KABA MOTOR FONKSİYONLARIN SAĞLIK ÜZERİNE ETKİLERİNİN ICF ÇEKİRDEK SETİ TEMEL ALINARAK ARAŞTIRILMASI

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Kaba Motor Fonksiyon Ölçümü (GMFM), serebral palsili (SP) çocuklarda kaba motor fonksiyonların değerlendirilmesinde yaygın olarak kullanılmaktadır. Amacımız SP'li çocuklarda klinik tipe ve fonksiyonel seviyelere göre kaba motor fonksiyon ile sağlık durumu arasındaki ilişkiyi araştırmaktı.

Yöntem: Bu kesitsel çalışmaya SP'li 75 çocuk (ortalama±standart sapma yaş 7,59±3,86 yıl) dahil edildi. Çocukların kaba motor fonksiyonlarını ölçmek için 66 maddelik Kaba Motor Fonksiyon Ölçeği (GMFM-66) kullanıldı. Bütünsel bir çerçeve elde etmek amacıyla vücut yapı ve fonksiyonları, aktivite ve katılım düzeyi ve çevresel faktörler de dahil olmak üzere çocukların genel sağlık durumunu değerlendirmek için Uluslararası İşlevsellik, Engellilik ve Sağlık Sınıflandırması (ICF) SP Çekirdek Seti kullanıldı.

Sonuçlar: Çocukların 61'i (%81,3) spastik, 14'ü (%18,7) diskinetikti. Çocuklar Kaba Motor Fonksiyon Sınıflandırması (GMFCS) düzeyine göre hafif (seviye 1-2, n=28), orta (seviye 3, n=16) ve şiddetli (seviye 4-5, n=31) olmak üzere 3 gruba ayrıldı.GMFM-66 ağır etkilenimli SP'li çocuklarda ICF'in vücut yapı ve fonksiyonları ($r=-0,811$, $p<0,001$) ve aktivite ve katılım seviyesi ($r=-0,862$, $p<0,001$) ile orta-güçlü ilişkiye sahipken, hafif veya orta şiddetli etkilenimi olan SP'li çocuklarda ICF'in hiçbir alanı ile güçlü ilişkisi bulunmadı.

Tartışma: Kaba motor fonksiyonlar, ağır etkilenmiş SP'li çocuklarda sağlık durumunu bütünsel olarak yansıtabilse de, hafif veya orta derecede etkilenmiş SP'li çocuklarda sağlık durumunu yansıtmada yeterli görünmemektedir.

Anahtar Kelimeler: Serebral palsi, Kaba motor fonksiyonlar, Sağlık durumu, ICF

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INTRODUCTION

Cerebral Palsy (CP) is a neurodevelopmental, non-progressive condition that occurs in infancy and continues throughout the life and is the most common cause of motor disability in childhood (1, 2). Although the lesion in the brain is not progressive, secondary musculoskeletal problems occur in the following years, which may affect participation. Motor problems such as hypertonia and dyskinesia adversely affect the mobility of children with CP and severely limit the functional independence and participation in the community (3, 4).

Children with CP have many significant obstacles to participation in daily activities and social roles (5). For example, children with CP have lower levels of participation in play activities than their peers as they have difficulties in mobility and have poorer fitness than their peers (6). Therefore, an impairment of physical movement does not limit only body structures and functions, but also activity and participation. Another example for an obstacle to participation in children with CP is that they have impairments in ability to interact with people and to adapt to the environment. In this case, children experience limitations in participating in activities of daily living and social roles, even if their physical conditions allow it. In the long term, it can yield developmental delays in other aspects of health, such as cognition, sensory function, or self-esteem. Depending on the children's impairments of body functions and structures, both of their activity and participation levels and their general health status are limited at varying degrees (7).

The main purpose of holistic treatment programs is to support activity and participation. Therefore, one of the main goals of treatment in CP is to increase the child's mobility to increase functional independence and participation in society as much as possible (4). The World Health Organization (WHO) created the International Classification of Functioning, Disability and Health Child and Youth (ICF-CY) as a classification of health and health-related domains, to standardize the description of functional abilities, health, and disabilities of individuals in a context of a health condition (8). The ICF offers a comprehensive framework for understanding functioning and disability from a dynamic biopsychosocial perspective. Activity and participation have been a focus of studies about childhood disability after the introduction of the ICF-CY. In the ICF-CY model, participation is a key element and is considered the result of the interaction between body functions, structures, activities, and environment (9). Therefore, the main purpose of pediatric rehabilitation should be holistically encouraging the child's participation, and this is also dependent on holistic assessment.

The most widely used, valid, and reliable method to evaluate motor functions in children with CP is the Gross Motor Function Measure (GMFM) The GMFM assesses the extent to which a child with CP can perform an activity, focusing on the level of completion rather than the quality of the activity execution. It scores each activity on a range from 0 (activity cannot be started) to 3 (activity can be completed successfully) regardless of how well the child performed the activity. Therefore, because it is an easy-to-score tool, the GMFM has become the most common functional outcome to evaluate the change in gross motor function of a child with CP among both clinicians and researchers.

On the other hand, there are various other measurement tools assessing other dimensions of participation, similar to GMFM. However, these tools are not used commonly in clinics as much as GMFM. Therefore, the holistic assessment recommended by WHO is not fully implemented. There is also no information about the relationship between gross motor functions and the general health status in children with cerebral palsy. The aim of our study was to investigate the association between gross motor level assessed with the GMFM and the general health status assessed by the ICF CP core set in children with CP. We hypothesized that the general health status of children with CP cannot be reflected when only the gross motor functions are assessed.

METHODS

Participants

This is a cross-sectional observational clinical study and was carried out at the Faculty of Physical Therapy and Rehabilitation, Hacettepe University.

Ethical approval for the study was obtained from the local ethics committee (GO 17/900-29). Before starting the study, written informed consent was obtained from each child's parent.

Children were recruited through the Department of Cerebral Palsy and Pediatric Rehabilitation, Faculty of Physical Therapy and Rehabilitation, Hacettepe University. Children were included into the study using census method. Children were enrolled if they were diagnosed with CP and aged between 6 and 12 years. Children having congenital or genetic disorders or having any orthopedic surgery and/or botulinum toxin injections in last 6 months were excluded from the study.

Study Design

All evaluations of the children included in the study were carried out by the researcher physiotherapist in our clinic. First, the functional level of the children was classified by observing them and asking their parents. Then, the children's gross motor functions were evaluated. Finally, the general health status of the children was determined using the ICF CP core set. All evaluations were completed in a single session. The obtained findings were analyzed and the relationships between general health status and gross motor functions were examined based on the children's functional level and clinical type.

Measurements

The Gross Motor Function Classification System-Expanded Revision (GMFCS, kappa 0.55-0.75) was used to determine the gross motor function level of the children (10, 11). The GMFCS is a valid and reliable tool to classify the gross motor function of children with CP (12, 13). It has a series of five distinct but comprehensive levels from level I (most independent) to level V (fully dependent). Then, the children were divided into three groups based on their functional level according to the GMFCS level as mildly affected children (GMFCS levels 1-2), moderately affected children (GMFCS level 3), and severely affected children (GMFCS levels 4-5).

The 66-item GMFM (GMFM-66) is a practical version of the original 88-item GMFM, and both of them measure children's gross motor functions (14). The GMFM-66 was developed to increase the usefulness of the original GMFM as it has fewer items to evaluate the child's gross motor functions. The GMFM-66 assesses children's activities in 5 different positions: (1) lying and rolling, (2) sitting, (3) crawling and kneeling, (4) standing, and (5) walking, running, and jumping. It classifies the children with CP into four groups depending on their achievement in specific items of GMFM-66. To determine the child's GMFM total score, only the performance of the items in the group in which the child was classified is evaluated, not all 66 items. The items are scored from 0 (cannot initiate) to 3 (completed independently). The GMFM-66 score, obtained by taking the average of the evaluated items and multiplying by 100, ranges from 0 to 100. Higher scores indicate better capacity. We used the Gross Motor Ability Estimator (GMAE), a computer program, to obtain the total score. Russell et al. found the test–retest reliability for the GMFM-66 to be high with an intraclass correlation coefficient of 0.99 (15).

The CP Core Set is a short form of the ICF consisting of 25 items specific to CP. The Core Set offers the opportunity to evaluate the child in a holistic frame (16). The Brief Core set consists of 25 domains, including body structure (s), body function (b), activity and participation (d), and environmental factors (e). The domains of the CP Brief Core Set and a total of 25 items contained in the domains are shown in Appendix. The scoring of the core set is done separately for each item in the domain (s), (b), and (d). It is determined if it is facilitating or barrier to the participation in the domain (e). The item identified as a facilitator is scored (+), while the item determined as a barrier is scored (-). After observing children or asking their parents and examining their medical reports, we scored each item between 0 (no problem) and 4 (complete problem) as indicated in its manual (17).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics 26.0 (SPSS, Chicago, IL, USA), with the significance level set at 0.05. Demographic and clinical characteristics of the participants are presented as mean ± standard deviation (SD) or median, interquartile range (IQR), and frequency. Spearman correlation coefficient (r) was used to examine

Table 1. Descriptive Information of Children in the Study

		X	SD
Age (years)		7.59	3.86
		n	**%**
Sex			
	Girl	38.00	49.35
	Boy	39.00	50.65
CP Type			
	Spastic Hemiplegic	17.00	22.07
	Spastic Diplegic	26.00	33.76
	Spastic Quadriplegic	20.00	25.99
	Dyskinetic	14.00	18.18
Functional Level			
	Mild (GMFCS 1-2)	28.00	36.36
	Moderate (GMFCS 3)	18.00	23.37
	Severe (GMFCS 4-5)	31.00	40.27

X: Mean, SD: Standard Deviation, n: Count, %: Percent, CP: Cerebral Palsy, GMFCS: Gross Motor Function Classification System.

the relationships between variables. Correlation coefficient was interpreted as follows: |r|>0.8 very strong relationship; 0.6<|r|<0.8 strong relationship; 0.4<|r|<0.6 moderate relationship; 0.2<|r|<0.4 weak relationship; and |r|<0.2 very weak relationship (18).

RESULTS

The study included 75 children with CP (mean ± SD age 7.59 ±3.86 years). Of the 75 children, 61 (81.3%) were spastic and 14 (18.7%) were dyskinetic type. Children were divided into 3 groups based on their GMFCS level as mild (level 1 and 2), moderate (GMFCS level 3), and severe (GMFCS level 4 and 5), and there are 28 (37.3%), 16 (21.3%), and 31 (41.3%) children in each group, respectively. The characteristics of the children are shown in Table 1.

Table 2 shows the GMFM-66 scores and the relationships between the sub-parameters of the CP

Table 2. Correlations between the GMFM-66 Score and ICF-CY Components According to Gross Motor Functional Levels

		GMFCS 1-2 (n=28)	GMFCS 3(n=16)	GMFCS 4-5(n=31)	All Population(n=75)
GMFM-66 Score (X±SD)		62.18±9.06	52.55±11.82	24.76±15.24	44.66±21.14
S1 – Structure of the nervoussystem	r	-0.153	-0.495	-0.756	-0.821
	p	0.438	0.051	<0.001**	<0.001**
B1 – Mental functions	r	-0.508	-0.367	-0.715	-0.740
	p	0.006**	0.162	<0.001**	<0.001**
B2 – Emotional functions	r	-0.005	-0.533	-0.812	-0.586
	p	0.982	0.034*	<0.001**	<0.001**
B3 – Movement relatedfunctions	r	-0.340	-0.196	-0.495	-0.772
	p	0.077	0.467	0.005*	<0.001**
B – Body structures andfunctions (total)	r	-0.458	-0.512	-0.811	-0.848
	p	0.014*	0.043*	<0.001**	<0.001**
D4 – Mobility	r	-0.521	-0.440	-0.845	-0.880
	p	0.004	0.088	<0.001**	<0.001**
D5 – Personal Care	r	-0.596	-0.342	-0.649	-0.860
	p	0.001**	0.195	<0.001**	<0.001**
D7 – InterpersonalCommunication	r	-0.464	-0.266	-0.843	-0.749
	p	0.013*	0.318	<0.001**	<0.001**
D – Activity and participation(total)	r	-0.594	-0.438	-0.862	-0.900
	p	0.001**	0.09	<0.001**	<0.001**
E1 – Products and Technology	r	0.387	0.150	0.347	0.326
	p	0.042*	0.580	0.056	0.004*
E3 – Support and Care	r	-0.183	0.114	0.111	-0.126
	p	0.350	0.675	0.554	0.283
E4 – Attitudes	r	0.369	0.130	0.356	0.696
	p	0.054	0.632	0.049*	<0.001**
E5 – Services	r	0.168	-0.457	0.430	0.336
	p	0.393	0.075	0.016*	0.003*
E – Environmental factors(total)	r	0.262	-0.025	0.469	0.416
	p	0.178	0.926	0.008*	<0.001**

X: Mean, SD: Standard Deviation, n: Count, r: Correlation Coefficient, *p<0.05, **p<0.001, GMFCS: Gross Motor Function Classification System, GMFM-66: The 66-Item Gross Motor Function Measurement, ICF: International Classification of Functioning, Disability and Health.

Table 3. Correlations between the GMFM-66 Score and ICF-CY Components According to Clinical Types of Cerebral Palsy

		Spastic Hemiplegic (n=17)	Spastic Diplegic(n=24)	Spastic Quadriplegic (n=20)	Dyskinetic(n=14)
GMFM-66 Score (X±SD)		63.77±8.87	58.58±8.37	27.17±15.09	22.60±12.71
S1 – Structure of the nervoussystem	r	0.000	-0.487	-0.793	-0.668
	p	1.000	0.016*	<0.001**	0.009*
B1 – Mental functions	r	-0.511	-0.197	-0.719	-0.743
	p	0.036*	0.357	<0.001**	0.002*
B2 – Emotional functions	r	-0.046	-0.039	-0.707	-0.693
	p	0.889	0.858	<0.001**	0.006*
B3 – Movement relatedfunctions	r	-0.195	-0.294	-0.753	-0.383
	p	0.454	0.163	<0.001**	0.176
B – Body structures andfunctions (total)	r	-0.279	-0.461	-0.817	-0.757
	p	0.278	0.024*	<0.001**	0.002*
D4 – Mobility	r	-0.489	-0.485	-0.852	-0.796
	p	0.046*	0.016*	<0.001**	0.001*
D5 – Personal Care	r	-0.648	-0.345	-0.728	-0.649
	p	0.005*	0.099	<0.001**	0.012*
D7 – InterpersonalCommunication	r	-0.583	-0.328	-0.818	-0.806
	p	0.014*	0.117	<0.001**	<0.001**
D – Activity and participation(total)	r	-0.542	-0.481	-0.882	-0.868
	p	0.025*	0.017*	<0.001**	<0.001**
E1 – Products and Technology	r	0.468	0.402	0.391	0.400
	p	0.058	0.052	0.089	0.156
E3 – Support and Care	r	-0.037	-0.417	0.186	0.276
	p	0.887	0.043*	0.431	0.339
E4 – Attitudes	r	0.355	-0.457	0.329	0.182
	p	0.162	0.025*	0.157	0.533
E5 – Services	r	0.216	-0.309	0.516	0.299
	p	0.405	0.142	0.020*	0.299
E – Environmental factors(total)	r	0.440	-0.333	0.584	0.398
	p	0.077	0.112	0.007*	0.158

X: Mean, SD: Standard Deviation, n: Count, r: Correlation Coefficient, *p<0.05, **p<0.001, GMFCS: Gross Motor Function Classification System, GMFM-66: The 66-Item Gross Motor Function Measurement, ICF: International Classification of Functioning, Disability and Health.

Core Set and the GMFM-66. The GMFM-66 score decreased as the GMFCS level decreased. The GMFM-66 was strongly correlated with the body functions and structures (r=-0.848, p<0,001) and activity and participation level (r=-0.900, p<0.001), and weak-to-moderately correlated with the environmental factors (r=0.416, p<0.001). The GMFM-66 had the strongest correlation with the "d4-mobility" (r=-0.845, p<0.001) among all of the Core Set parameters (Table 2).

In the severely affected group, almost all of the sub-parameters (12 of the 14 parameters of the CP Core Set) were correlated with gross motor function measured by the GMFM-66. However, the GMFM-66 had no strong relationship with the Core Set in the mildly and moderately affected group (Table 2). No statistically significant relationship was found between the environmental factors and GMFM-66 score in the mildly and moderately affected group (p>0.05) (Table 2) and it was weak in the severely affected group.

Significant relationships were found also between the Core Set and GMFM-66 when examined by the type of CP (Table 3). The GMFM-66 had strong-to-very strong correlation with Core Set parameters, except the environmental factors. The GMFM-66 had the strongest correlation with the "d-total activity and participation" in children with spastic quadriplegic CP and dyskinetic CP (r=-0.882, p<0.001 and r=-0.868, p<0.001, respectively).

DISCUSSION

The 88-item original GMFM-88 and the 66-item modified GMFM-66 are widely used in the field of pediatric rehabilitation to assess gross motor functions and sometimes the general condition of the children with CP. However, it was doubtful whether the GMFM could adequately reflect the general health status of children with CP as defined by the ICF. The purpose of this study was to explore if GMFM-66 is useful as an outcome tool to reflect the child's general health status in terms of ICF domains, body structure and functions, activity and participation, and environmental factors.

According to our results the GMFM-66 was strongly correlated with both the "b- body structures and functions" and "d- activity and participation". However, its correlation with the "e- environmental factors" was weak. These findings were similar with Tofani et al.'s study stating that ICF Core Set items have a limited usage, especially for evaluating environmental factors (19). They stated that the limited usage of the ICF Core Set to evaluate the environmental factors was due to both the complexity of environmental factors and the complexity of the patients. In the scoring of the environmental factors sub-dimension, unlike the body structure and functions and the activity and participation sub-dimension, the total score usually approaches 0 because there are both barriers (negative effect on the total score, minus score) and facilitators (positive effect on the total score, positive score). In this case, the overall score of the environmental factors sub-dimension is generally low, regardless of the child's motor functions. Therefore, we think that the relationship between gross motor functions and environmental factors is weak. On the other hand, it seems that the GMFM-66 is better correlated with the health status if the child has severe mobility limitations or severe impairment. These results suggest that the GMFM-66 may not be successful to reflect the environmental factors, which may affect participation, but reflect the body structure and functions and activity and participation. In their study on the CP Core Set, Noten et al stated that environmental factors are essential for participation. However, they also stated that environmental factors should be thought a different part of ICF and the tools in the literature is not sufficient to holistically evaluate environmental factors (20).

The main findings in the present study also revealed that the gross motor function level is not successful to reflect the global health in children with mild/moderate CP. We did not find any strong relationship between the GMFM score and ICF-CY components in children with GMFCS levels 1-3. Although only some parameters of the ICF were associated with the GMFM score, and these were weak correlations. A strong correlation was reported between functions such as communication, feeding, fine motor, or gross motor that may affect participation in severely affected children (21). In severely affected children, all functional skills that may affect the child's participation level decrease as the gross motor functions worsen. That is why it is thought that the relationships between GMFM and ICF-CY are strong in these children. Findings that could explain our results were also reported in studies examining the relationships between different functional levels such as gross motor, fine motor, communication, and eating and drinking, which can be among some areas focused on by the ICF Core Set (22-24). It was shown in children with CP that both hemispheres of the brain are affected (bilateral CP) and all functions are adversely affected. Therefore, there may be a strong relationship between these functions (22). On the other hand, it was reported that the relationship among these functional levels are reduced as the influence on the brain decreases. Because the severity of the functions will also differ (22). In conclusion, the GMFM better reflects the child's general health status in children with severely affected CP than in children with mild and moderate involvement. We think that this is not because the GMFM reflects general health in children with severely affected CP, but because the lesion that causes a decrease in the GMFM level in these children also causes a decrease in all sub-dimensions of the ICF CP Core Set. Another possible explanation of these weak correlations might be relatively small sample size after dividing the sample into three groups. This factor can also be shown as a limitation of the current study.

Since the publication of the GMFM, it has become the most common functional outcome measure used among pediatric physiotherapists over the past 25 years (25). The international acceptance of the tool is noted with many translations like Turkish, Spanish, French, Dutch, German, and Japanese (26-28). Additionally, in a study that examined many factors affecting participation, it was stated that a primary focus should be on gross and fine motor skills to increase participation (3, 29). However, our result showed that gross motor functions are not successful to reflect the general health status. On the other hand, the framework of the ICF-CY is relatively new and is not common in clinics, even though WHO suggests using this framework

when a child's health status is assessed (30). The participation in activities of daily living is multifactorial in nature. That is why WHO suggest using the ICF-CY. Our results highlighted the importance of the lack of various assessment tools that can be used commonly in clinical settings as well as the GMFM.

The study has several limitations. First one of these is relatively small sample size of the study. The study sample was divided into groups based on GMFCS or clinical types. For this reason, the number of children in each group may have been insufficient. This may have caused the relationships between the examined parameters to be weak. Secondly, the environmental factors domain of ICF Core set consists of barriers that is scored negatively and facilitators that is scored positively. Therefore, mostly obtained zero on the total score of the environmental factors due to facilitators and barriers. Due to this situation, relationships with environmental factors may have been weak.

In conclusion, a child with CP, depending on the extent of damage, will experience varying levels of restrictions to participation in activities of daily living. The GMFM may not be sufficient to meet the needs of holistic assessment based on the ICF-CY, especially when assessing a child with mild CP. There is a need for tools that evaluate other sub-dimensions of participation and environmental factors that can be used commonly among clinicians like GMFM. Then, the holistic framework offered by the ICF-CY can be achieved and the general health status might be fully reflected. Similarly, intervention should target the affected components of the ICF-CY, rather than on gross motor function alone. Therefore, when establishing a treatment plan for a child with CP, it is important to identify not only the child's physical ability and development, but also factors restricting activity and participation, using the ICF-CY function as a reference.

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Appendix Table. Brief Common ICF Core Set for Children and Youth with Cerebral Palsy

		Body Structures (n=1)	Score
s110	Structure of brain		
		Body Functions (n=8)	Score
b117	Intellectual functions	General mental functions, required to understand and constructively integrate the various mental functions, including all cognitive functions and their development over the life span.	
b134	Sleep functions	General mental functions of periodic, reversible and selective physical and mental disengagement from one's immediate environment accompanied by characteristic physiological changes.	
b167	Mental function of language	Specific mental functions of recognizing and using signs, symbols and other components of a language.	
b210	Seeing functions	Sensory functions relating to sensing the presence of light and sensing the form, size, shape and color of the visual stimuli.	
b280	Sensation of pain	Sensation of unpleasant feeling indicating potential or actual damage to some body structure.	
b710	Mobility of joint functions	Functions of the range and ease of movement of a joint.	
b735	Muscle tone functions	Functions related to the tension present in the resting muscles and the resistance offered when trying to move the muscles passively.	
b760	Control of voluntary movement functions	Functions associated with control over and coordination of voluntary movements.	
		Activities and Participation (n=8)	Score
d415	Maintaining a body position	Staying in the same body position as required, such as remaining seated or remaining standing for work or school.	
d440	Fine hand use	Performing the coordinated actions of handling objects, picking up, manipulating and releasing them using one's hand, fingers and thumb, such as required to lift coins off a table or turn a dial or knob.	
d450	Moving	Moving along a surface on foot, step by step, so that one foot is always on the ground, such as when strolling, sauntering, walking forwards, backwards or sideways.	
d460	Moving around in different locations	Walking and moving around in various places and situations, such as walking between rooms in a house, within a building, or down the street of a town.	
d530	Toileting	Indicating the need for, planning and carrying out the elimination of human waste (menstruation, urination and defecation), and cleaning oneself afterwards.	
d550	Eating	Indicating need for, and carrying out the coordinated tasks and actions of eating food that has been served, bringing it to the mouth and consuming it in culturally acceptable ways, cutting or breaking food into pieces, opening bottles and cans, using eating implements, having meals, feasting or dining.	
d710	Basic interpersonal interactions	Interacting with people in a contextually and socially appropriate manner, such as by showing consideration and esteem when appropriate, or responding to the feelings of others.	
d760	Family relationships	Creating and maintaining kinship relationships, such as with members of the nuclear family, extended family, foster and adopted family and step-relationships, more distant relationships such as second cousins or legal guardians.	
		Environmental Factors (n=8)	Score
e115	Products and technology for personal use in daily living	Equipment, products and technologies used by people in daily activities, including those adapted or specially designed, located in, on or near the person using them.	
e120	Products and technology for personal indoor and outdoor mobility and transportation	Equipment, products and technologies used by people in activities of moving inside and outside buildings, including those adapted or specially designed, located in, on or near the person using them.	
e125	Products and technology for communication	Equipment, products and technologies used by people in activities of sending and receiving information, including those adapted or specially designed, located in, on or near the person using them.	
e150	Design, construction and building products and technology of buildings for public use	Products and technology that constitute an individual's indoor and outdoor human-made environment that is planned, designed and constructed for public use, including those adapted or specially designed.	
e310	Immediate family	Individuals related by birth, marriage or other relationship recognized by the culture as immediate family, such as spouses, partners, parents, siblings, children, foster parents, adoptive parents and grandparents.	
e320	Friends	Individuals who are close and ongoing participants in relationships characterized by trust and mutual support.	
e460	Social attitudes	General or specific opinions and beliefs generally held by people of a culture, society, subcultural or other social group about other individuals or about other social, political and economic issues that influence group or individual behavior and actions.	
e580	Health services, systems and policies	Services, systems and policies for preventing and treating health problems, providing medical rehabilitation and promoting a healthy lifestyle.	

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KRONİK BOYUN AĞRILI BİREYLERDE AĞRI ŞİDDETİ, ÖZÜRLÜLÜK DÜZEYİ VE VÜCUT FARKINDALIĞI ARASINDAKİ İLİŞKİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu kesitsel çalışma kronik boyun ağrılı bireylerde ağrı şiddeti, özürlülük düzeyi ve vücut farkındalığı arasındaki ilişkiyi incelemek amacıyla planlandı.

Yöntem: Çalışmaya yaş ortalaması 43,23±15,42 yıl olan toplam 115 (44 kadın, 66 erkek) kronik boyun ağrılı birey katılmıştır. Katılımcıların ağrı şiddetleri Vizuel Analog Skalası (VAS), özürlülük düzeyileri Boyun Özür Göstergesi Anketi (BÖGA), vücut farkındalıkları ise Vücut Farkındalık Anketi (VFA) ile değerlendirildi.

Sonuçlar: Ağrı şiddeti puanları ile özürlülük düzeyi puanları arasında ise pozitif yönlü ve orta şiddetli ilişki saptandı. (p=0,000, r=0,661). Vücut farkındalığı anketi toplam puanı ile ağrı şiddeti (p=0,001, r=-0,301) ve özürlülük düzeyi arasında (p=0,000, r=-0,337) negatif yönlü ve düşük şiddetli ilişki bulundu.

Tartışma: Bu çalışmada kronik boyun ağrılı bireylerde özürlülük düzeyi, ağrı şiddeti ve vücut farkındalığı parametrelerinin negatif ilişkili olduğu belirlendi. Bu nedenle kronik boyun ağrılı bireylerde özürlülük düzeyi ve ağrı şiddetinin yanısıra vücut farkıdalığının da değerlendirilmesi ve bu durumu iyileştirmeye yönelik hazırlanacak tedavi programına vücut farkındalığını geliştirecek tedavilerin de ilave edilmesinin yaralı olacağı sonucuna varılmıştır.

Anahtar Kelimeler: Boyun Ağrısı, Farkındalık, Kronik Ağrı, Özürlülük Değerlendirmesi

RELATIONSHIP BETWEEN PAIN INTENSITY, DISABILITY LEVEL AND BODY AWARENESS IN INDIVIDUALS WITH CHRONIC NECK PAIN

ORIGINAL ARTICLE

ABSTRACT

Purpose: This cross-sectional study was planned to determine the relationship between pain intensity, disability level, and body awareness in patients suffering from chronic neck pain.

Methods: A total of 115 participants (44 female, 66 male) with chronic neck pain with a mean age of 43.23±15.42 years were included in the study. Visual Analog Scale (VAS) was used to assess pain intensity, Neck Disability Index (NDI) was used to assess disability level and Body Awareness Questionnaire (BAQ) was used to evaluate body awareness of the participants.

Results: There was a positive medium level correlation between pain intensity and disability level. (p=0.000; r=0.661). There was a significant, negative low level correlation between body awareness and pain intensity (p=0.001; r=-0.301) and disability level (p=0.000; r=-0.337).

Conclusion: In this study, it was determined that disability level, pain intensity and body awareness parameters were negatively related in individuals with chronic neck pain. This leads to the need to evaluate body awareness in addition to the disability level and pain severity in individuals with chronic neck pain, and to add therapy methods to improve body awareness to the treatment program.

Keywords: Neck Pain, Awareness, Chronic Pain, Disability Evaluation

GİRİŞ

Kronik boyun ağrısı kronik özürlülüğe neden olabilen, nöromuskuloskeletal ağrı sorunlarından biridir (1, 2, 3). Boyun ağrısı patolojisi ile karşılaşmış bireylerin problemi genellikle alevlenmeler ile birlikte karakterize olsa bile, oluşan semptomlardan birçoğu iyileşememekte ve bu problemi yaşayan hastaların %5-10'unun sorunları kronikleşmektedir (3). Kronik boyun ağrısı problemi olan toplam populasyonun yaklaşık üçte birinin günlük yaşamlarındaki farklı aktiviteler sırasında zorluk yaşadıkları (4) ve bu yaşanan problemin özürlülüğe yol açabilen oldukça yaygın bir sağlık problemi olduğu vurgulanmaktadır (5, 6)

Vücut farkındalığı, vücut deneyimi, vücut yönetimi ve vücut kullanımı için genel bir kavram olarak kullanılmakta ve bu kavram kişinin var olan bilincinin hem emosyonel hem de bedensel yönünün göstergesi olduğu belirtilmektedir. Kronik ağrıda problemin neden ortaya çıktığı ve gelecekteki sonuçlarıyla ilgili farklı inanışlar bulunmaktadır. Kronik ağrının yanlış uyarılmış nöroplastik değişikliklere sebep olabilecek davranış biçimlerini yönlendirdiğine işaret edilmekte ve azalan vücut farkındalığıyla ilişkili olduğu belirtmektedir. Bu durum kronik ağrısı olan hastalarda vücut farkındalığının da incelenmesi gerektiğini düşündürmüştür. (7, 8). Kronik ağrılı hastalarda klinik durumun şiddetini, ağrı katastrofisi, psikolojik stres, korkudan kaçınma inanışı ve lokal doku duyarlılığı gibi yaygın bilinen sebeplerden çok bozulmuş vücut farkındalığının arttırdığı gösterilmiştir. Buna bağlı olarak kronik ağrılı hastalarda ağrı tedavisinin yönetiminin daha etkin yapılabilmesi için vücut farkındalığının da değerlendirilmesi önerilmektedir (9, 10).

Literatüre bakıldığında kronik boyun ağrılı bireylerde ağrı şiddeti, özürlülük düzeyi ve vücut farkındalığı parametreleri tek başına veya farklı parametrelerle çalışılmıştır.(3, 4, 5, 6, 11) Ancak bu üç parametreyi aynı anda değerlendiren ve birbiri ile ilişkisini inceleyen bir çalışmaya rastlanmamıştır. Çalışmamızın amacı kronik boyun ağrısı olan kişilerde ağrı şiddeti, özürlülük düzeyi ve vücut farkındalığı parametrelerini değerlendirerek aralarındaki ilişkiyi incelemektir.

YÖNTEM

Bireyler

Bu çalışma kesitsel araştırma olarak planlandı. Çalışma, Şubat 2020 - Mayıs 2020 tarihleri arasında Siirt Devlet Hastanesi'nde kronik boyun ağrısı tanısı almış bireylerle yüz yüze görüşülerek gerçekleştirildi. Çalışmaya uzman doktor tarafından spondilolizis, spondilolistezis (grade 1, 2), servikal intervertebral disk patolojisi, servikal radikülopati, servikal lordoz düzleşmesi v.b. boyun ağrısı tanısı almış olan ve en az 3 aydır boyun ağrısı olan, gönüllü olan bireyler dâhil edildi. Cerrahi operasyon geçirmiş olan bireyler, boyun ağrısına neden olabilecek psikiyatrik veya sistemik tanı almış olan bireyler çalışmaya dâhil edilmedi.

Çalışmaya dâhil edilen tüm bireyler çalışma hakkında detaylı bir şekilde bilgilendirildi ve gönüllü onay formu imzalatıldı. Bu çalışma için Lefke Avrupa Üniversitesi, Etik Kurulu'ndan (ÜEK/49/01/01/1920/01) onay alındı.

Değerlendirme Yöntemleri

Katılımcılara ait cinsiyet, yaş, Beden Kütle İndeksi (BKİ), meslek, medeni durum, çalışma durumu, eğitim durumu gibi sosyo-demografik bilgiler forma kaydedildi. Çalışmada bireylerin ağrı şiddetini ölçmek için Vizuel Analog Skala'sı (VAS), özürlülük düzeyini belirlemek için Boyun Özür Göstergesi Anketi (BÖGA) ve vücut farkındalığını değerlendirmek için Vücut Farkındalık Anketi (VFA) kullanıldı.

Vizuel Analog Skalası (VAS)

VAS katılımcıların ağrı şiddetini ölçmek için kullanıldı. On santimlik düz bir çizginin üzerinde, iki ucu bireydeki ölçmek istenilen parametreyle tanımlanan ve bireyden kendinde hissettiği mevcut durumu çizelge üzerinde bir çizgi veya nokta koyarak belirtmesi istenerek değerlendirilir ve bireydeki ağrı şiddeti bu şekilde hesaplanır. Örneğin çizilen on santimlik düz çizginin bir ucuna (0=ağrı yok,10=dayanılmaz ağrı) değerlendirilmek istenen parametreler belirlenir. Hastadan o an hissettiği ağrı şiddetini bu aralıkta bir çizgi veya nokta konması istedikten sonra bir cetvel yardımıyla bireyin ağrının olmadığı yerden (0=ağrı yok) bireyin işaretleme yapmış olduğu yere kadar olan uzunluk ölçülür. Ölçülen bu uzunluk bireyin ağrı şiddetini verir (1, 12).

Boyun Özür Göstergesi Anketi (BÖGA)

BÖGA kronik boyun ağrısına bağlı oluşan özürlülük seviyesini belirlemek için kullanıldı. Dr. Howard Vernon tarafından 1980 yılında geliştirilen BÖGA'nın (13) Türkçe geçerlilik ve güvenilirlik çalışması Aslan ve ark. tarafından yapılmıştır (14). Toplam 10 bölümden oluşan anket, subjektif semptomları ve günlük yaşam aktivitelerindeki özürlülük durumunu değerlendirmek için geliştirilmiştir (ağrı şiddeti, baş ağrısı, konsantrasyon, yük kaldırma, uyku, okuma, araba kullanma, iş hayatı, kişisel bakım, ve boş zaman uğraşıları). Her bir bölümde 0-5 puan arasında değişen 6 madde bulunur. Toplam puan 0-50 arasında (0: özür yok; 50: maksimum özür) değişir ve özür şiddetini ifade eder (0-4 puan özür yok, 5-14 puan hafif özür, 15-24 puan orta derecede özür, 25-34 puan şiddetli özür ve 35 puan üstü total özür). Puanlama sonucunda skorun 50'e yaklaşması özürün arttığını ifade eder.

Vücut Farkındalık Anketi (VFA)

VFA vücut farkındalığındaki değişikliği belirlemek için kullanıldı. VFA, 1989'da Shields, Mallory & Simon tarafından geliştirildi (15) ve Türkçe geçerlilik, güvenilirliği Karaca ve ark. tarafından yapılmıştır (16). Vücut kompozisyonunun normal ya da normal olmayan duyarlılık düzeyini belirlemeyi amaçlayan bir anket olan VFA, dört alt grup (Vücut sürecindeki değişiklikler ve tepkilere dikkat etme, uyku-uyanıklık döngüsü, hastalığın başlangıcında tahmin, vücut tepkileri tahmini) ve toplam 18 ifadeyi kapsar. Katılımcı her ifadeyi bir ile yedi arası rakamlarla (1= Benim için hiç doğru değil, 7= Benim için tamamen doğru) puanlar ve toplam puan hesaplanır. Toplam puan en fazla 126, en az 18 olabilir ve toplam puan arttıkça, vücut farkındalığının daha iyi olduğu sonucu çıkarılmaktadır (9, 16).

Çalışmaya ilişkin power analizi G*Power 3.1.9.2 paket programı ile yapılmış olup, çalışmadan beklediğimiz etki büyüklüğünün orta düzeyde olacağı (d=0.5) varsayıldığında % 95 güvenle çalışmaya 115 kişi alınması önerilmiştir. Côté ve ark. (17) tarafından yapılan çalışma referans alınarak etki büyüklüğü belirlenmiş ve buna göre güç analizi yapılmıştır.

İstatistiksel Analiz

Araştırma verilerinin istatistiksel analizinde Statistical Package for Social Sciences (SPSS) 25.0 IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY, ABD) yazılımı kullanılmıştır. Katılımcıların sosyo-demografik özelliklerine ilişkin sonuçları sayı(n), yüzde oranı (%) ve ortalama standart sapma ile ifade edilmiştir. Katılımcıların VAS, BÖGA skorları ve VFA puanlarına ilişkin sonuçlar ortalama standart sapma ile gösterilmiştir. Verilerin normal dağılıma uygunluk durumu Kolmogorov-Smirnov ve Shapiro-Wilk testiyle incelenmiş ve normal dağılıma uymadıkları belirlenmiştir. Bu sebeple araştırmada non parametrik testler kullanılmıştır. İki sürekli değişken arasındaki ilişkinin incelenmesinde Spearman testi kullanılmıştır. Tüm analizlerde $p \leq 0.05$ istatistiksel olarak anlamlı kabul edildi.

Tablo 1. Katılımcıların Sosyodemografik Özellikleri

Özellikler	(N=115) n(%)
Cinsiyet	
Kadın	49(42,61)
Erkek	66(57,39)
Meslek	
Ev hanımı	37(32,17)
Öğrenci	10 (8,70)
İşçi	23(20,00)
Memur	38(33,04)
Diğer	7(6,09)
Medeni Durumu	
Evli	88(76,52)
Bekar	24(20,87)
Boşanmış/Dul	3(2,61)
Çalışma Durumu	
Çalışan	54(46,96)
Çalışmayan-işsiz	49(42,61)
Emekli/çalışan	2(1,74)
Emekli/çalışmayan	10(8,70)
Eğitim Durumu	
Okur-yazar	16(13,91)
İlkokul	19(16,52)
Ortaokul	15(13,04)
Lise	20(17,39)
Üniversite	45(39,13)

SONUÇLAR

Çalışmaya yaş ortalaması 43,23±15,42 yıl olan 115 katılımcı dâhil edildi. BKİ ortalamaları 26,69±4,60 kg/m2'dir. Tablo 1'de katılımcıların sosyo-demografik özelliklerine ait tanımlayıcı veriler gösterilmiştir. Katılımcıların %28,70'inin baş-boyun bölgesinde, %39,13'ünün boyun-omuz-kol bölgesinde, %30,43'ünün baş-boyun-omuz-kol bölgesinde ağrı-

Tablo 2. Katılımcıların Ağrı Şiddeti, Özürlülük Düzeyi ve Vücut Farkındalık Ortalama Değerleri

Değişkenler (N=115)	Ortalama±SS	Min-Max
Ağrı Şiddeti	5,68±1,69	2,10-8,80
Özürlülük Düzeyi	18,44±5,48	7-39
VFA-Vücut Sürecindeki Değişiklikler ve Tepkilere Dikkat	24,51±4,73	14-37
VFA-Vücut Tepkileri Tahmini	30,82±5,86	16-43
VFA-Uyku-Uyanıklık Döngüsü	26,63±5,53	11-40
VFA-Hastalık Başlangıcı	18,33±2,53	13-24
VFA-Toplam Skor	78,77±11,12	55-105

VFA: Vücut farkındalık Anketi; SS: Standart Sapma; Min: Minumum; Max: Maksimum.

sı olduğu görüldü. Katılımcıların %21,74'ünün hafif özürlü, %66,96'sının orta özürlü, %9,57'sinin şiddetli ve %1,74'ünün tamamen özürlü olduğu saptandı.

Katılımcıların ağrı şiddetlerinin VAS'a göre orta düzeyde olduğu belirlendi. Özürlülük düzeylerinin ise BÖGA' ya göre orta özürlülük seviyesinde olduğu saptandı. Tüm katılımcıların VFA'ne göre vücut farkındalık seviyelerinin azaldığı belirlendi (Tablo 2).

VFA ile VAS ve BÖGA skorları arasındaki ilişki sonuçları Tablo 3'de gösterilmiştir. (Tablo 3). VFA total skoru ile hem ağrı şiddeti arasında (p=0,001, r=-0,301) hem de özürlülük düzeyi arasında (p=0,000, r=-0,337) anlamlı, negatif yönlü ve düşük şiddetli ilişki olduğu belirlendi. VAS skorları ile BÖGA skorları arasında ise anlamlı, pozitif yönlü ve orta şiddetli ilişki saptandı. (p=0,000, r=0,661). Katılımcıların VFA total skorundan ve ankette yer alan Vücut Tepkileri Tahmini alt boyutundan aldıkları puanlar ile VAS ağrı skorları arasında istatistiksel olarak anlamlı ilişki olduğu belirlendi (p<0,05). Bu ilişki negatif yönlü ve zayıftır. Buna göre katılımcıların VKA total skoru ankette yer alan Vücut Tepkileri Tahmini alt boyutundan aldıkları puanlar arttıkça, VAS skorları azalmaktadır. Katılımcıların VFA yer alan Vücut Sürecindeki Değişiklikler ve Tepkilere Dikkat, Uyku-Uyanıklık Döngüsü ve Hastalık Başlangıcı alt boyutlarından aldıkları puanlar ile VAS skorları arasında istatistiksel olarak anlamlı ilişkinin olmadığı belirlendi (p>0,05).

Katılımcıların VKA total skoru ve ankette yer alan Vücut Tepkileri Tahmini, Uyku-Uyanıklık Döngüsü ve Hastalık Başlangıcı alt boyutlarından aldıkları puanlar ile BÖGA skorları arasında istatistiksel olarak anlamlı, negatif yönlü zayıf bir ilişki saptandı. (p<0,05). Katılımcıların VFA total skoru ve ankette yer alan Vücut Tepkileri Tahmini, Uyku-Uyanıklık Döngüsü ve Hastalık Başlangıcı alt boyutlarından aldıkları puanlar arttıkça, BÖGA skorları azalmaktadır.

Katılımcıların VFA' da yer alan Vücut Sürecindeki Değişiklikler ve Tepkilere Dikkat ile BÖGA skorları arasında istatistiksel olarak anlamlı bir ilişkinin olmadığı gözlendi (p>0,05).

Tablo 3. Katılımcıların VFA Puanları ile VAS ve BÖGA Skorları Arasındaki İlişki

VFA (N=115)	VAS		BÖGA	
	r	P	r	p
Vücut Sürecindeki Değişiklikler ve Tepkilere Dikkat	-0,047	0,616	-0,055	0,560
Vücut Tepkileri Tahmini	-0,308	**0,001***	-0,378	**0,000***
Uyku-Uyanıklık Döngüsü	-0,136	0,147	-0,262	**0,005***
Hastalık Başlangıcı	-0,148	0,114	-0,238	**0,010***
VFA Toplam Skoru	-0,301	**0,001***	-0,337	**0,000***

*p<0,05 VFA: Vücut Farkınlaık Anket; VAS: Visual Analog Skalası; BÖGA: Boyun Özürlülük Göstergesi Anketi.

TARTIŞMA

Çalışmamızda kronik boyun ağrılı bireylerde ağrı şiddeti, özürlülük düzeyi ve vücut farkındalığı parametrelerinin ilişkili olduğu belirlenmiştir. Çalışmamızın sonuçları kronik boyun ağrısının özürlülük düzeyini arttırarak vücut farkındalığını azalttığını göstermiştir. Çalışmamzın sonuçları kronik ağrının özürlülük düzeyini arttırdığını ve vücut farkındalığını azalttığını savunan ulusal ve uluslararası araştırma sonuçlarını desteklemektedir. (7, 10, 18, 19)

Son yıllarda yapılan çalışmalarda vücut farkındalığı ile ağrı ilişkisi araştırılmaya başlanmıştır. Erden ve ark, çalışmalarında, sağlıklı kişilerde vücut farkındalık durumu ile ağrı, emosyonel durum ve yaşam kalitesi arasındaki ilişkiyi incelemişlerdir. Vücut farkındalığı yüksek olan bireylerde genel olarak yaşam kalitesinin daha iyi olduğu, depresif semptomların daha az görüldüğü ve ağrı semptomlarının azaldığını belirtmişlerdir. Sonuç olarak vücut farkındalığının ağrı ile ilişkili olduğu ve fizyoterapi rehabilitasyon programlarında dikkate alınması gereken bir kavram olduğunu ortaya koymuşlardır (9). Bizim çalışmamızda ise kronik boyun ağrılı hastalarda ağrı skorları ile vücut farkındalığı arasında ilişki olduğu, vücut farkındalık skoru yüksek olan katılımcıların VAS skorlarının düşük olduğu sonucuna ulaşılmıştır. Vücut tepkileri tahmini alt boyutunda anlamlı ilişki tespit edildi Sonuçlarımız bu açıdan da literatürle uyumludur.

Wand ve ark. kronik bel ağrılı hastalarda vücut farkındalığının ağrı şiddeti ve özürlülük düzeyi ile ilişkisini değerlendirilmişlerdir. Hastalarda vücut farkındalığının bozulması sonucu ağrı şiddeti ve özürlülük düzeyinin arttığını belirtmişlerdir. Bu çalışmada vücut farkındalığı aynı zamanda stres, ağrıyla ilgili bilişsel düzey ve kişinin duyarlılığı ile ilişkili bulunmuştur. Ancak vücut farkındalığının ağrı şiddetinin tanımlanmasında daha etkin olduğu sonuca ulaşılmıştır. Yazarlar bel ağrılı hastalarda karmaşık olsa da ağrının nedenini anlamak ve tedavisini planlamak için vücut farkındalığı değerlendirilmesinin oldukça önemli olduğunu vurgulamışlardır (7). Wand ve ark. yapmış oldukları bir diğer çalışmada ise, kronik bel ağrısı olan ve olmayan kişiler bel bölgesine özgü vücut farkındalık anketi ile değerlendirilmiştir. Kronik bel ağrısı olan hastalarda kontrol grubuna oranla vücut farkındalığının azaldığı tespit edilmiştir (10). Boyun ağrısı olan bireylerin de sağlıklı kontrol grubu ile kıyaslanarak vücut farkındalığındaki farkların tespit edilebileceği çalışmalara ihtiyaç vardır.

Literatürde vücut farkındalık eğitimlerinin ağrı üzerinde olumlu etkileri olabileceği kanıtları mevcuttur. Courtois ve ark. 29 çalışmayı içeren metaanaliz çalışmalarında birbirinden farklı vücut farkındalık terapilerinin kronik ağrı üzerinde etkili olduğu sonucuna ulaşmışlardır (20). Lundwall ve ark. birçok değişik ağrı durumu olan kişileri değerlendirdikleri çalışmalarında vücut farkındalığı terapilerinin ağrıyla baş etmeyi öğretme konusunda başarılı sonuçlar aldıklarını göstermişlerdir. (21) Bravo ve ark. yaptıkları randomize kontrollü çalışmada fibromiyalji tanısı almış bireylerde vücut farkındalık eğitimini ağrı, hareket kalitesi ve endişe durumunu azaltmka için etkili bir yöntem olarak göstermişlerdir. (22) Bizim çalışma sonuçlarımızda kronik boyun ağrısı ile vücut farkındalık değerleri arasında ters yönlü bir ilişki bulunmuştur. İleriki çalışmalarda vücut farkındalık eğitimlerinin kronik boyun ağrısını azaltmadaki etkilerinin incelenmesi gerektiğini düşünmekteyiz.

Çalışmamızda VFA genelinde ve anketin vücut sürecindeki değişiklikler ve tepkilere dikkat alt boyutu dışındaki diğer alt boyutlarında aldıkları puanlar arttıkça BÖGA skorları azalmaktadır. Literatürde boyun özürlülük durumu ile vücut farkındalığını karşılaştıran bir çalışmaya rastlamadık. Ancak Cramer ve ark. yaptıkları çalışmalarında kronik kas-iskelet ağrılı 512 hastada postüral farkındalığın artması ile ağrıdan kaynaklı özürlülük düzeyinin azaldığı yönünde bir ilişki olduğunu göstermişlerdir. (18). Paolucci ve ark. kronik bel ağrılı hastalarda interoseptif farkındalığın iyileştirilmesinde Fldenkrais yönteminin ve boyun okulu eğitim programının ağrı şiddetini azaltmadaki etkinliğini karşılaştırdıkları çalışmalarında bu yöntemlerin hastalarda ağrı şiddetini ve özürlülük durumunu iyileştirdiği, hastalarda ağrı şiddetini azalttığını ve işlevselliği arttırdığını belirtmişlerdir (23). Bizim çalışmamızdan elde edilen sonuçlar aynı zamanda kronik boyun ağrısının tedavi edilmesinde vücut farkındalık terapilerinin ve boyun okulu eğitim programlarının etkili olacağını kanıtlar niteliktedir.

Subbarayalu ve ark. başın postürü, boyun ağrısı, ve

boyun ağrısına bağlı özürlülüğü inceledikleri çalışmalarında ağrı şiddetinin boyun özürlülüğü ile ilişkili olduğu ayrıca kötü boyun postürünün de özür durumunu artırdığını belirtmişlerdir. Yazarlar ağrı şiddetinin artması sonucu boyun özürlülüğünün arttığını belirtmiştir. (2). Genebra ve ark. yaptıkları başka bir çalışmada kronik boyun ağrısı olan hastalarda ağrı şiddetinin birçok sosyodemografik faktörle ilişkisini ortaya çıkardılar ve ağrının şiddetinin artması ile özürlülük düzeyinin arttığını tespit etmişlerdir (24). Beltran-Alacreulbai ve ark. spesifik bir nedene bağlı olmayan kronik boyun ağrısı şikayeti olan 128 vaka üzerinde yaptıkları bir çalışmada ağrı şiddetinin artması ile boyun engelliliğinin arttığını göstermiştir. (25) Özel ve ark. yaptıkları yeni bir çalışmada kronik boyun ağrısı olan bireylerde pozisyon duyusundaki değişikliklerin, boyun özür düzeyinin ve bazı psikososyal faktörlerin boyun farkındalığını etkileyen faktörler olduğu belirlenmiştir. (26) Yazarlar kronik boyun ağrısı olan bireylerde boyun farkındalığının değerlendirilmesini önerdiler. Sonuç olarak kronik boyun ağrılı hastalarda yapılan bu çalışmalarda boyun ağrısının artması ile boyun özürlülük düzeyinin arttığı ifade edilmiştir. Bizim çalışmamızda da boyun ağrısı ile özürlülük düzeyi arasında tespit edilen ilişki literatürdeki çalışmalarla uyumludur. Javdaneh ve ark. yaptıkları çalışmada kronik boyun ağrısı olan hastalarda ağrı eğitimi ile birlikte yapılan terapötik egzersiz uygulamalarının, özür durumu, ağrı durumunu felaket gibi düşünme durumu ve korku-kaçınma inançlarını tek başına terapötik egzersizlerden daha fazla azalttığını göstermişlerdir. (27). Boyun ağrılı hastaların, ağrı durumlarını erken ayırt etmeleri ve uygun hasta eğitimi (bel ve boyun okulları) ile rehabilitasyon süreçlerinin desteklenmesi, oluşabilecek özürlülük durumunu önlemek açısından önemlidir. Bu tür çalışmalara da ihtiyaç vardır.

Ağrı şiddetinin değerlendirilmesinde kullandığımız subjektif yöntemlerden biri olan VAS yerine algometre gibi objektif yöntemlerden birinin kullanılması ağrının şiddetinin değerlendirilmesinde daha objektif sonuçlar sağlayabilirdi. Bu durum araştırmamızın bir limitasyonu olarak kabul edilebilir. Ayrıca araştırmamızda değerlendirdiğimiz katılımcılar ağrı şiddetlerine göre gruplandırarak incelenebilirdi. Bu limitasyonlara rağmen araştırmamız kronik ağrılı bireylerde özürlülük seviyesinin arttığını gösterdiği gibi vücut farkındalık düzeyinin de olumsuz etkilendiğini göstermiştir. Çalışmamız bu konuda yapılan az sayıda çalışmalardan birisi olması ve literatüre katkı sağlaması açısından güçlü bir çalışma olarak kabul edilebilir.

Kronik boyun ağrılı bireylerde ağrı şiddeti, özürlülük düzeyi ve vücut farkındalıkları arasındaki ilişkiyi incelemek amacıyla yaptığımız çalışmada kronik boyun ağrılı bireylerde vücut farkındalığı ile ağrı şiddeti ve boyun özürlülük düzeyi arasında ilişki olduğu belirlenmiştir. Fizyoterapistler bireyin özürlülük seviyesini arttıran kronik boyun ağrısı gibi hastalıkların değerlendirilmesinde VFA kullanarak etkilenme düzeylerini belirleyebilir ve tedavi programlarına vücut farkındalık terapilerini ilave ederek daha bütüncül bir yaklaşımla daha etkili sonuçlar alabilirler. Kronik boyun ağrılı hastalarda ağrı şiddeti ile vücut farkındalığı arasında bulunan anlamlı ilişkiden dolayı ileride yapılacak çalışmalarda vücut farkındalık tedavilerinin kronik boyun ağrılı bireylerin ağrı şiddetini azaltmadaki etkileri incelenmelidir. Ayrıca, kronik boyun ağrılı hastalara verilecek hasta eğitim programları ve boyun okulu eğitim programlarının hastalarda vücut farkındalığını arttırmadaki etkileri de incelenmelidir.

Destekleyen Kuruluş: Bulunmamaktadır.

Çıkar Çatışması: Herhangi bir çıkar çatışması bulunmamaktadır.

Yazar Katkıları: Konsept – UC, BBK, MSD, SK Tasarım – UC, BBK, SK; Süpervizyon - BBK; Kaynaklar ve Finansal Destek; Materyaller - MSD, SK Veri Toplaması ve/veya İşleme – MSD, SK; Analiz ve Yorumlama: SD, BBK, UC, SK; Literatür Tarama - SD; Makale Yazımı: SD, BBK, UC Eleştirel İnceleme: UC.

Teşekkür: Bulunmamaktadır.

Açıklamalar: Bulunmamaktadır.

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THE RELATIONSHIP BETWEEN OCCUPATIONAL HEALTH AND SAFETY CULTURE AND LOW BACK PAIN, NECK PAIN AND WORK LIMITATIONS IN HEALTHCARE PROFESSIONALS

ORIGINAL ARTICLE

ABSTRACT

Purpose: This study was carried out to investigate the relationship between occupational health and safety culture, low back pain, neck pain and work limitations in healthcare professionals.

Methods: This descriptive cross-sectional study was conducted on 145 healthcare professionals working at Muş State Hospital between March 2022 and June 2022. The data was collected through Personal Information Form, Occupational Safety Culture Scale, Functional Low Back Pain Scale, Neck Bournemouth Questionnaire, and Work Limitations Questionnaire.

Results: While a statistically positive correlation was found between the occupational safety culture scores of health workers and functional activities due to the reduction low back pain, a statistically negative correlation was determined between the occupational safety culture scores and neck pain and work limitation ($p<0.05$).

Conclusion: While functional activities due to the reduction of low back pain increase with the increase in occupational safety culture of health workers, neck pain and work limitation decrease. Both employees and managers should be made more aware of the occupational health and safety culture in order to minimize musculoskeletal pain caused by inappropriate health behaviors among healthcare professionals and to determine the factors that contribute to job loss.

Keywords: Health Workers, Low Back Pain, Neck Pain, Safety Culture, Work Limitation

SAĞLIK ÇALIŞANLARINDA İŞ SAĞLIĞI VE GÜVENLİĞİ KÜLTÜRÜ İLE BEL AĞRISI, BOYUN AĞRISI VE İŞ LİMİTASYONU ARASINDAKİ İLİŞKİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu araştırma, sağlık çalışanlarında iş sağlığı ve güvenliği kültürünün bel ağrısı, boyun ağrısı ve iş limitasyonu arasındaki ilişkiyi araştırmak amacıyla gerçekleştirildi.

Yöntem: Tanımlayıcı-kesitsel türde planlanan araştırma Mart 2022–Haziran 2022 tarihleri arasında Muş Devlet Hastanesi'nde görev yapan 145 sağlık personeli üzerinde yapıldı. Araştırmanın verileri; Kişisel Bilgi Formu, İş Güvenliği Kültür Ölçeği, Fonksiyonel Bel Ağrısı Ölçeği, Bournemouth Boyun Ağrısı Anketi, İş Limitasyon Ölçeği ile toplandı.

Sonuçlar: Sağlık çalışanlarının iş güvenliği kültürü skorlarıyla bel ağrısının azalmasına bağlı fonksiyonel aktiviteleri arasında istatistiksel olarak pozitif yönde ilişki bulunurken, iş güvenliği kültürü skorlarıyla boyun ağrısı ve iş limitasyonu arasında istatistiksel olarak negatif yönde ilişki bulunmuştur ($p<0,05$).

Tartışma: Sağlık çalışanlarının iş güvenliği kültürü arttıkça bel ağrısının azalmasına bağlı fonksiyonel aktiviteleri artarken, boyun ağrısı ve iş limitasyonu azalmaktadır. Sağlık çalışanlarında uygun olmayan sağlık davranışları sonucunda meydana gelen kas iskelet ağrıların önlenmesinde ve iş kaybına neden olan faktörlerin belirlenmesinde hem çalışanların hem de yöneticilerin iş sağlığı ve güvenliği kültürü ile ilgili farkındalığın arttırılması için uygun stratejilerin geliştirilmesi gerekmektedir.

Anahtar Kelimeler: Sağlık Çalışanları, Bel Ağrısı, Boyun Ağrısı, Güvenlik Kültürü, İş Limitasyonu

INTRODUCTION

Safety culture is defined as the product of individual and group values, attitudes, perceptions, competencies and behavioral patterns that determine the health and safety management of an organization (1). The term "safety culture" was originally introduced in the 1986 Chernobyl nuclear accident and subsequently gained prominence by being given a larger role in the published reports after several disasters (2). It is stated that weak safety culture is the primary cause of major accidents, disasters, near misses, and other safety-related issues in today's workplaces (3).

The basic element of safe medical practice in healthcare is to have a strong safety culture (4). Developing a safety culture in healthcare workers is critical because it is associated with both patient safety (5,6) and positive perceptions of a safe cultural climate, and less injury and disease rates. People working in health sector are constantly exposed to a physical and psychological burden that can affect the safety culture, as they frequently encounter negative situations such as excessive workload, insufficient personnel, shift work, and inadequate rewarding (7). Thus, it is recommended to promote a sound safety environment for both patients and healthcare professionals in order to prevent injuries caused by occupational accidents in healthcare workers (8,9).

In comparison to other occupational groups, healthcare professionals are at a higher risk for musculoskeletal problems, and symptoms such as low back and neck pains are more prevalent among them (10,11) . Mostly, transportation of medical tools and equipment, exposure to excessive load during patient transfer, getting the patient on and off the stretcher, working in a bent position and standing for a long time, and working under intense stress cause discomfort such as low back and neck pain (12,13). Due to these disorders, health workers experience problems such as not being able to go to work, mental problems, loss of cost in the health system, and decrease in work performance and quality of life (10, 14-15). It is emphasized that high back-neck disorders in healthcare workers are caused by inadequate institutional safety practices and safety culture in occupational practices (16).

It is crucial for both employee and patient health to be aware of the situations that result in a loss of productivity in the professional area of workers (17). The intense and shift work schedule, work stress, and exposure to musculoskeletal diseases set restrictions on the employment of healthcare professionals (18,19). Due to a lack of knowledge, it is difficult to identify the limitations that contribute to a decrease in employee performance, distraction, and making serious mistakes. Work limitations questionnaires are used to evaluate the loss of efficiency in employees (20).

No study has been found in the relevant literature examining the relationship between occupational safety culture, functional activities related to low back pain, neck pain and work limitations. So, the research questions below guided this study:

i) Is there a relationship between occupational health and safety culture and functional activities related to low back pain and neck pain in healthcare workers?

ii) Is there a relationship between occupational health and safety culture and work limitations in healthcare workers?

METHODS

This study was carried out on health professionals working in Muş State Hospital. Ethics committee approval was obtained on 18.02.2022 from Muş Alparslan University, Non-Interventional Clinical Research Ethics Committee with the decision numbered 41236 and numbered 14.

Participants

The study was carried out with 145 health personnel working in X State Hospital. The 3.1.9.4 version of the G*Power program (Heinrich-Heine-Universität Düsseldorf, Germany) was used to determine the sample size of the study. Based on similar articles (21) a total of 145 healthcare professionals were included, with the power ratio of the sample calculated as β = 80% and α=0.05. The criteria for inclusion in the study were being a healthcare worker, volunteering to participate in the research, and not having a mental or physical disability that would prevent communication. Participants who

did not meet the inclusion criteria were excluded from the study.

Data Collection Tools

Healthcare professionals, whose written and verbal consents were obtained and who met the inclusion criteria, answered questions regarding their socio-demographic characteristics age, gender, height, weight, occupation, marital status, education level, working year, weekly working hours, chronic illness status, occupational accident status). Occupational Safety Culture Scale, Bournemouth Neck Pain Questionnaire, Functional Low Back Pain Scale, and Work Limitations Scale were used to collect data.

Occupational Safety Culture Scale

The validity and reliability study of the survey was conducted by Dursun (2013) consists of 35 items and 7 sub-dimensions. Managers' commitment consists of 8 questions, safety priority 4 questions, safety communication 5 questions, safety training 4 questions, safety awareness 5 questions, employee participation 4 questions, and reporting culture 5 questions. Each question was scored between "I totally disagree and I totally agree ". High scores obtained from the scale indicate a positive safety culture structure of each sub-dimension (2).

Functional Low Back Pain Scale

Turkish validity and reliability study of this scale was carried out by Koç and Bahar (2017). The scale aims to evaluate how much low back pain affects the functions of patients. Functions that are thought to be affected on the scale can be listed as work, school, home activities, habits, bending forward, wearing shoes or socks, lifting an object from the ground, sleeping, sitting, standing, walking, climbing stairs and driving. For patients who do not drive, the last question can be answered as traveling. Each item has a score between 0 and 5. Scoring is as follows: (0) not possible to do the activity, (1) extremely difficult, (2) quite difficult, (3) moderately difficult, (4) somewhat difficult, and (5) not difficult. The minimum score is "0" points, the maximum score is "60" points. A score of 60 indicates that any performance activity is not difficult (22).

Neck Bournemouth Questionnaire

The scale was developed by Bolton et al., and the Turkish validity and reliability study of the scale was performed by Özel Aslıyüce (2018). The questionnaire form consists of 7 questions in total. Each question scores between 0 and 10. The highest score is 70, and a higher score indicates a higher level of disability. The content of the questionnaire consists of variables that must be questioned for individuals with neck pain, such as pain severity, the effect of pain on activities of daily living and social life, anxiety-depression level, kinesiophobia and coping with pain (23).

Work Limitations Questionnaire (WLQ)

The Turkish validity and reliability study of this scale was carried out by Şahin (2019). It consists of 2 sub-dimensions and 8 questions. It is a test used to evaluate the impact of the physical and emotional health conditions of the employees on their work and also to detect the loss of work productivity of the employees. Questions 1 to 8 in the test are about time management task, physical task, mental-interpersonal task and productivity task. The 1st, 2nd, 5th, 6th, 7th and 8th questions are scored as 1: 'always difficult', 5: 'never difficult', arranged in a 5-point Likert form under the workload and concentration limitation sub-dimension. High scores obtained in this section indicate that more difficulties are encountered in the work performed. The 3rd and 4th questions in the test are scored as 1: 'always possible', 5: 'never possible', arranged in a 5-point Likert form under the physical limitation of the working environment sub-dimension. High scores obtained from this section indicate that the feasibility of the work has increased (24).

Employee productivity loss is also calculated from the formula given below from the work limitation scale (WLQ):

= (β1*WLQ Time Scale + β2*WLQ Physical Scale + β3*WLQ Mental-Interpersonal Scale + β4*WLQ Output Scale). (β1= 0.00048, β2 = 0.00036, β3 = 0.00096 ve β4 = 0.00106).

= (1- exp (-WLQ Coefficient) (24).

Statistical Analysis

Statistical analyzes were performed using "IBM®

SPSS© 24 software." The conformity of numerical variables to the normal distribution was performed using visual (histogram and probability plots) and analytical methods (Kolmogorov-Smirnov). Descriptive statistics for numerical variables with normal distribution were given with mean and standard deviation, while descriptive statistics for categorical variables were given using numbers and percentages. The relations between the variables were calculated by Pearson correlation test for normally distributed data, and the correlation coefficients and statistical significance were calculated by Spearman test if at least one of the variables was not normally distributed or ordinal. The correlation coefficient was interpreted as low correlation. Statistical significance level was accepted as $p<0.05$.

RESULTS

The data on the sociodemographic characteristics of the participant health workers are given in Table 1. This table shows that the average age of the health workers included in the study is 30.4 years, their average height is 164.8 cm, their average weight is 67.1 kg, their average working year is 7.7 years, and their weekly working hours are 48.2. According to the table, 72.4% of the participants are women, 76.6% are nurses/midwives, 61.4% have a bachelor's degree, 55.9% are married, 17.9% have a chronic illness and 17.2% have an occupational accident (Table 1).

The relationship between the occupational safety culture of the health workers included in the study and functional low back pain and neck pain is given in Table 2. A positive and low-level statistical correlation was found between the scores of health workers regarding managers commitment ($r=0.168$; $p=0.044$), safety awareness and competence ($r=0.160$; $p=0.045$), and reporting culture ($r=0.176$; $p=0.034$) which are the sub-parameters of occupational safety culture, and their scores of functional low back pain ($p<0.05$). A negative and low-level statistical relationship was found between the scores of health care workers regarding the sub-parameters of occupational safety culture,

Table 1. Data on Sociodemographic Characteristics of Participating Health Professional

		X	SD	Min	Max
Age		30.4	7.1	21	52
Height		164.8	14.5	156	192
Weight		67.1	12.9	44	115
Year of work		7.7	6.9	1	34
Weekly working hours		48.2	15.4	2	100
			n		**%**
Gender	Female		105		72.4
	Male		40		27.6
Occupation	Doctor		2		1.4
	Nurse/Obstetrician		111		76.6
	Other		32		22.1
Education	High School		17		11.7
	Undergraduate (2 years)		32		22.1
	Undergraduate		89		61.4
	Graduate		7		4.8
Marital Status	Married		81		55.9
	Single		64		44.1
Chronical Disease	Yes		26		17.9
	No		119		82.1
Occupational Accident	Yes		25		17.2
	No		120		82.8

X: Average, SD: Standard Deviation.

Table 2. The Relationship between Occupational Safety Culture of Health Workers and Functional Low Back Pain and Neck Pain

			Neck Pain			Functional low back pain
			Pain	Anxiety/Depression	Total	
Occupational Safety Culture	Managers' commitment	r	-0.076	-0.248	-0.144	0.168
		p	0.365	**0.003***	-0.238	**0.044***
	Safety priority	r	-0.023	-0.061	-0.037	0.025
		p	0.787	0.467	0.656	0.765
	Safety communication	r	-0.056	-0.193	-0.107	0.140
		p	0.500	**0.020***	0.201	0.093
	Safety training	r	-0.109	-0.184	-0.143	0.155
		p	0.192	**0.027***	0.086	0.063
	Safety awareness and competence	r	-0.064	-0.070	-0.071	0.160
		p	0.446	0.405	0.395	**0.045***
	Employee participation	r	0.033	-0.138	-0.021	0.072
		p	0.695	0.098	0.798	0.391
	Reporting culture	r	-0.005	-0.052	-0.021	0.176
		p	0.948	0.537	0.799	**0.034***

r; Pearson Correlation Test, *p<0.05.

the commitment of managers (r=-0.248; p=0.003), safety communication (r=-0.193; p=0.020) and safety training (r=-0.184; p=0.027) and the sub-parameter of neck pain, "anxiety/depression" (p<0.05).

The relationship between the occupational safety culture of the participant health workers and the work limitation is given in Table 3. A negative (r=-0.227; p=0.006) and low level statistical relationship was found between the "management commitment" scores of health professionals, one of the sub-parameters of the occupational safety culture, and their scores of "workload and concentration

Table 3. The Relationship between Occupational Safety Culture of Health Workers and Work Limitations

			Work Limitations	
			Physical Limitation of the Workplace	Workload and Concentration Limitation
Occupational Safety Culture	Managers' commitment	r	0.093	-0.227
		p	0.267	**0.006***
	Safety priority	r	0.031	-0.026
		p	0.707	0.752
	Safety communication	r	0.160	-0.098
		p	0.054	0.239
	Safety training	r	0.203	-0.236
		p	**0.014***	**0.004***
	Safety awareness and competence	r	0.081	-0.254
		p	0.335	**0.002***
	Employee participation	r	0.114	-0.182
		p	0.174	**0.029***
	Reporting culture	r	0.137	-0.313
		p	0.100	**0.000***

r; Pearson Correlation Test, *p<0.05.

limitation", which are the sub-parameters of work limitation ($p<0.05$). A positive ($r=0.203$; $p=0.014$) and low-level statistical relationship was found between the scores of health workers regarding "safety training", one of the sub-parameters of occupational safety culture, and "physical limitation of the working environment", which is one of the sub-parameters of work limitation ($p<0.05$). A negative ($r=-0.236$; $p=0.004$) and low level statistical correlation was found between the participating health professionals' "safety training" scores, which are the sub-parameters of the occupational safety culture, and their scores of "workload and concentration limitation", which are the sub-parameters of the work limitation ($p<0.05$). A negative ($r=-0.254$; $p=0.002$) and low level statistical correlation was found between the "safety awareness and competence" scores, one of the sub-parameters of the participants' occupational safety culture, and their scores of "workload and concentration limitation", which are the sub-parameters of work limitation ($p<0.05$). A negative ($r=-0.182$; $p=0.029$) and low level statistical correlation was found between the "employee participation" scores, one of the sub-parameters of the participants' occupational safety culture, and their scores of "workload and concentration limitation", which are the sub-parameters of work limitation ($p<0.05$). A negative ($r=-0.313$; $p=0.000$) and low level statistical correlation was found between the "reporting culture" scores, one of the sub-parameters of the participants' occupational safety culture, and their scores of "workload and concentration limitation", which are the sub-parameters of work limitation ($p<0.05$) (Table 3). The productivity loss of healthcare workers was found to be;

1- (446,5*0.00048+418,5*0.00036+496,5*0.00096+477,5*0.00106) = %34, 774

DISCUSSION

The present study, which was planned to examine the relationship between occupational safety culture and low back pain, neck pain and work limitation in health care workers, revealed that with the increase of occupational safety culture, functional activities of health care workers increased due to the decrease in low back pain, while neck pain and work limitation decreased. In our study, it was observed that 17.2% of the participants had an occupational accident. Aygün et al. (25) reported that 10% of employees had occupational accidents.

Our study has shown that occupational safety culture is associated with the functional activity level of health workers with low back pain, and with the increase of occupational safety culture, the functional activities of health workers increase due to the reduction of low back pain. A study by Caspi, et al. (26) reported that 47.5% of healthcare workers had deficiencies in their functional activity levels and that trainings including safe patient handling, ergonomics, and safety practices, and intervention strategies implemented by administrators, are effective in preventing low functional activity levels caused by low back and other pains in healthcare workers. Jakobsen et al. (27) determined that the training given at the workplace reduces pain in health care workers with low back pain and increases the functional activity capacity of the workers. Aljohani et al. (28) emphasized that unsafe behaviors in nurses during patient transport cause low back pain, changes in physical activity level are associated with low back pain at a high rate, and it is necessary to focus on environmental and organizational strategies in order to reduce this situation in order to create a safety culture for managers in health institutions. In the study of Oakman et al. (29) it was reported that the cause of low back pain, which is one of the musculoskeletal diseases in health workers, is the deficiencies of managers in applying the procedures and policies related to occupational health and safety, and this can be corrected with a strong culture about occupational health and safety. No study has been found in the literature that directly examines the relationship between occupational safety culture and functional low back pain in healthcare workers. In the studies mentioned above, suggestions and inferences were made that low back pain is common in healthcare workers in general and there is a decrease in the level of functional activity associated with this condition, and that a culture of occupational safety is vital in reducing or preventing them. Based on these suggestions and inferences, our study revealed that occupational safety culture in health workers is related to the functional activity level of workers with low back pain. Our study showed

that with the increase of occupational safety culture, the functional activity levels of health workers increased due to the decrease in low back pain, by confirming with statistical analyzes.

Studies have reported that due to organizational culture deficiencies of managers, employees experience symptoms such as work-related pain and depression (30). Elyıldırım (31) found that neck pain was associated with anxiety and depression in nurses, and that more than half of the participants did not receive any training about protecting the spine in the correct position. Another study reports that musculoskeletal disorders are very common in employees and that the education level of employees about workplace ergonomics and safety is associated with depression (32). Önder et al. (33) stated that neck pain, anxiety and depression are common among healthcare workers, and this may be due to insufficient training on occupational health and safety. In the same study, the importance of organizing regular training programs and informing about occupational diseases, risks in the hospital environment, and ways of protection were emphasized. In our study, in accordance with the recommendations of some studies in the literature and the findings of some studies, it was observed that as the safety communication and safety training scores, which are the sub-dimensions of occupational safety culture, increased, anxiety and depression, which are the sub-dimensions of neck pain, decreased.

Due to occupational diseases and work accidents, there is a risk of personnel loss, absenteeism, and job loss. It is stated that it is possible to reduce these losses and negativities by effectively creating an occupational health and safety culture in all enterprises (34). In the study conducted by Tucker et al. (35) it was reported that training, stress management and exercise training programs for health workers within the scope of occupational health and safety were effective in improving the physical fitness and working ability of the employees, and there were improvements in job loss. The current study, in line with the literature, showed that as the safety training scores of the employees, one of the sub-dimensions of the occupational safety culture, increased, the capacity of doing the work due to the physical environment limitation, which is the sub-dimension of the work limitation scale, increased.

It was revealed in the current study that as the scores of managers' commitment, safety training, safety awareness and competence, employee participation and reporting culture, which are sub-dimensions of the occupational safety culture, increase, the workload and concentration limitation scores, which are the sub-dimensions of the work limitation scale, decrease. Saleem et al. (36) stated that the COVID-19 pandemic causes a high level of stress in employees, and that a safety culture is necessary to prevent this situation where employees experience concentration problems while doing their jobs and their work performance decreases. Yang, C et al. (14) reported that assessment of managerial attitudes, training of healthcare professionals, and a safe reporting system affect employee safety culture and performance. Yıldız (37) found that the occupational safety performance due to lack of attention is low in health personnel working in shifts and working too many hours. Yıldız (37) also found that there is a positive and significant relationship between the occupational health and safety practices of the hospital management regarding occupational safety, employee safety training, safe communication and feedback, safety rules and safety procedures, and the occupational safety performance of the employees. In the study of Lee et al. (38) it was reported that nurses' high perceptions of institutional safety practices (safety climate, ergonomic practices, culture) were associated with lower physical workload and higher job satisfaction. McCaughey et al. (39) reported that health workers' perceptions of workplace safety climate are associated with work-related injury and illness, absenteeism, job satisfaction, and job stress that leads to impaired concentration. It is seen that the results obtained in our study are compatible with the results in the literature.

Zanon et al. (40) determined that the productivity loss of the employees was 13.7% and that the employees evaluated the general safety culture negatively due to various health problems. This study found that the productivity loss of health workers at work was 34.7%. When the general literature is compared, it is seen that this rate is quite high. The reason for this may be the difficulty of work-

ing conditions in our country, the low awareness of occupational safety culture and the inadequacy of productivity-enhancing practices.

As a result of our study, it was determined that occupational safety culture increased functional activities by reducing low back pain in health workers, and caused a decrease in neck pain and work limitation. To raise the understanding of occupational health and safety culture among managers in the workplace, it is necessary to devise suitable measures. Healthcare professionals should receive in-service training to promote workplace safety culture and knowledge in order to reduce musculoskeletal pain caused by inappropriate health behaviors. In addition, we believe that identifying the reasons causing productivity loss via the use of dependable questionnaires in the assessment of work efficiency, which is connected to the safety culture, and taking the appropriate precautions may be crucial for both employee and patient safety.

There are some limitations of our study. The first is that the data were collected only from a single province in the east of the country due to impossibilities and other regions could not be reached. Second, the scales we use as outcome measures are based on subjectively reported information. Third, our study included only the population in the young adult group in terms of mean age. It is suggested to conduct studies in which research data are collected from more than one center, the results are compared by considering the centers from which the data were obtained, objective measurement tools are used as outcome measurement, and older adult healthcare workers are included.

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COST ANALYSIS OF MOBILE TECHNOLOGY AND SUPERVISED EXERCISE TRAINING IN TYPE 2 DIABETES MELLITUS

ORIGINAL ARTICLE

ABSTRACT

Purpose: The aim of this study is to examine the cost analysis of a randomized controlled clinical study in which people with Type-2 Diabetes Mellitus (T2DM) were monitored for 12 weeks of exercise program through supervision, a smartphone application and a smart watch.

Methods: The budget impact was calculated by determining the payments made by the Social Insurance Institution for three different T2DM groups who exercised for 12 weeks through supervised exercise, smartphone application and smart watch, and the cost effectiveness was calculated from a social perspective.

Results: The Quality Adjusted Life Years (QALYs) per Turkish Liras (TL) were 14.863 TL ($1777) per QALY in the supervised exercise group; 6056 TL ($724) in the smartphone apps group, and 7379 TL ($882) in the smartwatch group. In the cost analysis, the change in SWM values was 0.11 in the supervised exercise group; 0.12 in the smartphone application group, and 0.11 in the smart watch group. It was determined that the most cost-effective method was the exercise application method via smartphone.

Conclusion: Cost effectiveness was high for the smartphone application group, medium in the mobile applications group and low in the supervised exercise group, and the results of the study are similar to the literature.

Keywords: Cost-effectiveness, Diabetes, Exercise, Telerehabilitation

TİP 2 DİABETES MELLİTUS'TA MOBİL TEKNOLOJİ VE DENETİMLİ EGZERSİZ EĞİTİMİNİN MALİYET ANALİZİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu araştırmanın amacı, Tip-2 Diabetes Mellituslu (T2DM) kişilerin gözetimli egzersiz, akıllı telefon uygulaması ve akıllı saat kullanarak yaptıkları 12 haftalık egzersiz takibinin yapıldığı randomize kontrollü klinik çalışmanın maliyet analizinin yapılmasıdır.

Yöntem: Denetimli egzersiz, akıllı telefon uygulaması ve akıllı saat yoluyla 12 hafta boyunca egzersiz uygulanan üç farklı T2DM grubu için Sosyal Sigortalar Kurumu tarafından yapılan ödemeler belirlenerek bütçe etkisi hesaplanmış ve maliyet etkinliği toplumsal bakış açısıyla hesaplanmıştır.

Sonuç: Türk Lirası (TL) başına Kaliteye Ayarlanmış Yaşam Yıl (KAYY) değerleri denetimli egzersiz grubunda 14.863 TL; akıllı telefon uygulama grubunda 6056 TL, akıllı saat grubunda 7379 TL olarak bulundu. Maliyet etkinliği en yüksek olan yöntemin akıllı telefonla egzersiz uygulama yöntemi olduğu belirlendi. Maliyet analizinde KAYY değerlerindeki değişim denetimli egzersiz grubunda 0,11; akıllı telefon uygulama grubunda 0,12 ve akıllı saat grubunda 0,11 olarak hesaplandı.

Tartışma: Maliyet etkinliği akıllı telefon uygulama grubunda yüksek, mobil uygulamalar grubunda orta ve denetimli egzersiz grubunda en düşük olup çalışmanın sonuçları literatür ile benzerlik göstermektedir.

Anahtar Kelimeler: Maliyet Analizi, Diyabet, Egzersiz, Telerehabilitasyon

INTRODUCTION

Diabetes Mellitus is one of the most important public health issues of the modern world (1), with a worldwide prevalence of over 8.8% (2). Type 2 Diabetes Mellitus (T2DM) is a metabolic disorder, accounting for around 90 to 95% of all diabetes cases (3). Globally, about 415 million people are currently living with T2DM (2) and this proportion of people is predicted to reach around 642 million by 2040 amounting to 10.4% of the world population (2). Looking specifically at Turkey, the diabetes-related death rate was 4.33% in 2019 (4). While the prevalence of T2DM is rapidly increasing all over the world, the economic cost associated with the disease and the treatment caused by the disease are quite high. Moreover, the direct (treatment-related), and indirect (absence from work) burden on people living with T2DM is enormous (4). In terms of the direct cost of care, T2DM is an expensive health condition to manage follow-up as most individuals will access some form of healthcare services for a prolonged period. Approximately 12% of global health expenditure is spent on T2DM care and exceeds $673 billion worldwide. This cost no doubt will increase over time and is predicted to increase 20% by 2040 and reach over $800 billion (2). While the expenditure on diabetes in Turkey was 4.5 billion Turkish Lira (TL) in 2008, it was 3.1 billion TL in 2016 (5).

The current guidelines for the management of T2DM recommend medication and diet to achieve therapeutic glycemic control (6). However, drug therapy and diet alone have been shown to be ineffective and holistic management of T2DM has been proposed (6). The recommendations include, in addition to drug therapy, lifestyle interventions, which include regular physical activity. Physical activity guidelines recommend that people with T2DM do 150 minutes or more of moderate to vigorous-intensity activity. People with T2DM should have resistance exercise in 2 to 3 sessions per week on nonconsecutive days (7). Achieving glycemic control has been shown to enhance general health and quality of life in individuals with T2DM (8,9,10,11). However, the proportion of individuals with T2DM who participate in adequate physical activity is very low (12).

Several ways to improve engagement in physical activity have been recommended. Technologies such as mobile health apps are available in the market to promote and monitor physical activity. Mobile health technologies and apps could be potential ways to engage in physical activity for people living with T2DM (13). As the number of mobile applications for T2DM is increasing, the applications include features known to improve adherence to therapy such as individually tailored programs, reminders, real-time monitoring, the adaptation of exercise activities and performance feedback. In the literature, there is a study showing that mobile technology-supported exercise applications increase the physical activity levels of individuals diagnosed with T2DM (14). According to Liebreich's study, the web-based delivery of physical activity programs ensures promise for behaviour change in this population. The increasing availability of the internet lets such programs reach lots of people while providing momentary feedback (15). Thus, technology plays an important role in the treatment of diabetes.

The use of technology has not only been shown to improve health outcomes and engagement but it is also suggested to be cost-effective. There is limited research supporting the cost-effectiveness of technology-assisted physical activity participation. A systematic review shows incremental cost-effectiveness ratio (ICER) is calculated in the range of $516.33 to $126.23 per QALY in the studies (16). Despite limited studies, the positive economic contribution of mobile applications and technology to the health system should not be ignored.

The diverse forms of involvement, such as text messages, mobile apps, interactive telephones, internet servers, websites, video conferences, and mobile devices, may also explain the influence of mobile health apps to improve physical activity levels. This research is another study examining the cost analysis of a randomized controlled trial, whose clinical phase has been completed. The aim of this study was to assess the cost-effectiveness to deploy smartphone apps and smartwatches for 12 weeks in a clinical trial compared to a traditional supervised program. In addition to this study,

treatment costs were calculated over the fees covered by Social Security Institution.

METHODS

Study design

The study was the cost-effectiveness of an assessor-blind randomized clinical trial designed to estimate the extent to which an exercise program delivered through a smartphone and smartwatch compared to a supervised program is effective in achieving glycemic control in individuals with T2DM. The current paper presents a cost-effectiveness analysis of three different exercise delivery methods which are supervised exercise training group (supervised exercise), program delivered through smartphone apps supported exercise training group (smartphone apps), and smartwatch supported exercise training group (smartwatch). Smartphone apps and smartwatches were called intervention groups while supervised exercise programs included a control group of patients. During the interventions, all participants took the same exercise program both duration and exercises. All participants have been informed about the trial and their consent has been taken.

Figure 1 shows the randomization, assessments, and follow-ups of the study participants. In summary, a total of 90 individuals were stratified randomized by age and sex, 1:1 to one of the three groups: supervised exercise, smartphone apps, or smartwatch groups (17). The intervention period was for 3-month with a follow-up at 3-month. The trial was conducted from March to September 2018 at the Fatih Sultan Mehmet Hospital Diabetes and Obesity Center in Istanbul, Turkey. The ethical approval of this study has been obtained from the Marmara University Ethics Committee of Clinical Research. (Approval Date: 06.10.2017 and Approval Number 09.2017, 604)

Outcomes Assessed

Several laboratory tests and therapist-supervised physical assessments were carried out to measure the outcomes of alternative interventions for the trial. The Quality Adjusted Life Years (QALY) were calculated for all groups. The outcomes were assessed at baseline and 3-month follow-up.

Intervention

Control Group

Supervised Exercise Training Group (Supervised Exercise): The control group had a physiotherapist-supervised exercise program for 3 sessions per week for a total of 36 sessions during the 3-month intervention period (17). The duration of each exercise session lasted around 60 minutes including a warm-up, aerobic exercises, resistance exercises, exercises of balance and flexibility and a cool down.

Intervention Groups

(a) Smartphone Apps Supported Exercise Training Group (Smartphone Apps): The participants in this group had smartphone apps installed on their personal cell phones (17). The app was programmed by a physiotherapist to create a personalized exercise program including strengthening, walking, balance, stretching, aerobic exercises, and relaxation. The exercise program lasted for around 60 minutes and was supplemented with training videos. The participants were expected to use the program 3 days per week and 36 times for 3-month. The physiotherapist followed up with the participants once a week through phone calls to troubleshoot and modify exercises, as needed.

(b) Smartwatch Supported Exercise Training Group (Smartwatch): A personal account was registered at www.diabetexercise.com (Marmara University Department of Physiotherapy Rehabilitation Education and Informatics, İstanbul, Turkey) for each participant in the smartwatch-supported exercise group (18,19). The participants in this group participated 3 days per week (a total of 36 times) in a 12-week aerobics, strengthening, and stretching exercise training program through a smartwatch. Exercise programs were defined specifically for each participant via video, and after choosing an exercise from the same platform with a smartphone, exercises were performed between 30 and 60 minutes, which is the exercise time that the patients can tolerate. During the exercise program, patient communication was provided by the physiotherapist through the smartwatch once a week so that the exercises could be corrected and modified as needed.

Data analysis: To answer our research question, we

followed Consolidated Health Economic Evaluation Reporting Standards (CHEERS) Checklist recommended by ISPOR which is The Professional Society for Health Economics and Outcomes Research (20). After measuring the cost and effectiveness of alternative interventions, we estimated cost-effectiveness ratios and carried out a budget impact analysis. Measuring the cost and effectiveness of alternatives is essential for all cost-effectiveness studies. Measuring cost and effectiveness dimensions as well as estimating cost-effectiveness and budget impact analysis as described below:

1. Cost dimension: The cost dimension was calculated from therapist-supervised training obtained from the 2019 Social Security Institution Health Practice Statement from the Ministry of Health, Republic of Turkey (21). The costs incurred for the three groups are shown in Table 2.

2. Effectiveness dimension: QALY was used to assess the effectiveness dimension in this study (22). The QALY is an important indicator in the health economy, with a QALY of 0 representing death, and 1 representing perfect health (23). The EuroQol-5 Dimensions is a versatile quality of life instrument which is included dimensions of anxiety/depression, a visual analogue scale, usual activities, mobility, pain/discomfort, and self-care. It is used to calculate QALY (24). There are no population norms for Turkey. Therefore, the referenced values for Germany were used in this calculation (25).

3. Cost-effectiveness dimension: There are different perspectives on cost-effectiveness and the cost was calculated from a societal perspective in this study. Two different Incremental Cost Effectiveness Ratios (ICERs) were calculated to compare the extent of cost-effectiveness for alternatives: ICER for supervised exercise versus smartphone apps, and supervised exercise versus smartwatch (26). The calculated ICER values were compared with the threshold values of the Gross Domestic Product (GDP) per capita. Any treatment cost that is up to three times below the threshold is considered cost-effective (22). According to TURKSTAT data published in 2018, GDP was estimated to be around 45 463 TL ($9 632).

4. Budget effect size: The direct cost incurred for providing treatment to all three groups was extrapolated to the total number of people with T2DM for one year in Turkey. The individual treatment cost was multiplied by the total number of referred people with T2DM to physiotherapy clinics in one year. In order to meet the exercise needs of diabetic patients in physiotherapy clinics, the referral rate was calculated as approximately 2% per (27). While calculating the cost, a family education fee was added for groups using smartwatches and smartphone apps.

Statistical Analysis

Data analysis was carried out using IBM SPSS Statistics, version 22.0 (IBM Corporation, Armonk, New York, USA). The normality of the five dimensions of the EQ-5D-5L was tested using the Kolmogorov-Smirnov test. The obtained cost and effectiveness data were compared by using ANOVA and t-tests for paired and independent samples. A Student t-test was used to compare the groups at a significance level of $p \leq 0.05$. Also, a cost analysis was calculated for 28 people in each group.

RESULTS

Cost Analysis Phase of Mobile Health Application Developed in Type 2 Diabetes

According to the results of the trial, there was not any difference between the groups after the inter-

Table 1. Participants Characteristics at Baseline

Characteristics	Supervised Exercise (n=26)		Smartphone Apps. (n=25)		Smartwatch (n=24)	
	Mean	SD/%	Mean	SD/%	Mean	SD/%
Age (years)	51.8	8.0	51.6	7.8	51.4	8.1
Weight (kg)	91.6	17.0	89.5	19.1	90.5	18.9
Height (cm)	164.1	9.6	164.6	8.8	165.4	9.0
BMI (kg/m^2)	33.2	6.9	33.0	6.2	32.1	6.3

SD: Standard Deviation, %: Percentage, BMI: Body Mass Index.

Table 2. 12-Week Cost Amounts of Groups

Assessments, units or equipment	Supervised Exercise	Smartphone Apps.	Smartwatch
Therapist-supervised assessements and training	**Cost in TL per test or assessment**		
Educational information	300 ($35.88)	300 ($35.88)	300 ($35.88)
Home exercise program and family education	NA	156 ($18.66) (13*12 sessions)	156 ($18.66) (13*12 sessions)
Range of motion and flexibility	80 ($9.56)	80 ($9.56)	80 ($9.56)
Six-minute walk test, distance in meters	66 ($7.89)	66 ($7.89)	66 ($7.89)
Supervised strengthening exercises	35 ($4.18)	35 ($4.18)	70 ($8.37)
Relaxation exercises	22 ($2.63)	22 ($2.63)	44 ($5.26)
Balance and coordination training	22 ($2.63)	22 ($2.63)	44 ($5.26)
Walking exercises	20 ($2.39)	20 ($2.39)	40 ($4.78)
Stretching exercise	7 ($0.83)	7 ($0.83)	14 ($1.67)
Exercise therapy in chronic diseases	1080 ($129.1)	NA	NA
Total Cost (TL)	1632 ($195.2)	708 ($84.68)	814 ($95.36)

NA: not applicable (Calculated according to the 2019 dollar rate)

Table 3. Within Group Difference on QALY Scores by Groups

Group	Time points	Mean(SD)	Mean Difference	p
Supervised Exercise (n=28) (n=26)	Baseline	0.76(0.23)	0.11	0.002*
	3-month	0.87(0.10)		
Smartphone Apps (n=28) (n=25)	Baseline	0.75(0.22)	0.12	0.001*
	3-month	0.87(0.13)		
Smartwatch (n=28) (n=24)	Baseline	0.76(0.22)	0.11	0.001*
	3-month	0.87(0.13)		

*p<0.005=Statistically significance (Paired-Samples t-test).

vention programs. Laboratory and physical tests showed similar results in all groups. The clinical results of our study are presented in our published article (17). Table 1 shows participants characteristics at baseline.

Cost Dimension

The costs of activities under three alternatives and total costs were calculated for each participant and they are shown in Table 2. While the cost per person for the supervised exercise was 1632 TL ($195.39), the smartphone apps group was 708 TL ($84.76), and the smartwatch group was 814 TL($97.45).

The Effectiveness Dimension

The scores obtained from the EQ-5D-5L were used to obtain the QALY value. German weights were used in order to obtain the QALY scores for quality of life because Turkey weights for QALY are not available in Turkey to Germany (22). The median QALY values were 0.76 at baseline and 0.87 post-intervention for the supervised exercise training group (Figure 2). The QALY values at baseline for smartphone apps and the smartwatch group increased from 0.75 to 0.87 and 0.76 to 0.87 respectively (Table 3).

Table 4 shows the median values for each dimension of the EQ-5D-5L scale and the mean visual analogue scale for current health status. Mean EQ-5D-5L Index Values for the 3 groups can be seen in the chart.

Cost Effectiveness Dimension

QALY scores were estimated to be 0.11 in the supervised exercise group, 0.12 in the smartphone apps group, and 0.11 in the smartwatch group (Table 3).

Cost-effectiveness analysis provides a measure of

Table 4. The Median Score For Each Item and The Mean Score For Visual Analog Health Status of EQ-5D-5L Across Three Groups

Groups	Time points	Mobility	Self Care	Usual Activities	Pain/ Discomfort	Anxiety/ Depression	Visual Anolag Scale	Mean (SD)
Supervised Exercise	Baseline (n=28)	2.0	1.0	2.0	2.0	1.0	51.03	0.75 (0.03)
	3-month (n=26)	1.0	1.0	2.0	2.0	1.0	66.16	0.88 (0.05)
Smartphone Apps.	Baseline (n=28)	2.0	1.0	2.0	2.0	1.0	57.28	0.74 (0.05)
	3-month (n=25)	1.0	1.0	1.0	2.0	1.0	69.44	0.87 (0.04)
Smartwatch	Baseline (n=28)	2.0	1.0	2.0	2.0	1.0	53.97	0.78 (0.05)
	3-month (n=24)	2.0	1.0	2.0	2.0	1.0	67.72	0.86 (0.05)

Table 5. TL per QALYs For All Groups and Budget Impact Dimension

Group	TL per QALYs ($)	Total cost in millions TL($)	Share of Total Health Expenditures (%)
Supervised Exercise (n=26)	14 863 ($1777)	218 505 ($26 136)	0.108
Smartphone Apps. (n=25)	6 056 ($724)	94 792 ($11 338)	0.047
Smartwatch (n=24)	7 379 ($882)	108 984 ($13 036)	0.054

QALYs: The Quality Adjusted Life Years, TL: Turkish Lira

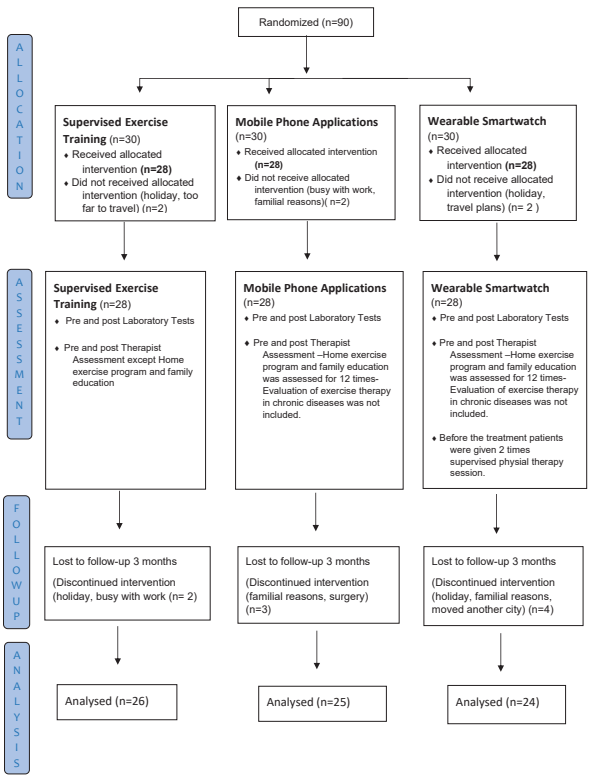

Figure 1. Flow diagram for study participants

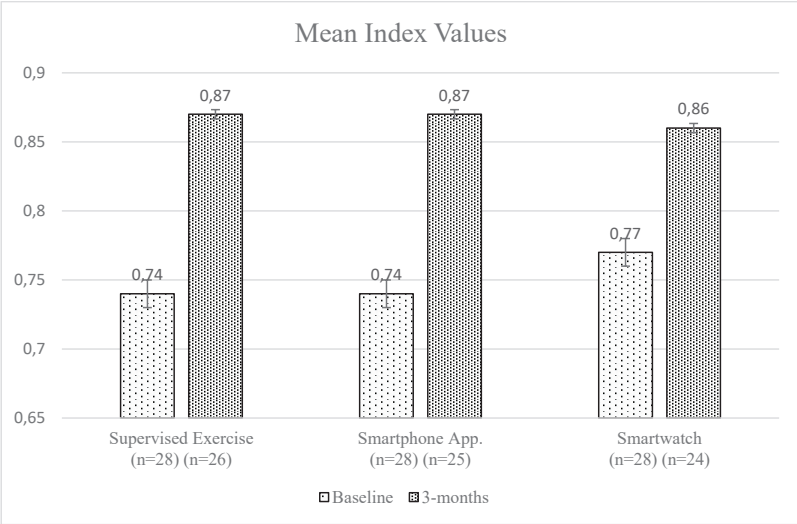

Figure 2. Mean EQ-5D-5L index values for the 3 groups

lives saved in health-related units and life-years achieved, as a health-related unit. It is important to monitor the cost and effectiveness of each alternative intervention over time. For this reason, the cost per gained QALY in the past 3-month was calculated, and the results provided are in Table 5 by using the below formula (22).

(Cost of Intervention 2) – (Cost of Intervention 1)

Change in QALY

The cost in TL per gained QALYs in the last 3 months was calculated and they are; 14 863 TL ($1777) per QALY in the supervised exercise group; 6 056 TL ($724) in the smartphone apps group, and 7 379 TL ($882) in the smartwatch group (Table 5).

Across all three treatment groups, the smartphone apps group resulted in the same QALYs but at a lower cost compared to the other two groups.

The net change in costs (between two interventions) divided by the net change in QALYs gives ICER (29). ICER expresses the cost-effectiveness (cost-utility) and is calculated by dividing incremental cost by incremental QALYs. While ICER for smartphone apps was 33 000 in TL ($3947), ICER for smartwatches was 511 250 in TL ($61 154).

Budget Effect Size

According to the IDF, around 6.7 million people with T2DM are living in Turkey (28). Since only 2% of diabetic patients were referred to outpatient physical therapy, total health expenditures were calculated according to this group (27). The total number of people referred to physiotherapy clinics with T2DM in a year was estimated to be 134 thousand. The budget spent on health in 2019 was approximately 201 billion 031 million TL (29). These numbers are multiplied by the individual numbers for each group, respectively, 218 million 505 thousand TL ($ 26 million 136 thousand) for the supervised group, 94 million 792 thousand TL ($ 11 million 338 thousand) on smartphone apps, 108 million 984 thousand TL ($13 million 036 thousand) on the smartwatch. This translates to an approximate expenditure of 0.108% on supervised exercise therapy, 0.047% on smartphone apps, and 0.054% on the smartwatch. Table 5 shows the estimated total annual health expenditures for each group.

DISCUSSION

The aim of this paper was to compare the cost-effectiveness to deploy a smartphone app or smartwatch, versus supervised exercise training for older adults with T2DM in the context of a clinical trial. The changes in QALY values were calculated as 0.11 in the supervised exercise group, 0.12 in the smartphone apps group, and 0.11 in the smartwatch group. For the cost-effectiveness between groups, the smartphone apps group was highly cost-effectiveness followed by mobile applications, while the supervised exercise treatment option was the least.

Approximately 12% of global health expenditures

are utilized in the management of T2DM (2). In Turkey, the health expenditure in the management of the T2DM population is close to double, around 23% (5). Technology should be used to reduce costs in healthcare services. Increasingly technology such as mobile applications, and monitoring devices such as smartwatches are commercially available, cost-effective, and timely to meet the needs of a large population. In this randomized controlled clinical trial, glycemic control, muscle strength, physical function, and exercise behaviours of individuals with T2DM were assessed at baseline and after 3-months. Although the overall benefits of the interventions were inconclusive to improve behavioural outcomes, smartphone apps and smartwatches training interventions were non-inferior in improving glycemic control and physical functions compared to supervised exercise training after 3-months of trial exercise training (17).

In this study, the cost-effectiveness analysis was conducted for the 3 intervention groups to compare their net health benefits and cost. EDUC@DOM is a telemonitoring and tele-education program in France. This program was found cost-effective strategy for telemonitoring and tele-education in patients with T2DM (30).

Brun et. al. assessed moderate endurance training on healthcare cost, and fitness in people with T2DM and showed a 50% reduction in the total healthcare expenditure at one year between the exercise intervention and usual care (31). The results of the study conducted with patients with heart failure showed when the total healthcare costs per participant were compared, it was found that the telerehabilitation group was significantly lower than the traditional centre-based program group (32). Our findings showed that the supervised exercise group has the highest cost, while the smartphone app intervention has the lowest cost.

The cost-effectiveness between groups, the smartphone apps group was highly cost-effective followed by mobile applications, while the supervised exercise treatment option was the least. The Feel Diabetes intervention (Feel4Diabetes) was cost-effective in high-income and low to middle-income countries, and cost-saving in the high-income countries under austerity measures following the financial crisis (33).

It should be mentioned that all exercise alternatives enhanced the quality of life in patients deployed in different intervention groups. The estimated costs per gained quality for each intervention were 14.863 TL ($1777) per QALY in the supervised exercise group, 6056 TL ($724) in the smartphone apps group, and 7 379 TL ($882) in the smartwatch group. A study in Australia showed that exercise interventions were estimated to cost around $5.61 (22,16 TL) per QALY for pre-diabetes, and $5.13 (20,26 TL) per QALY for T2DM in 2015. The incremental cost per QALY gained for the combined exercise was $37.87 (149,58 TL) compared with no exercise program (34).

When the economic cost of exercise therapy across the country was calculated, the ratio of supervised exercise therapy in the total health budget was 0.108%, the ratio of smartphone application-assisted exercise therapy was 0.047%, and the rate of exercise therapy supported by smartwatches was 0.054%. According to a study on people with heart failure, exercise therapy had a modest incremental cost-effectiveness ratio of $26,462 (104 524 TL) per QALY and $21,169 (83 617 TL) per life-year in a Brazilian Public Health System (35).

A smartphone app-based diabetes self-management intervention was found to be able to optimize patients' glycemic control and improve participants' self-management performance (36). According to our study, in the comparison of the groups, the smartphone app group was found to be the most cost-effective exercise treatment option. So the next step to continue work in this area will involve developing accessible smartphone apps for android and iOS versions, with features such as language options, interpretable feedback to the users, and including the apps as a part of routine clinical care. Future steps will be to develop policies to uptake the use of smartphone apps to improve glycemic control, physical function, and exercise behaviour for people with T2DM. There is a need to understand the economic burden of diabetes on health systems in order to regulate future policies and practices (37). The development of policies should involve multi-stakeholders such as patient experts, researchers, clinicians, health ministries, and other

relevant stakeholders.

This study has some limitations. One of them is the cost-effectiveness was not calculated by considering the patient perspective such as transfer to hospital, accessibility to treatment, and time. It would be useful to conduct a cost-effectiveness analysis from the patient perspective in future studies. The other limitation is QALY scores were assessed for only 3-months. Health-related quality of life coefficients have not been produced for Turkey. Therefore, calculated coefficients for Germany were used in the study.

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INVESTIGATION OF PERSISTENT POST-COVID-19 SYMPTOMS, FRAILTY, KINESIOPHOBIA, AND QUALITY OF LIFE IN OLDER ADULTS: AN OBSERVATIONAL CROSS-SECTIONAL STUDY

ORIGINAL ARTICLE

ABSTRACT

Purpose: The aim of this study was to compare kinesiophobia and quality of life in older adults among subgroups created according to persistent post-COVID-19 symptoms and frailty.

Methods: This study included 63 adults over the age of 65 with COVID-19.. Frailty was assessed with the Clinical Frailty Scale (CFS). Tampa Scale of Kinesiophobia (TSK) was used to assess the kinesiophobia and The World Health Organization Quality of Life Instrument-Older Adults Module (WHOQOL-OLD) was used to assess quality of life.

Results: The TSK score was significantly higher in the visibly frail and frail group than in the non-frail group (p=0.040). The TSK score was also significantly higher in the group with at least one persistent symptom after COVID-19 than participants with no persistent symptoms (p=0.008). Among participants with at least one persistent post-COVID-19 symptom, the TSK score was significantly higher in those with persistent dyspnea compared to those without (p=0.016). There was no significant difference in the WHOQOL-OLD scores ofany sub-groups (p>0.05).

Conclusion: The results of the study showed that kinesiophobia was affected by the presence of persistent COVID-19 symptoms and dyspnea, and frailty in older adults. In addition, quality of life was found to be independent of frailty and persistent COVID-19 symptoms.

Keywords: Elderly, Frailty, Post-acute COVID-19 Syndrome, Quality of Life

YAŞLI YETİŞKİNLERDE COVID-19 SONRASI KALICI SEMPTOMLAR, KIRILGANLIK, KİNEZYOFOBİ VE YAŞAM KALİTESİNİN İNCELENMESİ: GÖZLEMSEL KESİTSEL BİR ÇALIŞMA

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışmanın amacı, yaşlı yetişkinlerde kinezyofobi ve yaşam kalitesinin COVID-19 sonrası kalıcı semptomlara ve kırılganlığa göre oluşturulan alt gruplar arasında karşılaştırılmasıydı.

Yöntem: Çalışmaya 65 yaşın üzerinde, COVID-19'lu 63 yetişkin dahil edildi. Kırılganlık, Klinik Kırılganlık Skalası (KKS) ile değerlendirildi. Tampa Kinezyofobi Skalası (TKS) kinezyofobiyi değerlendirmek için ve Dünya Sağlık Örgütü Yaşam Kalitesi Enstrümanı-Yaşlı Yetişkinler Modülü (DSÖYKE-YYM) yaşam kalitesini değerlendirmek için kullanıldı.

Sonuçlar: TKS skoru görünürde kırılgan ve kırılgan olan grupta kırılgan olmayan gruba kıyasla anlamlı şekilde daha yüksekti (p=0,040). TKS skoru ayrıca, COVID-19 sonrası en az bir kalıcı semptomu olan grupta hiç semptomu olmayan gruba kıyasla anlamlı şekilde daha yüksekti (p=0,008). COVID-19 sonrası en az bir kalıcı semptomu olan grup içerisinde TKS skoru kalıcı dispnesi olanlarda olmayanlara kıyasla anlamlı şekilde daha yüksekti (p=0,016). DSÖYKE-YYM skorunda hiçbir alt grup arasında anlamlı fark yoktu (p>0,05).

Tartışma: Çalışmanın sonuçları, COVID-19'lu yaşlı bireylerde kinezyofobinin COVID-19 sonrası kalıcı semptom ve nefes darlığı varlığı ile kırılganlıktan etkilendiğini gösterdi. Ayrıca yaşam kalitesinin, kırılganlık ve COVID-19 sonrası kalıcı semptomlardan bağımsız olduğu bulundu.

Anahtar Kelimeler: Yaşlı, Kırılganlık, Post-akut COVID-19 Sendromu, Yaşam Kalitesi

INTRODUCTION

Although coronavirus (SARS-CoV-2) infection can progress with severe acute respiratory syndromes in all age groups, the burden of disease is relatively higher in people aged 65 years and over (1). More than one comorbidity accompanying COVID-19 infection in older adults has been associated with worsen prognosis and prolonged recovery time (2). The World Health Organization (WHO) has reported the recovery time from COVID-19 to be approximately 2 weeks in the presence of mild infection and between 3 and 6 weeks in more severe infections (3). Post-acute COVID-19 syndrome is defined as the persistence of symptoms for more than three weeks from the onset of the first symptoms. The situation in which the symptoms continue for 12 weeks or more is defined as chronic COVID-19 syndrome and the symptoms are expressed as persistent post-COVID-19 symptoms (4). While the majority of the infected patients recovered completely, it was observed that some of the symptoms of a significant part of the patients continued after the first recovery period of the disease. Dyspnea, muscle and joint pain, fatigue, cough and fever are the most common persistent symptoms. (5, 6). Tosato et al. reported that 83% of 137 older adults had at least 1, and 46.3% of them had 3 or more persistent post-COVID-19 symptoms (7). The authors stated that dyspnea, cough, fatigue, and joint pain were the most commonly reported persistent symptoms.

Age-related frailty is a clinical disorder that reduces the functioning of multiple organ systems, causes loss of homeostasis, and consequently renders the elderly person highly vulnerable to minor stressors (8). Frailty was associated with a higher rate of hospital mortality, days of hospital stay, admission to the intensive care unit, and the need for mechanical ventilation support, independent of the older age. (9). It has been reported that even younger individuals with COVID-19 had much more vulnerability and multimorbidity (10). In addition to increasing the risk of hospitalization, admission to the intensive care unit and death, which are the direct effects of COVID-19, the indirect effects of social isolation applied during the pandemic period such as malnutrition, physical inactivity, depression and anxiety also play a role in worsening frailty (10).

The condition caused by frailty, debilitating physical movements and causing an excessive and irrational fear of activity is defined as kinesiophobia. (12). Decreased physical activity level with the effect of social isolation and frailty has a negative relationship with fear of movement (13). Recent studies have reported a strong relationship between dyspnea and kinesiophobia in individuals with chronic obstructive pulmonary disease (COPD) (14, 15). However, as far as we know, there is no study investigating the relationship between dyspnea, one of the most common persistent post-COVID-19 symptom, and kinesiophobia. It has also been reported that frailty, which is seen at a high rate in older adults, increases kinesiophobia by worsening symptoms and restricting physical function (16). In addition, it has been shown that kinesiophobia, dyspnea, and limitation of movement can reduce quality of life in frail older adults (17).

Considering the direct relationship of kinesiophobia with frailty, the impact of persistent post-COVID-19 symptoms in older adults on kinesiophobia is not yet known. In addition, although it is known that quality of life can be affected by both frailty and symptoms such as dyspnea, pain, and fatigue, there has been no study focusing on the effects of persistent post-COVID-19 symptoms on quality of life in older adults. The aim of this study was to compare kinesiophobia and quality of life in older adults with COVID-19 among subgroups according to persistent post-COVID-19 symptom and frailty.

METHOD

This study was conducted as an observational cross-sectional study between January and June 2022. This study protocol was approved by the Ethical approval was obtained from Ethical Committee of Biruni University (Protocol Number 2022/68-16) and required permission were got from Turkish Ministry of Health. Sixty-three older adults over the age of 65 who had COVID-19 were included in the study. Since the presence of symptoms longer than 12 weeks is considered persistent post-COVID-19 symptoms; the symptoms present for at least 12 weeks from the onset were classified as persistent post-COVID-19 symptom. The inclusion criteria

were being 65 years or older who were diagnosed as COVID-19 based on a positive SARS-CoV-2 real-time reverse transcriptase-polymerase chain reaction (RT-PCR) on nasal swabs, able to understand and speak the national language and being volunteer to participate in the study. Subjects who have been diagnosed with a psychiatric or neurological disorder that may cause cognitive impairment and no access to high speed internet were excluded from the study. All assessments were completed using the tele-assessment method.

Physical and sociodemographic characteristics of the participants were recorded. Time after positive RT-PCR test, persistent post-COVID-19 symptoms (dyspnea, fatigue, joint pain, cough, fever, headache, vomiting, diarrhea etc.), history of smoking, and comorbidities were also recorded.

The frailty level of the participants was assessed with the Clinical Frailty Scale (CFS). The CFS evaluates activities of daily living and comorbid conditions, and 1 point represents very fit individuals and 9 points represents highly frail individuals (terminal patients, individuals with a life expectancy of less than 6 months) (18). According to the Clinical Frailty Scale; participants with a score of 0-4 were classified as non-frail, participants with a score of 5-6 were classified as seemingly defenseless or participants with a score of 7-9 were classified as frail. The Turkish version of the CFS used in this study (19).

Kinesiophobia was assessed with the Tampa Scale of Kinesiophobia (TSK). The TSK is a self-report questionnaire consisting of 17 items and each item is evaluated with a 4-point Likert scale. The scale is based on a model of fear of movement, work-related activities, and re-injury. Participants answered all items between 0 and 4 points, with answers ranging from "strongly disagree" to "strongly agree". In total, the lowest 17 and the highest 68 points can be obtained, and a higher score indicates a higher degree of kinesiophobia. Vlaeyen et al. calculated the cutoff value of the scale as 37 points and found that scores above this point indicated high level of kinesiophobia (20). The Turkish version of the TSK used in this study (21).

The quality of life was assessed with the World Health Organization Quality of Life Instrument-Older Adults Module (WHOQOL-OLD). WHOQOL-OLD is a 5-point Likert-type scale and consists of 6 subscales and 24 items. High scores obtained from the scale indicate a better quality of life (22). The Turkish version of the WHOQOL-Old used in this study (23).

The study was approved by the Ethics Committee with the protocol number 2022/68-16. The study was conducted in accordance with the principles of the Declaration of Helsinki. All participants were included in the study after obtaining written informed consent.

Statistical Analysis

The calculation of the sample size of the study was conducted with The G*Power 3.1 program. The sample size calculation was made on the result of a study with 80% power and 0.75 effect size (two tailed; α=0.05) that investigating the effect of kinesiophobia on health-related quality of life in elderly individuals with COPD (24), and we estimated that a total of at least 62 participants should be included in the present study.

IBM SPSS v.26 (SPSS Inc., USA) was used for all statistical analysis. The normality of the distribution of data was analyzed using Kolmogorov-Smirnov, Lilliefors and Shapiro-Wilk Test. Independent Samples t test and Mann Whitney U test were used for comparisons between groups, depending on the distribution characteristics of the data. Independent Samples T-test was used for the comparison of normally distributed data between groups, and the Mann-Whitney U test was used for the comparison of data that did not show normal distribution between groups. Categorical variables between groups were compared with the Chi-square test. $p<0.05$ was accepted as the significance value for the results.

RESULTS

A total of 88 older adults with COVID-19 were assessed in terms of eligibility in the study. Twenty-five participants who had cognitive, psychiatric or neurological disorders were not included in the study. Sixty-three participants (36 female, 27 male) were enrolled in the study. Demographics and clinical characteristics of the participants were shown in Table 1. The mean duration of per-

sistent post-COVID-19 symptoms that started and continued after the patients were diagnosed was approximately 37 weeks (262.33 ± 162.67; [Minimum:30,00 - Maximum: 669.33] days). The scores of frailty, kinesiophobia and quality of life of the participants were shown in Table 2. According to the CFS, 68.25% of the participants (n = 43) were non-frail (0 ≤ CFS ≤ 4); 28.8% of the participants (n = 15) were seemingly defenseless (5 ≤ CFS ≤ 6) and 7.9% of the participants (n = 5) were frail (7 ≤ CFS ≤ 9). There was no significant difference between the mean ages of the non-frail group and the seemingly defenseless or frail group (71.32 ± 5.03; 74.85 ± 6.87; respectively, p > 0.05).

Table 1. Demographics and Clinical Characteristics of the Participants

	Mean ± SD (n=63)
Age (years)	73.39 ± 6.40
Gender	
Female (n)	36 (57.14%)
Male (n)	27 (42.85%)
BMI (kg/m²)	23.4 ± 3.5
Smoking	
Non-smoker (n)	33 (52.38%)
Ex-smoker (n)	21 (33.33%)
Active-smoker (n)	9 (14.28%)
Comorbidities	
Hypertension (n)	42 (66.66%)
Diabetes (n)	30 (47.61%)
Hyperlipidemia (n)	10 (15.87%)
Asthma	7 (11.11%)
Coronary artery disease (n)	2 (3.17%)
Chronic obstructive pulmonary disease (n)	2 (3.17%)
Bronchitis (n)	2 (3.17%)
Regular use of prescribed (n)	56 (88.88%)
Time after RT-PCR test (days)	262.33 ± 162.67
History of hospitalization due to COVID-19	
Yes (n)	9 (14.3%)
No (n)	54 (85.7%)
Hospital Length of Stay (days)	5.60 ± 2.25
History of staying in intensive care	
Yes (n)	0
No (n)	63 (100%)
History of outpatient treatment	
Yes (n)	0
No (n)	63 (100%)
Persistent Post-COVID-19 Symptoms	
Yes (n)	41 (65.07%)
No (n)	22 (34.92%)
Type of Persistent Post-COVID-19 Symptoms	
Dyspnea	33 (79.4%)
Joint pain	14 (34.9%)
Fatigue	9 (21.95%)
Cough	8 (19.0%)
Headache	6 (14.63%)
Loss of smell	5 (12.91%)
Loss of taste	3 (7.31%)
Weight loss	2 (4.87%)
Sleep disorder	2 (4.87%)

Note: Data are presented as mean ± standard deviation or n (%).

Abbreviations: BMI: body mass index, RT-PCR: real-time reverse transcriptase-polymerase chain reaction.

Table 2. The Scores of Frailty, Kinesiophobia and Quality of Life of the Participants

	Mean ± SD (n=63)
Clinical Frailty Scale Score	3.88 ± 1.51
Non-frail (0-4 points) (n; %)	43 (68.25%)
Seemingly defenseless (5-6 points) (n; %)	15 (28.8%)
Frail (7-9 points) (n; %)	5 (7.9%)
Tampa Scale of Kinesiophobia Score	42.57 ± 6.77
WHOQOL-OLD Score	74.47 ± 8.64

Note: Data are presented as mean ± standard deviation or n (%).
Abbreviations: WHOQOL-OLD: The World Health Organization Quality of Life Instrument-Older Adults Module.

Table 3. Comparison of the Tampa Scale of Kinesiophobia Score of the Participants According to Clinical Frailty Scale Score, Time after COVID-19, and Presence of Persistent Symptoms

Variables	Tampa Scale of Kinesiophobia Score	p	95% Confidence Interval	
			Lower	Upper
Clinical Frailty Scale Score				
Non-frail (n=43)	41.46 ± 7.04	**0.040**	-6.805	-0.164
Seemingly defenseless or frail (n=20)	44.95 ± 5.59			
Time after RT-PCR test (days)				
< 3 months (n=13)	43.53 ± 7.70	0.729	-9.296 -2.707 -4.810	10.123 7.403 5.601
3 - 6 months (n=8)	43.12 ± 10.96			
6 - 12 months (n=21)	41.19 ± 5.11			
> 12 months (n=21)	43.14 ± 5.92			
Persistent Post-COVID-19 Symptoms				
Yes (n=41)	44.29 ± 6.07	**0.008**	-8.499	-1.358
No (n=22)	36.00 ± 6.97			
Persistent Dyspnea				
Yes (n=33)	46.07 ± 5.02	**0.016**	-7.921	-0.912
No (n=30)	41.66 ± 6.97			
Joint pain				
Yes (n=22)	44.13 ± 6.10	0.164	-5.828	1.019
No (n=41)	41.73 ± 7.03			
Fatigue				
Yes (n=9)	44.00 ± 5.47	0.433	-6.121	2.787
No (n=54)	42.33 ± 6.98			

Note: Data are presented as mean ± standard deviation.
Abbreviations: RT-PCR: real-time reverse transcriptase-polymerase chain reaction.

Comparison of the Tampa Scale of Kinesiophobia score of the participants according to frailty, time after COVID-19, and presence of highly reported persistent symptoms (dyspnea, joint pain and fatigue) were shown in Table 3. The Tampa Scale of Kinesiophobia score was significantly higher in the participants seemingly defenseless or frail group than in the non-frail group (p = 0.040). No significant difference observed in the Tampa Scale of Kinesiophobia score between the subgroups separated by time after positive RT- PCR (p > 0.05). The Tampa Scale of Kinesiophobia score was also significantly higher in the participants with at least one persistent post-COVID-19 symptom than par-

Table 4. Comparison of the WHOQOL-OLD Score of the Participants According to Clinical Frailty Scale Score, Time after COVID-19, and Presence of Persistent Symptoms

Variables	WHOQOL-OLD Score	p	95% Confidence Interval	
			Lower	Upper
Clinical Frailty Scale Score				
Non-frail (n=43)	75,60 ± 8,93	0.111	-0.851	7.960
Seemingly defenseless or frail (n=20)	72,05 ± 7,63			
Time after RT-PCR test (days)				
< 3 months (n=13)	76,69 ± 8,31			
3 - 6 months (n=8)	72,50 ± 5,83	0.706	-2.290 -4.104	10.675 8.251
6 - 12 months (n=21)	74,61 ± 8,87		-3.426	9.382
> 12 months (n=21)	73,71 ± 9,70			
Persistent Post-COVID-19 Symptoms				
Yes (n=41)	74.54 ± 10.39	0.967	-5.017	5.230
No (n=22)	74.43 ± 7.68			
Persistent Dyspnea				
Yes (n=33)	74.23 ± 9.25	0.914	-5.662	6.280
No (n=30)	74.54 ± 8.57			
Joint pain				
Yes (n=22)	74.54 ± 7.81	0.962	-4.516	4.303
No (n=41)	74.43 ± 9.15			
Fatigue				
Yes (n=9)	70.44 ± 4.41	0.093	0.721	8.685
No (n=54)	75.14 ± 9.01			

Note: Data are presented as mean ± standard deviation.
Abbreviations: RT-PCR: real-time reverse transcriptase-polymerase chain reaction.

ticipants without persistent post-COVID-19 symptom (p = 0.008). Among participants with at least one persistent post-COVID-19 symptom, the Tampa Scale of Kinesiophobia score was significantly higher in those with persistent dyspnea compared with those without persistent dyspnea (p = 0.016). There was no significant difference in the Tampa Scale of Kinesiophobia score between the groups regarding to joint pain or fatigue (p > 0.05).

Table 4 showed the comparison of the WHOQOL-OLD score of the participants according to Clinical Frailty Scale score, time after COVID-19, and presence of at least one persistent post-COVID-19 symptom. There were no significant differences in WHOQOL-OLD score between any subgroups (p > 0.05).

DISCUSSION

In the present study, it has been shown that kinesiophobia was significantly higher in the seemingly defenseless or frail older adults compared to the non-frail older adults. In addition, seemingly defenseless or frail older adults were tend to report at least one persistent post-COVID-19 symptom compared to non-frails. Among the most common persistent post-COVID-19 symptoms, presence of joint pain and fatigue did not make a significant difference while the presence of persistent dyspnea increased the kinesiophobia.

Among the changes brought about by aging, the decrease in independence, physical activity and functional capacity, social isolation, and the increase in rates of morbidity and mortality due to all these are among the most challenging problems that individuals have to deal with (25). Frailty is defined as a syndrome that results in decreased

functionality and mobility, which may occur as a result of multiple factors including decline of muscle mass, physical activity, and performance in older adults (26). The COVID-19 pandemic has brought massive morbidity, mortality, and unprecedented problems all over the world, and older adults at high risk of developing serious complications after COVID-19 have been advised to follow strict isolation guidelines to minimize their risk during the pandemic (27). Mishra et al. compared the mobility before and during the pandemic and found that the practices during the pandemic significantly reduced the mobility of older adults (28). Since it is known that decreased mobility increases frailty (29), it is possible to say that there may be a relationship between decreased physical activity and increased frailty, although as far as we know there is no study that evaluating the frailty of older adults during the pandemic. The vicious cycle between decreased mobility and kinesiophobia is shown as one of the possible causes of higher kinesiophobia in older adults (30). In our study, the kinesiophobia score was found to be higher in the seemingly defenseless or frail participants compared to non-frail participants, in line with the relationship between frailty and kinesiophobia reported in the literature.

A new term, defined as Long-COVID, has emerged in COVID-19 patients, in which symptoms begin during the hospitalization period and continue even after 1 year (31). Consistent with the literature, more than half of the participants in our study had more than 6 months after COVID-19 and had persistent post-COVID-19 symptoms. In a prospective study, Wu et al. reported that despite the elapsed time in their evaluation at the 3rd, 6th, 9th, and 12th months in COVID-19 patients, there were persistent physiological and radiological changes and the symptoms continued (32). Our findings showed that the time after COVID-19 did not make any difference in kinesiophobia and quality of life. Since it is known that the persistent changes and symptoms caused by COVID-19 start in the early period and continue in the long term, we think that it is acceptable that the time after COVID-19 does not make a significant difference.

Previous studies have shown that pain has a direct relationship with kinesiophobia because it limits physical activity, functional capacity, and mobility (33, 34). Dyspnea and pain are defined as subjective experiences and multifactorial mechanisms are known to play a role in their occurrence (34). Considering that common cortical areas and nerve pathways are involved in the perception of pain and dyspnea, it can be said that the mechanism of dyspnea-related kinesiophobia is similar to the mechanisms of pain-related kinesiophobia (35). A limited number of studies have investigated the relationship between dyspnea and kinesiophobia in patients with COPD (14, 36) and patients with chronic respiratory diseases (37). Supporting the results of these studies showing that there is a strong relationship between dyspnea and kinesiophobia, the kinesiophobia score was found to be higher in participants with persistent dyspnea compared to participants without persistent dyspnea.

Considering the association of kinesiophobia with age-related morphological changes and also its association with symptoms such as dyspnea and pain, it is very difficult to determine the main factors causing kinesiophobia. Larsson et al. found that the kinesiophobia score was high in individuals over the age of 65 with only pain, and the kinesiophobia score was low in individuals over the age of 65 without pain (38). In addition, the authors reported that the kinesiophobia score did not change in individuals over the age of 65 who had no pain at 12-month follow-up. As a result, they stated that kinesiophobia may have been associated with pain rather than age-related physiological changes. In a study by Kocjan and Knapik, the effect of determining factors such as age, gender, health status, and psychological status on the level of kinesiophobia in young-old adults was examined and it was shown that psychological factors have a greater effect on kinesiophobia than biological factors (39). In accordance with the literature, the relationship between kinesiophobia and factors such as dyspnea and pain was shown in older adults in our study. Although the majority of the individuals included in the study had mild COVID-19, persistent post-COVID-19 symptoms may have played a larger role in kinesiophobia than age-related factors.

Recent 2 meta-analyses reviewed studies showing a negative relationship between frailty and quality of life in older adults (40, 41). The authors

stated that there were results showing that frailty and quality of life were associated in the studies which were included the meta-analyses, however, the mechanisms of this association could not be explained. In addition, it has been reported that poor quality of life in the frail older adults may be associated with a history of frequent falls, reduced functional capacity and muscle strength, and lack of family support (40). In the results of our study, unlike the literature, there was no difference between the quality of life in frail and non-frail participants. One of the weaknesses of our study, but the nature of our methodology, which prevents us from discussing the reasons for the similar quality of life as the failure to assess the participants' fall, functional capacity, strength, and family support.

Garrigues et al., assessed the quality of life of 120 older adults with COVID-19 whose symptoms persisted after 100 days or more after discharge and stated that the most common symptoms were dyspnea and fatigue. The authors found that despite the persistent symptoms, the patients' quality of life did not deteriorate, and the majority of patients were able to return to work and professional activities (42). In a meta-analysis on quality of life with post-acute COVID-19 syndrome, the participants of the included studies consisted of older adults with a mean age of 58.75 years. The reviewed studies also showed that the most common persistent symptoms were fatigue and dyspnea. The authors stated that the quality of life deteriorated mostly in patients with a history of intensive care, and stated that low quality of life was mostly associated with pain, anxiety, depression and mobility. However, they also reported that there was no certain result due to the insufficient evidence (43). Similarly, in our study, the most common persistent symptoms were dyspnea and fatigue, and there was no difference in quality of life participants with persistent symptoms compared to participants without persistent symptoms. Our results may be related to the fact that none of our participants had a history of intensive care, very few of them had a history of hospitalization, and the length of hospital stay was relatively low.

There are some limitations and future recommendations to this study. Considering that kinesiophobia is mostly associated with mobility and physical activity, and quality of life is mostly associated with anxiety and depression, the absence of these assessments in our study is one of our limitations. Another limitation of the present study is that when the participants were divided into two groups as frail and non-frail, the number of people in the groups was not relatively close to each other. Another important limitation is that the majority of the individuals included in our study had mild COVID-19 and the number of individuals with moderate and severe COVID-19 was small. For all these reasons, we think that comparing the sub-groups with more equal numbers and evaluating mobility, anxiety, and depression in future studies may add a different perspective to the results. In addition, future studies that include individuals with moderate and severe COVID-19 will be beneficial for generating results.

In conclusion, the results of our study showed that frailty, persistent post-COVID-19 symptoms and persistent dyspnea among these symptoms are factors that increase kinesiophobia in older adults with COVID-19. The fact that the time after COVID-19 did not make a difference shows that it is important to evaluate the presence of persistent COVID-19 symptoms and the kinesiophobia in both the early and late periods of the older adults.

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Conflict of Interest: The authors report no conflict of interest.

Ethical Approval: This study protocol was approved by the Ethical approval was obtained from Ethical Committee of Biruni University (Protocol Number 2022/68-16) and required permission were got from Turkish Ministry of Health.

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EXPERIENCES OF PHYSICAL THERAPISTS WORKING IN NEUROLOGICAL REHABILITATION DURING COVID-19

ORIGINAL ARTICLE

ABSTRACT

Purpose: The study aimed to identify the experiences of physical therapists working in neurological rehabilitation during the COVID-19 process.

Methods: The draft survey was created by two physical therapists working in the field of neurological rehabilitation, and Lawshe method was used to assess its content validity. The survey included demographic information and questions regarding clinical practice, and psychological states. The final survey was administered via Google forms. Only physical therapists working in the field of neurology were involved in the study.

Results: The content validity ratio of the draft survey was found to be 0.745. According to this survey, the number of patients per week decreased significantly during the first 3 months and normalization process ($p<0.01$). Usage of tele-health applications significantly increased during the pandemic/normalization period ($p<0.01$). The mean score of physical therapists' anxiety about their family's health was 7.72±2.39 (min=0, max=10). The study showed that working conditions changed, number of patients decreased ($p<0.01$), some precautions were taken, and the use of tele-health applications increased in clinics during pandemic period ($p<0.01$).

Conclusion: The COVID-19 pandemic has had a significant impact on neurological rehabilitation services according to this study. As a result, methods to provide the most appropriate treatment without endangering patients and physiotherapists and policies to be followed in extraordinary situations need to be developed.

Keywords: COVID-19, Experience, Neurorehabilitation, Pandemic, Physical Therapy

NÖROLOJİK REHABİLİTASYON ALANINDA ÇALIŞAN FİZYOTERAPİSTLERİN COVİD-19 SÜRECİNDEKİ DENEYİMLERİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışma, nörolojik rehabilitasyon alanında çalışan fizyoterapistlerin COVID-19 sürecindeki deneyimlerini belirlemek amacıyla yapılmıştır.

Yöntemler: Taslak anket nörolojik rehabilitasyon alanında çalışan iki fizyoterapist tarafından oluşturuldu ve bu oluşturulan taslak anketin kapsam geçerliliğini değerlendirmek için Lawshe yöntemi kullanıldı. Anket, demografik bilgi, klinik uygulama ve psikolojik durumları talep eden soruları içeriyordu. Son olarak oluşturulan anket Google formlar aracılığıyla uygulandı. Çalışmaya sadece nöroloji alanında çalışan fizyoterapistler dahil edildi.

Sonuç: Taslak anketin kapsam geçerlilik oranı 0,745 olarak bulundu. Anket sonuçlarına göre haftalık hasta sayısı ilk 3 ayda ve normalleşme sürecinde istatistiksel olarak anlamlı şekilde azaldı ($p<0,01$). Pandemi/normalleşme döneminde tele-sağlık uygulamalarının kullanımı önemli ölçüde arttı ($p<0,01$). Ailelerinin sağlığı ile ilgili ortalama kaygı puanı 7,72±2,39 (min=0, maks=10) idi. Çalışma, pandemi döneminde çalışma koşullarının değiştiğini, hasta sayısının azaldığını, bazı önlemlerin alındığını ve tele-sağlık uygulamalarının kullanımının arttığını gösterdi.

Tartışma: Bu çalışmaya göre COVID-19 pandemisinin nörolojik rehabilitasyon hizmetleri üzerinde önemli bir etkisi olmuştur. Sonuç olarak, hastaları ve fizyoterapistleri tehlikeye atmadan en doğru tedaviyi sunma yöntemlerinin ve olağan dışı durumlarda izlenecek politikaların geliştirilmesi gerekmektedir.

Anahtar Kelimeler: COVID-19, Deneyim, Nörorehabilitasyon, Pandemi, Fizyoterapi

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INTRODUCTION

The novel coronavirus disease (COVID-19) is a contagious disease that causes severe acute respiratory syndrome (1). The World Health Organization (WHO) officially declared the global COVID-19 outbreak a pandemic on March 11, 2020 due to the virus's frightening rate of spread and the severity of its symptoms (2). Various precautions and restrictions have been implemented around the world to minimize the risk of transmission of virus, which is transmitted through close contact and droplets (3).

The COVID-19 pandemic has affected many areas. The healthcare system is one of the fields most affected by the COVID-19 pandemic. Hospital capacities and service delivery have been inadequate with the increase in the number of infected people (4). Therefore, the delivery of healthcare to patients with non-emergency problems has been minimized to reduce the overburden on healthcare institutions and the workload of health personnel (5).

Physical therapists are among the healthcare professionals affected by the COVID-19 pandemic. They perform different treatment methods including respiratory physical therapy, passive and active mobilization, strengthening training, airway clearance technique training, and positioning and exercise training in the course of various severity levels of the disease (6, 7). In addition, physical therapists continue to work in clinics on site and/or remotely during the pandemic. There have been changes in both the professional and personal lives of physical therapists with the COVID-19 pandemic.

Neurological rehabilitation is an active, dynamic process designed to help individuals with neurological diseases acquire knowledge and skills that will minimize their physical, physiological, and social limitations. Physical therapists evaluate and record the patient's current condition in terms of body structure and function, activity, and participation and determine rehabilitation goals within the framework of personal and environmental factors (8). Positive effects on recovery have been obtained with effective rehabilitation in the early stages of neurological disease (9). Early rehabilitation is especially important because it can minimize the patient's severity of disability (10-12).

In addition to the early initiation of neurological rehabilitation, continuity, follow-up, and effectiveness are very important (10, 11, 13). Physical therapists working in the field of neurological rehabilitation continued to work actively during the COVID-19 pandemic. Therefore, they are among the groups affected by the changes caused by the pandemic conditions (14, 15), and also affected by the changes in the health system during the pandemic. Therefore, the aim of this study was to determine the experiences of physical therapists working in the field of neurological rehabilitation during the COVID-19 process, and to compare their clinical practice and psychological state in the pandemic period with the pre-pandemic period. The hypothesis of the study is that the clinical practice and psychological state of physical therapists working in the field of neurological rehabilitation are changed during the COVID-19 compared to pre-pandemic period.

METHODS

Design

This online cross-sectional survey study was conducted at Hacettepe University, Faculty of Physical Therapy and Rehabilitation between January and May 2021. The Non-interventional Clinical Research Ethics Board was approved the study protocol (Approval Number = GO21/28).

The study has two stages including designing a survey and online application of the survey to the physical therapists working in the neurological rehabilitation.

Participants

Responses from physical therapists who were (i) working in neurological rehabilitation services at least one year, (ii) having worked in the pre-pandemic period, (iii) working during the pandemic period and (iv) consenting to participate in the study were included.

A post-hoc power analysis performed by using the G*Power Version 3.1.9.6. It was found that the sample size of 107 physical therapists has 99% statistical power with α=0.05 and 0.502 effect size according to the change in the number of patients among the pandemic period, in the first three months of pandemic period and during the pandemic normalization periods.

Outcome measures

An initial draft survey was created by two physical therapists working in the field of neurological rehabilitation services based on literature review and their clinical experiences. The survey had three main domains consisting of the demographic information of physical therapists (7 questions), information about clinical practice (42 questions), and information about the psychological state of physical therapists (6 questions).

An expert-panel approach was used to determine the content validity of the draft survey. Eleven physical therapists with expertise in neurological rehabilitation that were blind to the survey participated as expert panel members. First, the aim of the study was explained, and the survey was introduced to them. Then, each expert was asked to score each question individually as 'Appropriate', 'Appropriate but should be corrected' or 'Should be removed'. The Lawshe method was used to assess the content validity of this draft survey (16). The content validity ratio was calculated according to the formula below. The content validity ratio was taken as a minimum of 0.636 for 11 experts at the p=0.05 significance level (17).

CVR = [NA / (N/2)] - 1

CVR = Content validity ratio

NA = Number of experts who scored as 'Appropriate'

N = Total number of experts

The final survey with an invitation text including the purpose of the study and describing the required participant characteristics was sent electronically to the physical therapists via the e-mail network of the Turkish Physiotherapy Association. The informed consent was provided when the physical therapists clicked the start button of the survey.

The survey included questions including (i) demographic information, (ii) clinical practice and (iii) psychological states of physical therapists. It took to complete the form approximately 15 minutes. The pre-pandemic period in the questions describes the period 'before 11 March 2020', the pandemic period '11 March - 1 June 2020' and the normalization period 'from 1 June 2020 to the present'.

In the demographic information part, there were 5 questions including the type and place of institution, duration of working experience and presence of any chronic disease.

In the clinical practice part, there were 38 questions related to the status of their clinics (changes in working conditions, number of physical therapists and COVID-19 transmission situations), the number of patients per periods, the precautions (screening procedures, protective equipment, usage of institution-specific directives, usage of any guideline), practices related to evaluation and rehabilitation, and tele-health practices during pandemic period (tele-health method, duration, frequency, difficulties, facilities, etc).

In the psychological state part, there were 5 questions. The level of anxiety about their own and their families' health, and their sleep status during the pandemic period were questioned.

Statistical analysis

The SPSS for Windows version 22 software made in Armonk, New York, USA (IBM Corporation) was used for statistical analysis. The visual (histograms, probability plots) and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk's test) were used to determine whether the assessed parameters were normally distributed. Descriptive statistics were calculated as a number/percent for qualitative data, and mean, standard deviation, minimum and maximum values for quantitative data. Friedman test was conducted to test whether there is a significant change in the clinical practice before pandemic period, in the first three months of pandemic period and normalization period. The McNamar's test was used to compare the change in using tele-health applications between before and during pandemic. A p value of less than 0.05 was considered to show a statistically significant result.

RESULTS

The content validity ratio was found to be 0.745 as sufficient, and the final survey included 48 questions after the adjustments made in line with the expert opinions. A total of 107 physical therapists who were working in the neurological rehabilitation services were included in the study. A percentage of 54.2 (n = 58) of the physical therapists have attended from the capital city of Turkey, Ankara. Answers were collected from 20 different provinc-

Table 1. The Descriptive Information Related to the Physical Therapists.

	N	%
City		
Ankara	58	54.21
İstanbul	12	11.21
Others (18 Different Cities)	37	34.68
Institution		
Special Education Center	29	27.10
University Hospital	22	20.56
Private Physical Therapy and Rehabilitation Center	16	14.95
Training And Research Hospital	14	13.08
Private Hospital	13	12.15
Public Hospital	10	9.35
Others	3	2.80
Presence of Chronic Disease		
No Chronic Disease	87	81.31
Chronic Respiratory Diseases	7	6.54
Diabetes	3	2.80
Oncological Diseases	1	0.94
Others	9	8.41

es. A percentage of 27.1 (n = 29) of the physical therapists were working in special education centres. Most of the physical therapists had no chronic diseases (n = 87, 81.3%). The mean professional experience was 8.29 ± 7.79 years (min = 1, max = 30), and the mean experience in neurological rehabilitation was 6.93 ± 6.86 years (min = 1, max = 30). Table 1 represents the descriptive information related to the physical therapists.

In the first 3 months from the start of the pandemic period, 46.73% (n = 50) of the institutions were closed. During the normalization period, 73.83% (n = 79) started working face-to-face. Most institutions employed new physical therapists (n = 82, 76.64%). The mean number of physical therapists was 6.86 ± 7.48 (min=1, max=50), and the mean number of physical therapists who were infected with COVID-19 was 1.08 ± 2.07 (min=0, max=12). A percentage of 26.17 (n=28) of the physical therapists were infected with COVID-19, and 35.71%

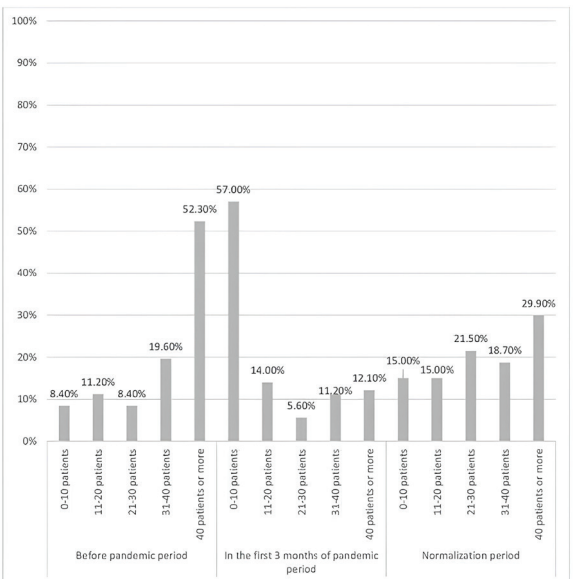

Figure 1. Change in number of patients

Table 2. Status of the Clinic

Pandemic Period	**N**	**%**
Completely Closed	50	46.73
Worked With Flexible Working Hours	38	35.51
Worked Face to Face	13	12.15
Worked Remotely (Online Methods)	6	5.61
Normalization Period		
Completely Closed	2	1.87
Worked with Flexible Working Hours	22	20.56
Worked Face to Face	79	73.83
Worked Remotely (Online Methods)	4	3.74
Physical Therapy Team Exchange		
New Physical Therapists Joined (Team Expanded)	82	76.64
Continued with the Same Team	11	10.28
Fired Physical Therapists (Team Downsized)	10	9.35
Included in the Filiation Team	9	8.41
Being COVID-19 And Potential Cause of Transmission		
No Transmission	79	73.83
Family Member	10	9.35
Patient Contact	6	5.61
Not Known	10	9.35
Other	2	1.87

Table 3. The Information Related to Precautions

Screening Procedures	**N**	**%**
Temperature Check	90	84.11
Risk Assessment With Anamnesis	36	33.64
Covid-19 Custom App Code Control	31	28.97
Nasopharyngeal Swab Test	10	9.35
Saturation Measurement	9	8.41
Precautions During Evaluation and Rehabilitation		
Surgical Mask	107	100
Gloves	76	71.03
Face Shield	55	51.40
Standard Gown	39	36.45
Overshoe Covers	17	15.89
FFP3 Mask	13	12.15
Glasses	12	11.21
Water Resistant Gown	4	3.74
Institution-Spesific COVID-19 Directive		
Developed and Implemented	72	67.29
Developed but not Implemented	19	17.76
Do not Developed	16	14.95
Social Distancing Rule in the İnstitution		
Yes, It's Very Carefully Observed.	16	14.95
Yes, but It is Sometimes Overlooked.	54	50.47
Yes, but It is Often Overlooked	24	22.43
No, It is not Obeyed	13	12.15
Followed Information Guide		
None	26	24.30
Ministry of Health Guidelines	65	60.75
World Health Organization Guidelines	27	25.23
Free Guidelines	12	11.21
World Confederation for Physical Therapy Guidelines	9	8.41

(n=10) stated their family members as the potential cause of transmission (Table 2). Considering the number of patients in the clinics, the number of patients per week decreased statistically significant in the first 3 months and normalization process compared to the pre-pandemic period ($p < 0.01$) (Figure 1).

The information related to precautions during the pandemic period is given in Table 3. The most frequently used screening procedure in acceptance of the patients to the institutions was temperature measurement (n=90, 84.11%), and mostly used precautions taken during patient admission were surgical mask (n=107, 100%) and gloves (n=76, 71.03%). Supply of hygiene equipment increased in 70.10% (n=75) of the institutions. It was stated that there was an increase in the amount of daily hand washing in 94.39% (n=101) of the physical therapists, the amount of weekly bathing in 57.94% (n=62), the frequency of hand washing after coughing, rubbing the nose and sneezing in 85.98% (n=92) and the frequency of hand washing after object contact in 91.59% (n=98). A percentage of 53.27 (n=57) of the physical therapists stated that they needed training to perform risk assessment, and 61.68% (n=66) needed training on infection transmission precautions. The responses of the physical therapists regarding the changes in patient evaluation and rehabilitation are summarized in Figure 2. A percentage of 10.28 (n = 11) of the institutions had a special physical therapy team for COVID-19, and 32.71% (n = 35) of the participants stated that either they or their colleagues have applied treatment to a COVID-19 patient.

While 14.95% (n = 16) of the participants used telehealth applications before the pandemic, 32.71%

Table 4. The Information Related to Tele-Health Applications

Tele-Health Method	N	%
Telephone	27	77.14
Online Connection (i.e.; Skype, Zoom, Facetime)	25	71.43
Hospital System	1	2.86
Duration of Tele-Health Session		
0-10 Minute	10	28.57
10-20 Minute	8	22.86
20-30 Minute	5	14.29
30 Minutes and Above	12	34.29
Frequency of Re-Check Patients		
Every 1-3 Days	6	17.14
Every 3-5 Days	12	34.29
Every 5-7 Days	5	14.29
7 Days or More	12	34.29
Shared Material Types		
Video	19	54.29
Audio	14	40.00
Written Material	12	34.29
Application Link	12	34.29
None	8	22.86
Challenges in Tele-Health		
No Difficulties	8	22.86
Internet Connection	17	48.57
Compliance with Physical Examination	17	48.57
Technological Device Access/Use İssues	15	42.86
Communication Problems	14	40.00
Difficulty in Applicability	9	25.71
Billing İssues	1	2.86
Foreign Language Barrier	0	0
Challenges in Tele-Health		
High Accessibility	26	74.29
Patient Safety	20	57.14
Expert Safety	15	42.86
Helping More Patients	11	31.43
Psychological Support	8	22.86
Using A Standardized Protocol	3	8.57

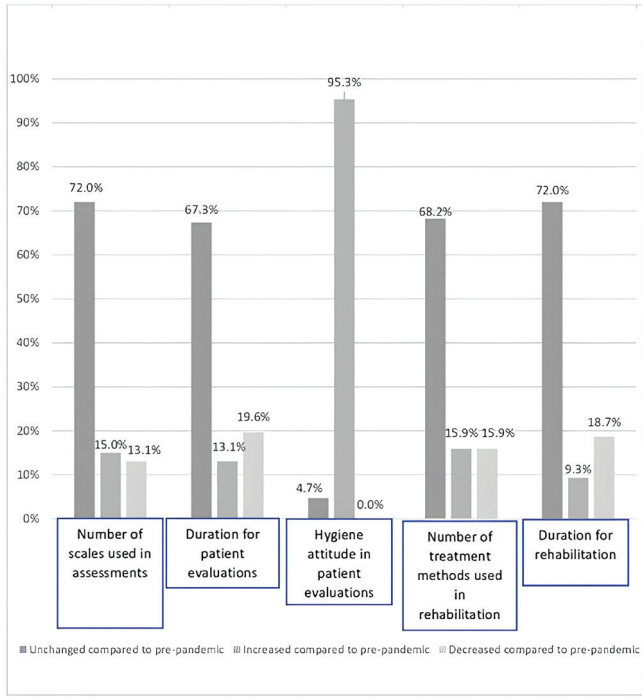

Figure 2. Changes in patient assessment and rehabilitation compared to pre-pandemic

(n = 35) of the physical therapists started to use tele-health applications during the pandemic/normalization period (p <0.01). The information about the physical therapists who have used tele-health application is given in the Table 4. The mean trust level of the physical therapists in the evaluations made with the tele-health applications was 6.00 ± 2.38 (min=1, max=10), the mean trust in the treatment recommendations was 6.74 ± 2.42 (min=2, max=10), and the mean of the recommending the use of tele-health applications in neurological rehabilitation was 6.34 ± 3.00 (min=0, max=10).

A percentage of 58.88 (n=63) of the physical therapists were worried for their families, 44.86% (n=48) were worried about being carriers, 39.25% (n=42) were worried about getting sick and 26.17% (n=28) were worried about social unrest. The mean anxiety level of the physical therapists about their own health was 4.36 ± 2.42 (min=0, max=10), and the mean anxiety about their family's health was 7.72 ± 2.39 (min=0, max=10). The mean anxiety about working during the pandemic period was 6.78 ± 2.50 (min=0, max=10), and the mean amount of experiencing sleep problems during the pandemic period was 2.07 ± 2.54 (min=0, max=10).

DISCUSSION

Healthcare systems worldwide underwent major changes due to the COVID-19 pandemic (18). The healthcare system focuses on patients with COVID-19; therefore, other areas have been negatively affected, including neurological rehabilitation. However, early rehabilitation in neurological disorders is very important to minimize the severity of disability (9). Therefore, it is important to define the changes in these clinics and determine best practices for taking precautions while improving service delivery. The current study shows that there has been a decrease in the number of patients, an increase in hygiene measures and an increase in the use of tele-health applications with the pandemic. In addition, this study shows that physical therapists were particularly concerned about their families' health.

The most notable findings in this study are the significant changes in working conditions and patient numbers. Most institutions were completely or partially closed, especially in the first 3 months of the pandemic. During the normalization period, most institutions returned to face-to-face working. In parallel with this, the number of patients in clinics has decreased. These results are supported by

research (19-22). In a study examining dental hospitals in China, it was reported that non-emergency patients were not treated at the beginning of the pandemic, and 9/10th of dental services were delivered using a web-based system (19). A study conducted in the USA reported a 32% decrease inpatient admissions in the first 3 months, which later increased (20). In another study conducted in Turkey, it was observed that the number of admissions to the Physical Medicine and Rehabilitation Polyclinic decreased at the beginning of the pandemic (21). A study conducted in European countries, including Italy, France, and Germany reported that the number of patients in stroke care units decreased considerably during the pandemic period (22). They concluded that stroke patients may be adversely affected by this situation. Decreases in the admission of neurological patients due to COVID-19-related precautions have prevented individuals with chronic diseases from attaining neurological rehabilitation services. This may lead to negative consequences, such as an unmanageable increase in the demand for neurology clinics in the future, and continued inability to access neurological rehabilitation services. In pandemic situations, it is very important for both patients and physical therapists to emerge with minimal damage. Therefore, it is important to define the roles of physical therapists working in the field of neurology in emergency situations like pandemics in order to regulate the working conditions of clinics and to plan appropriate strategies.

Many countries have permitted the reopening of centers that require one-on-one contact, such as dental clinics, physical therapy centers, and aesthetic centers, as long as they strictly adhere to infection control guidelines (23). According to our study, some screening procedures were followed before patient admission, and temperature check was reported with a percentage of 84.1 as recommended. A temperature check is usually performed with hand-held, non-contact thermometers. However, temperature assessment may not be sufficient to identify COVID-19 carriers who are taking paracetamol to reduce fever prior to treatment or those who do not have a fever (24). In addition, most institutions developed institution-specific COVID-19 directives, and there has been an increase in provision of hygiene equipment, which suggests that institutions are prioritizing the health of both patients and their employees.

Physical therapists stated that most frequently used equipment was surgical masks (100%) and gloves in clinical settings, and there was an increase in personal hygiene precautions including frequency of hand washing and weekly bathing. These results were found to be in accordance with the published guidelines (23, 25). The majority of physical therapists reported that they followed various informational guidelines specific to COVID-19, which showed that physical therapists working in neurological rehabilitation had a high awareness of the need for hygiene. One remarkable finding is that although they paid great attention to their personal hygiene in practice, they reported that they needed training on risk assessment and transmission precautions, and they felt inadequate in this regard.

Physical therapists generally complied with social distance in the working environment, but the rate of complete compliance was very low. The possible reasons were (i) inability to quit habits immediately, (ii) probability of clinics being small, (iii) the necessity of close contact in performing neurological rehabilitation, (iv) since the rehabilitation team does not only consist of physical therapists. Similarly, in a study conducted in England, it was reported that the majority of the participants did not fully comply with the social distance rules (26). However, it is known that maintaining social distance reduces the spread of the virus (27). This result highlights the necessity of planning social distance rules in neurological rehabilitation clinics. Therefore, it is necessary to focus on raising awareness and improving behaviour on this issue.

Telehealth has allowed health care professionals to evaluate, diagnose, and treat patients, thereby its usage is widespread (28). The popularity of telehealth applications has considerably increased due to the COVID-19 pandemic (29). Similarly, the use of tele-health applications in neurological rehabilitation has increased during the pandemic period according to our study. A review of patients with neurological disease found a significant effect in favour of telerehabilitation compared to face-to-face rehabilitation (30). Intensive treatment programs were required in neurological diseases (31),

and this may not always be possible due to time constraints in face-to-face treatments. Therefore, it can be concluded that the use of tele-health applications in neurological rehabilitation would become more widespread in the future, and clinicians should be more informed about this issue. However, confidence of physical therapists in telehealth applications were slightly above the average, which shows that trust of physical therapists in telehealth practices in neurological rehabilitation is not enough. Although accessibility, patient and specialist safety are high, difficulties such as compliance problems with physical examination and internet connection problems may have led to this result. Similarly, in a study conducted with physical therapists working in the field of neurology, they stated that they encountered certain obstacles during tele-rehabilitation practices and concluded that tele-rehabilitation practices needed to be strengthened (32). In addition, technologies used in some telehealth applications including more comprehensive sensors and devices can be expensive and require training (30). The confidence of physical therapists working in the neurological rehabilitation on tele-health applications could be increased by improving the internet infrastructure, creating close treatment protocols with physical examination, training on transferring tele-health applications to the clinical practice.

In this current study, the anxiety levels of physical therapists were also questioned. It has been found that physical therapists working in neurology had high concerns about their families and their own health during the COVID-19 process. It has also been observed that working during pandemic period negatively affected the psychological state of physical therapists. This is a highly anticipated situation during the pandemic period. Various negative psychological effects including burnout syndrome, decreased tolerance, psychological fatigue, anxiety, depression, and post-traumatic stress disorder have been reported in health professionals during the pandemic process (33-35). Similar to our results, it was stated that the physical therapists working in Nigeria were negatively affected during the pandemic process (36). Similarly, in a study conducted on nurses in China, a significant relationship was found between the fear of disease transmission to family members and the level of stress (37). It is more important to prevent psychological problems compared to provide treatment during this process (38). Studies conducted in health professionals provide recommendations for the protection of mental health. Some suggestions include resolving housing and transportation issues to reduce the fear of spreading the disease to family members, organizing motivating activities such as regular praise and rewards, arranging working hours, not keeping risky health professionals at the forefront, organizing trainings and psychological support conversations, and providing update trainings (36, 39). Implementing such recommendations is also important for protecting the mental health of physical therapists who are actively working.

Although this study had a sufficient number of physical therapists, it is thought that the results can be strengthened with the participation of more physical therapists, including the whole country, and studies that reveal the differences between institutions. In addition, the study may not adequately reflect the experience of physical therapists in other parts of the world during the COVID-19 pandemic, as the physical therapist's profession and legal situations may vary from country to country.

The current study defines the status and procedures followed in neurological rehabilitation services during the COVID-19 pandemic. It was found that working conditions changed, number of patients decreased, some precautions have been taken, and the use of tele-health applications increased throughout pandemic period. Also, it has been found that physical therapists working during the pandemic period have high concerns about their families and their own health, which negatively affects their psychological state. It can be concluded that there is a need for more attention related to clinical and/or individual precautions, developing most accurate ways of accessing the treatment without risking the health of the patient and physical therapists, the creation of policies to be followed in extraordinary situations considering also psychological states of healthcare professionals, and the development of special tele-health practices for neurological rehabilitation.

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THE RELATIONSHIP BETWEEN PES PLANUS SEVERITY AND LOWER EXTREMITY FUNCTIONAL PERFORMANCE IN YOUNG ADULTS

ORIGINAL ARTICLE

ABSTRACT

Purpose: To examine the relationship between pes planus severity and lower extremity functional performance in young adults with pes planus.

Methods: Volunteers with asymptomatic flexible pes planus aged between 18-25 years were included, and 53 (32 Females) individuals with a mean age of 20.19±1.93 years were evaluated in this study. Navicular drop (ND) test was used to decide the presence and severity of pes planus. Balance and jump tests were used for assessing lower extremity functional performance. Balance performance was evaluated with the Y balance test and jump performance was evaluated with the single leg jump test (SLJ) using the Opto Jump system (Microgate, Bolzano, Italy).

Results: On the dominant side, a negative and weak correlation was found between ND values and balance results in anterior and posteromedial directions (p=0.014; r=-0.336, p=0.046; r=-0.276, respectively). On the non-dominant side, a negative and weak correlation was found between ND values and balance results in the anterior direction (p=0.040; r=-0.284). There was no correlation between ND values and SLJ heights in both extremities (p>0.05).

Conclusions: In young adults with asymptomatic flexible pes planus, insufficient dynamic balance performance was observed as the severity of pes planus increased, but the severity of pes planus did not affect vertical jump distance. This result suggests that interventions for pes planus severity may also have an effect on balance performance.

Key Words: Flat Foot, Physical Performance, Postural Balance

GENÇ YETİŞKİNLERDE PES PLANUS ŞİDDETİ İLE ALT EKSTREMİTE FONKSİYONEL PERFORMANSI ARASINDAKİ İLİŞKİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Pes planuslu genç erişkinlerde pes planus şiddeti ile alt ekstremite fonksiyonel performansı arasındaki ilişkiyi incelemektir.

Yöntem: Çalışmaya 18-25 yaş aralığında, asemptomatik esnek pes planusu olan gönüllüler dahil edildi. Çalışmamıza 20,19±1,93 yaş ortalamasına sahip 53 (32 Kadın) birey katıldı. Pes planus varlığını ve şiddetini belirlemek için naviküler düşme (ND) testi kullanıldı. Alt ekstremite fonksiyonel performansı için denge ve sıçrama testleri seçildi. Denge performansı Y balans denge testi ile, sıçrama performansı ise OptoJump sistemi kullanılarak tek ayak sıçrama testi (TAS) ile değerlendirildi.

Sonuçlar: Dominant tarafta ND değerleri ile anterior ve posteriomedial yönde denge sonuçları arasında negatif yönlü zayıf derecede bir korelasyon bulundu (sırasıyla p=0,014; r=-0,336, p=0,046; r=-0,276). Nondominant tarafta ise ND değerleri ile anterior yönde denge sonuçları arasında negatif yönde zayıf derecede bir ilişki bulundu (p=0,040; r=-0,284). Her iki ekstremitede de ND değerleri ile TAS yükseklikleri arasında anlamlı bir ilişkiye rastlanmadı (p>0,05).

Tartışma: Asemptomatik esnek pes planuslu genç erişkinlerde pes planus şiddeti arttıkça yetersiz dinamik denge performansı gözlendi, ancak pes planus şiddeti dikey sıçrama mesafesini etkilemedi. Bu sonuç pes planus şiddetine yönelik uygulamaların denge performansı üzerinde de etkili olabileceğini düşündürmektedir.

Anahtar Kelimeler: Düz Taban, Fiziksel Performans, Postural Denge

INTRODUCTION

Pes Planus is a frequent foot deformity. This deformity is defined as the loss of height of the medial longitudinal arch (MLA) with forefoot abduction and hindfoot valgus while transferring body weight. (1, 2). The prevalence of pes planus in young adults is % 11.25 (3). The most important problem accompanying pes planus is inordinate pronation of the foot in standing and walking. Flattening of the MLA, increased foot pronation, and decreased plantar flexion muscle strength seen in pes planus cause increased plantar pressure on the medial side of the foot (4). This change in plantar pressure affects the person's functional performance by changing the alignment and loading in all body segments through the kinetic chain (5). Pes planus also causes excessive stress and compressive shear forces in the knee joint, and internal rotation in the hip joint due to impaired load transfer in the foot and ankle joints during walking (5-7).

Balance is a postural adaptation skill that keeps the center of gravity within the support surface during function or resting state (8). Especially when providing balance on one foot, the foot, which is the extreme segment of the lower extremity, forms the support surface. It is thought that biomechanical changes in the support surface may affect postural control, therefore changes in MLA may also affect balance performance (9). In the literature, there are studies showing that the support surface increases in individuals with pes planus, but this change in foot posture negatively affects postural stability and balance ability (4, 6, 10, 11).

Vertical jump height is an evaluation method used in many sports that gives information about lower extremity strength, neuromuscular fatigue and jump performance (12). A physiological process including the neuromuscular system and biomechanical conditions are effective in jumping performance (13). When individuals with pes planus and normal foot structure were compared during vertical jump, significant differences were found in plantar pressure and lower extremity kinematics in individuals with pes planus (14). Neuromuscular coordination is required during the vertical jump, involving the foot-ankle, knee, hip joints, and trunk muscles. In addition, it is known that the muscles around the foot and ankle are closely related to the thrust in the jump function. It has been shown that it affects foot plantar flexor and dorsiflexor muscles strength values and, accordingly, jump heights in individuals with pes planus (15). In addition, in a study conducted on gymnasts, it was found that the activation of the gastrocnemius medialis and soleus muscles during the vertical jump was lower in those with pes planus compared to the normal arch structure (13).

In many studies in the literature, the negative effects of pes planus on lower extremity physical performance have been reported. (4, 16, 17). However, revealing the effect of pes planus severity on performance in individuals with pes planus may guide in determining the risk factors of inadequate lower extremity performance in these individuals. In addition, knowing this relationship is important in terms of considering performance-oriented approaches in the evaluation and treatment of these individuals. We conducted our study with the assumption that lower extremity functional performance will decline with an increase in the amount of navicular drop (ND) in young adults with flexible asymptomatic pes planus. The aim of this study is to examine the relationship between pes planus severity and balance and jump performance.

METHODS

Participants and Design

This study is a cross-sectional study. This research was carried out in Alanya Alaaddin Keykubat University Vocational School of Health Services Department of Therapy and Rehabilitation to examine the relationship between pes planus severity and lower extremity functional performance in individuals with bilateral asymptomatic flexible pes planus between January 2020 and April 2021. The Clinical Research Ethics Committee of Alanya Alaaddin Keykubat University approved this study (10354421-2020/15-04). The study was accomplished in accordance with the Declaration of Helsinki. All individuals participating in the research were informed verbally and in writing about the purpose, scope and duration of the research. An "Informed Consent Form" was obtained from the

individuals, indicating that they voluntarily agreed to participate in the study.

In the present study, volunteers with asymptomatic flexible pes planus aged 18-25 years, a body mass index (BMI) of 18.5-30 kg/m², ND values of 10 mm and above for both extremities, and a positive Jack's finger test (18) were included. Exclusion criteria were having symptoms such as pain and fatigue in the foot-ankle during activities of daily living, a neurological or orthopedic disease affecting the lower extremity, a history of trauma or surgery in the foot-ankle, and leg length discrepancy of more than 1 centimeter (cm), and being involved in any amateur or professional sports.

The demographic information and physical characteristics of the individuals (such as age, weight, height, gender) were recorded. The dominant leg was determined by questioning which leg the individuals used to kick the ball (19).

Within the scope of our study, 248 young adult individuals were evaluated for the presence of pes planus. It was determined that the amount of ND in 74 individuals was 10 mm or more on both feet and they had flexible pes planus according to Jack's finger lift test. Of these, 11 participants were excluded because they did not meet the other inclusion criteria, 6 participants had complaints of pain, and 4 participants did not want to participate in the study. Our study was completed with a total of 53 individuals, 21 men and 32 women (Figure 1).

Navicular Drop (ND) Test

The ND value is obtained by subtracting the navicular height measured by placing weight on the foot while standing, from the navicular height measured without weighting the foot while sitting (20, 21). These obtained values give information about the height of the MLA in the sagittal plane. If the amount of ND is 10 mm or more, it is considered pes planus (22). For the ND test in our study, the volunteers were seated with their hips and knees at 90°, and the ankle joint was placed in a subtalar neutral position. The navicular tubercle was identified and marked by palpating approximately 2.5 cm anterior-inferior to the medial malleolus (23). The height of the navicular tubercle relative to the ground was measured. The same measurement was made while standing with equal body weight transferred to both feet. Individuals with a differ-

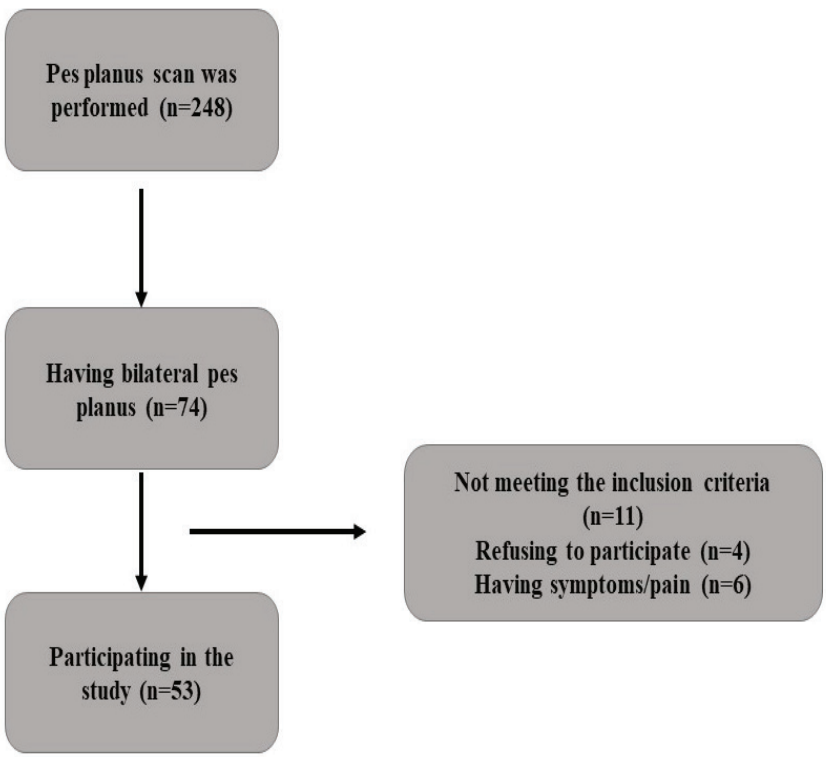

Figure 1. Flowchart of the study

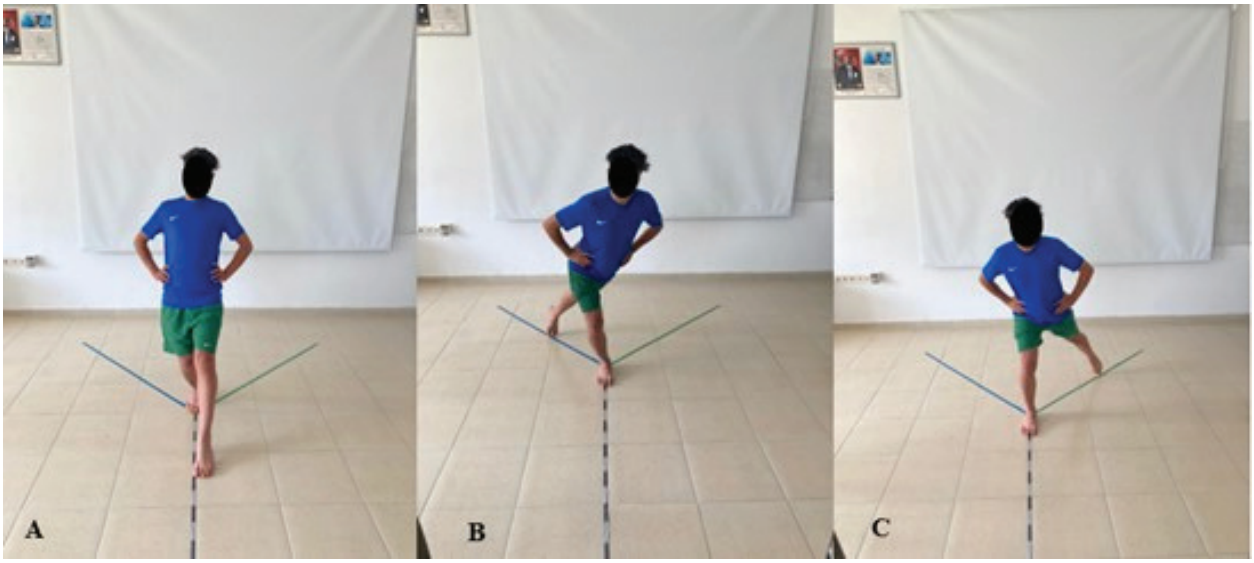

Figure 2. Y balance test (A- Anterior B- Posteromedial C-Posterolateral)

ence of 10 mm or more between the two measurements were accepted as pes planus. The test was repeated for both extremities.

Dynamic Balance Assessment

The Y-balance test was used to evaluate lower extremity dynamic balance performance in our study. This test is used to determine the level of motor control, assess the risk of injury, measure the development of sportive performance, and evaluate dynamic balance performance. The Y-balance test is a modified form of the Star Excursion Balance Test. The validity and reliability assessments of this test were performed by Plisky et al. (24). To perform the test, a Y-shaped mechanism was prepared on the ground. After fixing in the anterior direction using a tape measure on a hard surface, tape measures were placed at an angle of 135° in the posterolateral (pl) and posteromedial (pm) directions. Before the test was performed, how the test will be performed was explained and the participants performed the test at least 3 times. During the test, the volunteers were asked to touch as far as they could without transferring weight with their toes on tape meters in three directions with their hands on their waists, and the distance they reached was recorded in centimeters (cm) (Figure 2). The test was repeated if the subjects lost their balance, separated their hands from their waists, could not return to the starting point, and lifted their heel off the ground. The average of three successful reach distances in each direction was recorded for analysis. The test was repeated in this way for both extremities. The obtained value was normalized using lower extremity lengths. Lower extremity length was considered as the distance between the medial malleolus and the anterior superior spina iliaca. The following formula was used to determine the normalized reach distance. (24, 25).

Relative (normalized) reach (%) = Average reach distance / limb length X 100

Jumping Assessment

The vertical jump test on one leg was used to evaluate the jumping performance of the participants in our study. The jump heights of the participants were evaluated using the OptoJump System and software (Microgate, Bolzano, Italy). The validity and reliability study of this system was accomplished by Glatthorn et al. (26). The single leg vertical jump (SLJ) test was performed for both extremities with the use of Drift protocol included within testing procedures in the Optojump System. For the SLJ test, the participants were asked to jump on one leg in the starting position with their hands on the waist and knees stretched. According to the test protocol, the participants tried to jump as far as they could reach, with the legs stretched without pulling the knees up (Figure 3). Participants were verbally motivated to reach the maximum height in jumps. The SLJ test was repeated 5 times on both

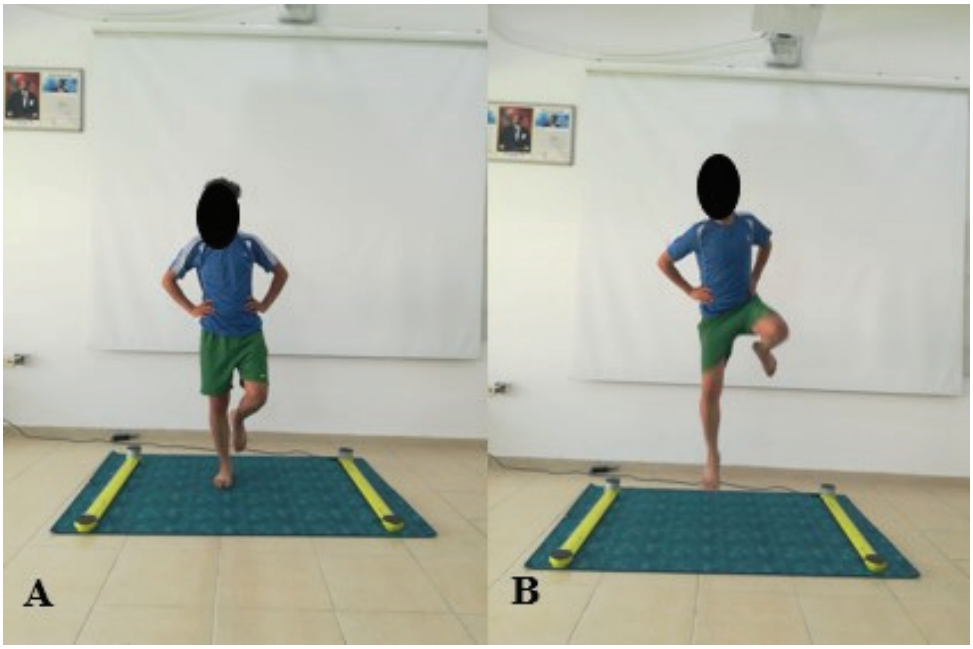

Figure 3. The single leg vertical jump test (A: Single leg vertical jump test starting position, B: Single leg vertical jump moment)

extremities for each participant. The tests were repeated in cases of excessive slump before jumping, involvement of the other foot in the jump, or separation of the hands from the waist. The highest jump height achieved in the SLJ test was recorded in cm (27).

Statistical Analysis

G* Power version 3.1.9.2 software (Heinrich-HeineUniversität Düsseldorf, Düsseldorf, Germany) was used to perform statistical power analysis. It has 0.4 effect size, 5% type I error margin and 85% statistical power conditions to evaluate the relationship between ND values and Y balance test values in 53 individuals with bilateral pes planus statistically (28, 29).

The "SPSS 21.0 for Windows" program was used for statistical analysis. Descriptive statistics are expressed as mean ± standard deviation for normally distributed numerical variables, and as median, minimum, maximum, percentile, and interquartile values for numerical variables that did not show normal distribution. The Shapiro-Wilks test was used for normality evaluation. The Spearman Correlation Analysis method was used to determine the statistical relationship between ND values and Y balance test and SLJ values. Any p value less than 0.05 was accepted as statistically significant. Correlations were interpreted as weak (0.1-0.39), moderate (0.4-0.69), or strong (0.7-0.99) (30).

RESULTS

The physical characteristics of the individuals participating in our study are given in Table 1. Forty-six of these individuals were right dominant. The descriptive statistics of the ND values, Y balance, and SLJ test values for both extremities of the par-

Table 1. Physical Characteristics of the Participants

N=53	X±SD	Min-Max
Age (years)	20.19±1.93	18-25
Height (m)	1.68±0.08	1.52-1.89
Weight (kg)	64.17±11.84	42-95
BMI (kg/m²)	22.48±2.48	18.56-28.68

N: Number of individuals participating in the study, BMI: Body mass index, X: Mean, SD: Standard deviation.

Table 2. Descriptive Statistics of the Measured Values

N=53	Median	Min-Max	Percentile	Interquartile value
ND (mm) (Dominant)	13	11-21	12/14	2
Anterior (%) (Dominant)	78.20	65.33-95.85	73.59/84.7	11.11
Posteromedial (%) (Dominant)	80.48	67.50-97.03	72.82/84.36	11.55
Posterolateral (%) (Dominant)	87.80	74.67-106.92	83.91/93.33	7.52
SLJ (cm) (Dominant)	8.80	2.70-15.80	6.45/10.60	4.20
ND (mm) (Nondominant)	13	10-21	11/15	4
Anterior (%) (Nondominant)	79.65	67.4-97	76.32/85.47	9.16
Posteromedial (%) (Nondominant)	78.75	68.19-95.35	74.91/83.91	9
Posterolateral (%) (Nondominant)	87.91	76.84-109.09	82.77/93.37	10.59
SLJ (cm) (Nondominant)	7.70	3.70-17.30	5.60/10.50	13.60

N: Number of individuals participating in the study, ND: Navicular drop value, SLJ: Single leg vertical jump.

ticipants in the study are shown in Table 2.

As a result of the statistical analysis, a weak negative correlation was detected between the ND value and the anterior direction of balance values in both extremities (dominant p=0.014; r=-0.336/ nondominant p=0.040; r=-0.284). While a weak negative correlation was detected between the ND values and the balance values in the posteromedial direction on the dominant side (p=0.046; r=-0.276), no statistically significant correlation was found between the ND values and the balance values in the posterolateral direction (p>0.05). It was found that there was no correlation between ND value and balance assessment in both the posteromedial and posterolateral directions on the nondominant side (p>0.05). There was no relationship between ND value and SLJ heights in both extremities (p>0.05) (Table-3).

DISCUSSION

In the present study, the relationship between the amount of ND and lower extremity functional performance including balance and jump parameters was assessed in young adults with pes planus, and it was determined that these individuals may show insufficient dynamic balance performance as the severity of pes planus increases. It was concluded that the vertical jump performance was not affected.

In our study, it was found that dynamic balance performance decreased with increasing ND value in individuals with flexible pes planus. There are

Table 3. Relationship Between ND Value and Balance, Jump Results

Dominant side	ND		Nondominant side	ND	
	r	p		r	p
Anterior	-0.336	0.014*	**Anterior**	-0.284	0.040*
Posteromedial	-0.276	0.046*	**Posteromedial**	-0.029	0.838
Posterolateral	-0.014	0.918	**Posterolateral**	-0.067	0.631
SLJ	-0.130	0.354	**SLJ**	-0.024	0.867

p<0.05 significant difference; p>0.05 no significant difference; Spearman Correlation test, ND: Navicular drop value, SLJ: Single leg vertical jump.

many studies in the literature examining the effect of balance in individuals with pes planus (4, 17, 31). Kızılcı and Erbahçeci found that the single leg standing time was negatively affected according to the pes planus severity (17). Dabholkar et al., in their study involving 60 individuals aged 18-25 years, found that the Y balance test scores of individuals with pes planus in all three aspects were lower than those with normal feet (31). Cote et al., in their study in 48 individuals, showed that there was a difference between the dynamic balance performances of individuals with and without pes planus (4). In our study, we think that the decrease in balance performance with the increase in the amount of ND, which indicates the severity of pes planus, may be due to reasons related to the level of structural disorders in the foot structure that occur in individuals with pes planus. As body weight is shifted onto the forefoot and toes, the intrinsic and extrinsic plantar flexors exert forces against ground reaction force as well as non-contractile structures such as the plantar fascia and other plantar ligaments to increase stiffness for forefoot stabilization. This counterforce may be insufficient to maintain foot stability in individuals with pes planus. Imbalance in load distribution that causes this insufficient counterforce, weakness in the muscles supporting the arch, weakness in the plantar fascia and ligaments may cause balance problem (17, 32).

Vertical jump height is an evaluation method used in many sports that gives information about lower extremity strength, neuromuscular fatigue, and jump performance (12). As a result of our study, it was observed that the MLA height did not affect the vertical jump height on one leg in individuals with asymptomatic flexible pes planus. In the study of Fu et al., in 20 male individuals, individuals with pes planus during vertical jump had greater plantar flexion and smaller external rotation in the ankle, and greater flexion, abduction movement, and smaller external rotation movement in the knee than those with a normal foot structure (14). Tudor et al. concluded that MLA structure does not affect vertical jump height in adolescent basketball players (33). Hu et al., in their study in 66 university students, concluded that the height of the MLA did not affect the vertical jump height of the two feet (34). Supporting these studies, Ho et al., in a study conducted in 26 male basketball players, found that athletes with low MLA showed a jumping performance similar to athletes with normal arch structure (35). David et al. reported that there was no relationship between ND value and vertical jump height in their study in 105 healthy volunteers aged 18-35 years (36). Contarlı and Çankaya also stated that the presence of pes planus did not affect vertical jump performance in gymnasts (13). Considering that the neuromuscular control and biomechanical alignment of the whole lower extremity are effective on jump performance (13, 37), the fact that the participants in our study were young and in the asymptomatic period of pes planus suggests that the severity of pes planus may not have affected jump performance yet.

In the literature, there are studies reporting the results of physical performance comparisons of individuals with pes planus and healthy individuals (4, 16, 17, 38) or examining the relationship between high MLA and performance (36, 39). However, as far as we know, there is no study examining the effect of the severity of pes planus on dynamic balance performance and vertical jump height in young adults with asymptomatic flexible pes planus. We think that the results of our study will make a significant contribution to the literature, as it is the first study to investigate the effects of pes planus severity on dynamic balance and vertical jump height in young adults with asymptomatic flexible pes planus.

Our study has several limitations. The fact that only asymptomatic individuals with flexible pes planus were evaluated in our study is a limitation. Another limitation is that the gender factor is not taken into account. We think that similar studies should be conducted in individuals with symptomatic pes planus and also considering the gender factor.

In conclusion, individuals with asymptomatic flexible pes planus may show insufficient balance performance with the increased severity of pes planus. We think that interventions to reduce the severity of pes planus in young adults with asymptomatic flexible pes planus may also improve balance performance and prevent other problems that may arise related to balance.

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EFFECTS OF PHYSICAL AND COGNITIVE FACTORS ON REACTIVE AGILITY IN PROFESSIONAL FOOTBALL PLAYERS

ORIGINAL ARTICLE

ABSTRACT

Purpose: The primary aim of this study is to examine the effects of physical and cognitive factors on reactive agility in football players; the secondary aim is to compare reactive agility parameters in football players with low and high risk of lower extremity injury in football.

Methods: Thirty professional football players were included. All participants underwent physical and cognitive assessments. Reactive Agility Test (RAT), tablet-based right/left discrimination, Vertical Jump Test, T Agility Test (T-Test), Y Balance Test (YBT), 20 m sprint test and hamstring eccentric strength were evaluated. Tuck Jump assesment (TJ) was used for injury risk analysis.

Results: In our study, there was a negative correlation between RCT movement time parameter and Y-Balance test composite, posteromedial and posterolateral reach scores and right/left discrimination accuracy; there was a positive correlation with the T-Test ($p<0.05$). In addition, there was a negative correlation between the RAT response time parameter and the right/left discrimination test time, and a positive moderate correlation with the T-Test result ($p<0.05$). In the comparisons between the athletes with low and high risk of injury, there was no difference between the groups in the parameters of RAT movement, reaction and decision-making time ($p>0.05$).

Conclusion: Reactive agility in football players is associated with physical parameters such as dynamic balance and agility, and cognitive factors such as right/left discrimination. We suggest that sports physiotherapists working with football players should evaluate the reactive agility performance and consider the physical and cognitive factors associated with reactive agility during the rehabilitation.

Keywords: Athletes, Balance, Performance, Physical Fitness, Strength Sport

FİZİKSEL VE BİLİŞSEL FAKTÖRLERİN PROFESYONEL FUTBOL OYUNCULARINDA REAKTİF ÇEVİKLİK ÜZERİNE ETKİLERİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışmanın birincil amacı futbolcularda fiziksel ve kognitif faktörlerin reaktif çeviklik üzerine etkisini incelemek; ikincil amacı ise futbolda alt ekstremite yaralanma riski düşük olan ve yüksek olan futbolcularda reaktif çeviklik parametrelerini karşılaştırmaktır.

Yöntem: Çalışmaya 30 profesyonel futbol oyuncusu dahil edildi. Tüm katılımcılara fiziksel ve kognitif değerlendirmeler uygulandı. Reaktif çeviklik değerlendirmesinde görsel uyaran ve fotoselli kapılar içeren Reaktif Çeviklik Testi (RÇT) kullanıldı. Tablet temelli sağ/sol diskriminasyonu, Dikey Sıçrama Testi, T Çeviklik Testi (T-Test), Y Denge Testi (Y-Denge), 20 m Sprint Testi ve Hamstring Eksentrik Kuvveti değerlendirildi. Yaralanma risk analizi için ise Tuck Jump Testi kullanıldı.

Sonuçlar: Çalışmamızda RÇT hareket süresi parametresi ile Y-Denge testi komposit, posteromedial ve posterolateral uzanma skoru ve sağ/sol diskriminasyonu doğruluk oranı arasında negatif yönde; T-Test ile pozitif yönde bir ilişki vardı ($p<0,05$). Ayrıca, RÇT tepki süresi parametresi ile sağ/sol diskriminasyonu test süresi arasında negatif yönde, T-Test sonucu ile pozitif yönde orta düzeyde ilişki gözlendi ($p<0,05$). Yaralanma riski düşük olan ve yüksek olan sporcular arasında yapılan karşılaştırmalarda gruplar arasında RÇT hareket, tepki ve karar verme süresi parametrelerinde fark yoktu ($p>0,05$).

Tartışma: Futbolcularda reaktif çevikliğin dinamik denge ve çeviklik gibi fiziksel parametrelerle ve sağ/sol diskriminasyonu gibi kognitif faktörlerle ilişkili olduğu gözlenmiştir. Bu nedenle özellikle futbolcular ile çalışan spor fizyoterapistlerinin reaktif çeviklik performansını değerlendirmesi ve rehabilitasyon aşamasında reaktif çeviklik ile ilişkili fiziksel ve kognitif faktörleri göz önüne almalarını önermekteyiz.

Anahtar kelimeler Sporcular, Denge, Performans, Fiziksel Uygunluk, Kuvvet Sporu

INTRODUCTION

Football is accepted as the most popular sport worldwide. Therefore the studies on the importance of athlete health in football players, maintaining health and increasing performance in sports are increasing (1). Physical fitness, which is defined as the ability to perform professional, recreational, and daily activities correctly and successfully without fatigue, plays an important role in increasing the performance of athletes and determining the risk of injury (2). Many prominent physical fitness parameters for football players have been determined in the literature (3). These parameters can be summarized as especially balance, strength, flexibility and agility (4). Reactive agility, one of the physical fitness parameters, is defined as a sudden change in speed or direction that occurs in response to an unplanned stimulus containing a reactive component (5-7). Studies have shown that reactive agility exercises increase on-field performance in football players (8). As a common view, it is recommended to evaluate and develop reactive agility especially in athletes who are interested in football where there are many stimuli.

The importance of deficit in reactive agility or decrease in reactive agility performance as a risk factor for sports injuries is not yet known, but applications on agility in physiotherapy and rehabilitation, prevention of injuries, return to sports after injury, and sports-specific exercise programs are quite common (9). Therefore, knowing the effective factors in reactive agility practices, which are estimated to be associated with many physical and cognitive factors, may be the focus of the rehabilitation program.

Research on injury mechanisms and injury prevention has increased in recent years (10-12). However, there is no study in the literature that states whether reactive agility parameters can be used to determine the risk of injury (13, 14). In the literature, specific reactive agility test protocols have been determined for different sports branches and it is stated that the visual reactive component for football is more suitable for the nature of the sport (15).

Knowing the factors associated with reactive agility will provide basic information for training programs to be applied to increase reactive agility performance and for further studies in this field. Therefore, the primary aim of this study is to examine the effects of physical and cognitive factors on reactive agility in football players. Additionally, the secondary aim is to compare reactive agility parameters in football players with low and high risk of lower extremity injury in football.

METHODS

Participants

The GPower (version 3.1.9.3) program was used in the sample analysis before the study. In the analysis, it was determined that at least 29 analyzable athletes should be included in the study in order to show the relationship between the movement time, one of the reactive agility parameters, and the reaction time of the right/left discrimination test with 80% power. A total of thirty asymptomatic football players from Sebat Gençlikspor, Erdoğduspor, and Uçarsuspor football clubs were included in the study. Volunteer football players between the ages of 18-36, licensed for at least 5 years, continuing active sports life and training in the last 6 months were included in our study. Football players who had a history of visual, mental, or systematic disease, had acute or chronic pain in the last 6 months, goalkeepers, and did not volunteer to participate in the study were excluded. This study was designed as a cross-sectional study design and carried out between October 2019 and August 2021. Ethical approval was obtained from the Hacettepe University, the Non-Interventional Clinical Research Ethics Committee (Approval Date: 22 October 2019 and Approval Number: 2019/25-20) and all volunteers were informed about the study and signed a consent form.

Procedures

This study consisted, of two visits made to each sports club at different times. In the first visit, the athletes were informed about the research, and they were asked to maintain regular sleep patterns before the next visit. Also, demographic information (age, height, weight, sports age, weekly training time) of the participants were recorded. At the second visit, all participants performed the physical

fitness tests [Reactive agility test (RAT), Left/Right Discrimination Test, Vertical Jump Test (VJT), Y Balance Test (YBT), 20m Sprint Test, Hamstring Eccentric Test, Tuck Jump Assessment (TJ)] after the standard warm-up procedure (5-minute jogging and standard dynamic lower extremity exercises).

Reactive agility was measured with the Reactive Agility Test system, which was created using a visual stimulus (16). Microgate Witty Photocell (Microgate, Bolzano, Italy) system with photocell and stimulating monitor was used for measurements. For measurement, 3 different balls were placed at a distance of 150 cm from the photocell door at 45° angles. From left to right, the balls were given the codes 'A', 'B', and 'C'. In addition, the measurement was recorded using a camera (iPhone 7; Apple Incorporated, CA, USA; 12 megapixels [f/1.8]) mounted on a tripod positioned to view the test area. During the test, the athletes were given standard commands; first, the athlete was asked to look at the monitor placed in front of him while in an upright position. When the players saw the first warning on the monitor, they were asked to switch to the 'Ready!' position. When the countdown from three was finished on the monitor, one of the names of the balls 'A', 'B', or 'C' flashed randomly. The football player started running towards the ball indicated by the lit letter. The football player, who came out of the photocell door, was asked to touch the ball with his foot and go back again and pass through the door.

Tablet-based right/left discrimination test was used to evaluate right/left discrimination (17). In this evaluation, the Noi Recognize App (Neuro-Orthopedic Institute, Australasia) used on the mobile device was used. Before starting the test, the test was explained to the participants. It was tried once for practice.

Jumping performance was evaluated using the VJT. Athletes were asked to jump as far as they could where they were. The test was repeated 3 times. The test was repeated separately on the right, left, and bilateral lower extremities, and the average result of each test was recorded (18). The test was recorded with a camera (iPhone 7; Apple Incorporated, CA, USA; 12-megapixel [f/1.8]) placed so that the athletes could see their contact with the ground. The recorded video was watched with the Kinovea (version: 0.8.15) program. With the slowed display, the time between the athlete's last contact with the ground before jumping and the first contact with the ground at the time of fall was determined. The jump height was determined by the formula: Jump height=9.81 x (flight time) ^{2}

Change of direction speed was evaluated with the T-test, which is a standard field test (19). For evaluation, 4 T-shaped cones were lined up on the track. The athlete was asked to touch the cones with the 'Start' command and return to the starting point. The total time was recorded with a stopwatch. The average result after 3 repetitions was accepted as the agility score of the athlete.

Dynamic balance was evaluated with the YBT (20). For the evaluation, the test setup was prepared by using a standard "Y" shaped tape measure with 120° angle between them. The athlete was asked to stand on one foot at the midpoint and maintain his balance with the other foot in the anterior, posteromedial and posterolateral directions. Atlethes were asked to reach as far as they could reach. The test was performed bilaterally. The reaching distances of the athletes were measured by doing 3 repetitions for each direction. The average of the 3 measurements obtained was divided by the leg length and multiplied by 100 to obtain the participant's normalized score. While determining the composite score, the amount of reach towards the anterior, posteromedial, and posterolateral directions on the side being evaluated was added, divided by 3 times the leg length, and multiplied by 100, and the participant's normalized composite score was recorded.

The 20 m Sprint Test was used to measure the sprint performance of the athletes (21). Marks were placed at the start (0 m) and finish (20 m) points for the measurement. The athlete was asked to run the entire distance in the shortest time, starting from 1 m behind the starting line. The athlete started running with the 'Start' command. The running time was recorded via the stopwatch. In the sprint performance with three repetitions, 2-minute rest intervals were given between runs. The best results in performances were included in the analysis.

Eccentric hamstring muscle strength was evalu-

ated using the Hamstring Eccentric Strength Test (Nordic Hamstring Test) (22). In this test, the athlete was placed in the "Nordic Hamstring Exercise" standing position on the knees to the starting position. The athlete was asked to cross his hands in front of his chest and to move forward in a controlled manner without disturbing the body alignment as far as he could maintain this position. Meanwhile, the recording was taken with a camera placed perpendicular to the participant. The degree to which the athlete lost control and exceeded 10°/s speed was determined on the videotape and the angle between him and the starting position was taken. After 3 repetitions, the best score was recorded as the athlete's score.

Injury risk analysis was performed using the Tuck Jump Lower Extremity Injury Risk Analysis (23). For risk analysis, the athlete was asked to jump within an area marked on the floor, 41 cm long and 35 cm wide, for 10 seconds by pulling his knees as far as possible to his stomach. Before starting the assessment, the athletes were explained the test verbally and were told to jump for 10 seconds with only their knees drawn to their stomachs. The test was repeated 1 time. Jump performance was recorded with anterior and lateral view cameras (iPhone 7; Apple Incorporated, CA, USA; 12-megapixel [f/1.8]). Records of knee, foot, hip, and jump biomechanics were checked and injury risk analysis was performed according to these parameters.

Statistical Analyses

The data of all analyzed variables were evaluated with the Shapiro-Wilk Test and it was determined that all variables showed normal distribution ($p>0.05$). Pearson correlation analysis was used in statistical analysis. The correlation coefficient (r) between the variables was evaluated. Regression analysis was performed to examine the effect of independent variables on reactive agility. Student-t Test was used in independent groups in order to compare reactive agility parameters between groups of football players with low and high risk of injury. Demographic information and descriptive information about performance tests were presented as mean (X) and standard deviation (SD). SPSS 24.0 (IBM, USA) program was used for statistical analysis of the data. The statistical significance level was accepted as $p<0.05$ for all analyses (24).

RESULTS

This study was conducted with 30 football players between the ages of 18-28 (mean age 20.13 ± 0.5). The sports age of these football players was between 5 and 15 years (mean sports age 8.2± 2.32) (Table 1).

According to the results of the correlation analysis, a moderate correlation found between the duration of movement, and the posteromedial reach score obtained from the dominant and non-dominant side in the YBT composite score ($p<0.05$; respectively $r=-0.533$, $r=-0.591$). Additionally, a moderate negative correlation was found between the duration of movement, and the accuracy rate recorded in the right/left discrimination test ($p<0.05$, $r=-0.411$) (Table 2). According to the results of the regression analysis performed for further analysis, the YBT dominant and non-dominant side composite score obtained by the evaluation of the dynamic balance explains 28% to 34% of the RAT movement time.

On the other hand, a correlation was found between the movement time and the posterolateral

Table 1. Demographic Characteristics

	(n=30) X ± SD	Minimum – Maximum
Age (years)	20.13 ± 0.5	18-28
Height (cm)	177.4 ± 0.7	169-187
Weight (kg)	69.63 ± 1.29	52-88
BMI (kg/m²)	22.1 ± 1.92	17.2-26.6
Sports Age (years)	8.2 ± 2.32	5-15
Weekly Training Time (min)	503 ± 60	450-600

X: Mean, SD: Standart Deviation, BMI: Body Mass Index, cm: centimeter, kg: kilogram, m²: meter square, min: minute.

Table 2. The Relationship between Reactive Agility Parameters and Physical and Cognitive Factors

		Movement Time		Reaction Time		Decision Making Time	
	X ± SD	r	P value	r	P value	r	P value
Right/Left Discrimination Test, DOM Time	1.71 ± 0.44	-0.094	0.61	-0.061	0.74	-0.274	0.14
Right/Left Discrimination Test, DOM Accuracy Rate	70 ± 15.53	-0.206	0.27	0.106	0.57	-0.126	0.50
Right/Left Discrimination Test, Non-DOM Time	1.78 ± 0.54	-0.332	0.07	-0.492	**0.006***	-0.037	0.84
Right/Left discrimination Test, Non-DOM Accuracy Rate	68.33 ± 19.84	-0.411	**0.02***	-0.152	0.42	-0,080	0.67
VJT, DOM Score	6.61 ± 0.27	-0.136	0.47	-0.058	0.75	-0.11	0.56
VJT, Non-DOM Score	6.77 ± 0.28	-0.123	0.51	0.031	0.87	-0.039	0.83
VJT, Bilateral Score	11.93 ± 0.40	0.066	0.72	-0.155	0.41	-0.046	0.81
T-Test	9.70 ± 0.11	0.425	**0.01***	0.415	**0.02***	-0.01	0.95
YBT, Anterior, DOM Score	82.03 ± 1.42	-0.046	0.80	-0.082	0.66	0.137	0.47
YBT, Posteromedial, DOM Score	103.98 ± 1.62	-0.442	**0.01***	-0.063	0.74	-0.03	0.87
YBT, Posterolateral, DOM Score	93.07 ± 1.96	-0.677	**<0.001***	-0.201	0.28	-0.298	0.11
YBT, DOM Composite Score	93.12 ± 1.32	-0.533	**0.002***	-0.155	0.41	-0.111	0.55
YBT, Anterior, Non-DOM Score	81.52 ± 1.61	-0.183	0.33	-0.157	0.40	0.067	0.72
YBT, Posteromedial, Non-DOM Score	103.67 ± 1.74	-0.506	**0.004***	-0.2	0.28	-0.099	0.60
YBT, Posterolateral, Non-DOM Score	92.18 ± 1.97	-0.7	**<0.001***	-0.2	0.28	-0.334	0.07
YBT, Non-DOM Composite Score	92.46 ± 1.44	-0.591	**0.001***	-0.231	0.22	-0.167	0.37
Sprint 20 m	3.31 ± 0.04	0.24	0.20	0.319	0.08	-0.065	0.73
Hamstring Eccentric Strength	22 ± 1	0.083	0.66	-0.182	0.33	0.264	0.15

X: Mean, SD: Standart Deviation, p: statistical significance level, *p <0.05, sec: second, cm: centimeter. r: Pearson Corelation Coefficient VJT: Vertical Jump Test, T-Test: T Agility Test, YBT: Y Balance Test, DOM: Dominant side, Non-DOM: Nondominant side.

reach score of the YBT for both dominant and non-dominant sides respectively (p<0.01, r=-0.677, r=-0.700). In addition, there was a moderate correlation between the movement time and the T-Test score (p<0.05, r=0.425). There was a moderately positive correlation between response time and T-Test (p<0.05, r=0.415). In addition, a moderately significant correlation was found between the reaction time and the test time recorded with the right/left discrimination test (p<0.0, r=-0.492). According to the results of the regression analysis, the non-dominant side time score obtained by the right/left discrimination evaluation explains 24% of the RAT response time. There was no correlation between the decision-making time, another sub-parameter of RAT, and the physical and cognitive factors (p>0.05) (Table 2).

TJ risk analysis revealed n = 13 players with a high risk of injury (TJ score ≥ 6) and n = 17 players with a low risk of injury (TJ score <6). According to the Student's t-test results, there was no difference between the groups with low and high risk of injury in all RAT parameters (p>0.05) (Table 3).

DISCUSSION

According to the results of the study, it was found that reactive agility parameters were related to both physical and cognitive factors. On the other

Table 3. Comparison of Reactive Agility Parameters between Groups

	High Injury Risk (n=13) X ± SD	Low Injury Risk (n=17) X ± SD	P value
RAT - Movement Time (sec)	2.4 ± 0.16	2.3 ± 0.17	0.06
RAT - Reaction Time (sec)	0.28 ± 0.07	0.26 ± 0.05	0.45
RAT - Decision Time (sec)	0.56 ± 0.13	0.54 ± 0.16	0.70

X: Mean, SD: Standart Deviation, p: statistical significance level, sec: second, RAT: Reactive Agility Test

hand, the results of this study showed that there was no difference in any of the reactive agility parameters between the athletes at low and high risk of injury.

According to the study in which dynamic balance is associated with RAT movement time, football players with high dynamic balance performance show reactive agility performance, while better controlling body oscillations and dynamic balance components during direction change, allowing the athlete to achieve more stable ground contact (25). In addition, Dolan et al. (26) investigated the relationship between the balance test performed by the Balance Error Score System on 14 female football players and reactive agility. In this study, it has been shown that the move made towards the right side of the athlete is related to the balance on the left foot, and the move made towards the left side is related to the balance on the right foot, according to the stimulus while performing the task in reactive agility assessments. These results also show that there is a relationship between peripheral joint stability and the ability to change direction abruptly. Considering this relationship, dynamic balance exercises can be use to improve reactive agility. For this, agility skills exercises that include stability and change of direction can be included in training programs.

In cases of chronic pain and injury, the body parts lose the ability (speed and accuracy) to identify left or right images and this skill is also relevant to sports because it concerns complex motor laterity profiles and spatial orientation of the body for athletes beyond right/left preference (27). Our study is the first to compare left/right discrimination with reactive agility parameters. In our study, right/left discrimination was found to be associated with movement time and reaction time, which are sub-parameters of RAT. Although the right/left discrimination test also evaluated the decision-making time, no relationship was found with the RAT decision-making time. This result showed that even if they measure similar parameters in football players, computer-based decision-making tests can produce different results from evaluation tests suitable for sports on the field. Wilkerson et al. (28) reported that there was a difference between the tasks performed to the right and left in the reactive agility performance of the athletes in his study on 35 elite athletes who had concussions. Our results are in agreement with this study. However, it should be considered that there is no difference in reactive agility sub-parameters between players with low and high injury risk. Although it is known that reactive agility has an important place in football, it may be recommended to add right/left discrimination skills, which are not included in rehabilitation after injuries and routine sportive evaluations, to the tests. In addition, for the purpose of increasing reactive agility performance based on the relationship between reactive agility and right/left discrimination, training and practices to improve right/left discrimination skills can be given importance in training programs.

A moderate correlation was observed in terms of RAT movement time and reaction time parameters, but this relationship was not between decision making time and T-test. This shows that reactive agility assessments can also produce similar results with tests that evaluate agility performance due to changes in the direction of agility. However, there are also studies in the literature stating that agility tests involving changing direction on agility are not associated with reactive agility (29, 30). The most important reason for this situation is that RAT protocols can be very different from each other. If the RAT protocols selected for evaluation and the agility test, which includes a to change direction on agility, do not contain similar movement

patterns, a statistically significant relationship may not be found between the two tests. This result shows the importance of choosing a sport-specific test design, especially in RATs.

There was no relationship between reactive agility and 20 m sprint performance. The reason for this situation is that the fast running within the RAT takes place in a short distance; it includes acceleration, deceleration, and change direction in agility. On the other hand, 20 m sprint running involves linear acceleration. It has been observed that studies on this subject offer conflicting results (29-31). Based on our results, it can be suggested that RATs in football should be evaluated independently of speed and handled separately in programs.

Vertical jumping ability, which is one of the most basic sportive skills in football, no correlation was shown between reactive agility parameters. These results are in agreement with the results of many studies in the literature (32-34).

It is known that hamstring eccentric muscle strength is effective in the performance of athletes. (35-37). The hamstring eccentric strength test was preferred because it allows an objective evaluation of the athlete without tiring the field without a device (16). According to the results, hamstring eccentric strength was not related with RAT subparameters. This result may be due to the indirect hamstring eccentric strength evaluation with field test and bilateral function evaluation.

In this study, no relationship was found between reactive agility parameters and lower extremity injury risk in football players. However, it has been suggested that rugby players with good decision-making skills can avoid situations that may cause potential injury relatively more easily, thus the risk of injury will be less. There is also evidence that agility training can prevent injuries (13,14).

There are some limitations of this study. All measurements made in this study were made on different pitches of different football teams. These different teams could not be visited in the same weather conditions, at the same times, and in the same environmental conditions. Another limitation of our study can be shown as testing cognitive factors in a limited framework. In addition, the injury risk analysis applied was evaluated with the TJ injury assessment. This analysis grouped football players for anterior cruciate ligament injuries and non-contact injuries. It did not have a classification feature for contact injury or overuse injury.

In conclusion, it was determined that reactive agility parameters in football players were related to both physical and cognitive factors. This study showed that reactive agility parameters are associated with right/left discrimination, agility including change direction in agility, and dynamic balance. On the other hand, the results of this study showed that there was no difference in any of the reactive agility parameters between the athletes with low and high injury risk.

According to these results, right/left separation skills should be evaluated by physiotherapists, especially after injuries. In cases where there are limitations for the development of reactive agility, dynamic balance training can be added to the program and an improvement in reactive agility performance can be achieved. Sports physiotherapists should consider reactive agility performance during injury prevention, performance evaluations, rehabilitation programs, and return to sports; and it is important for athletes to consider the physical and cognitive factors related to reactive agility in improving their performance.

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OPINIONS OF TURKISH SOCIETY ON PHYSIOTHERAPIST CONSULTANCY FOR MATTRESS SELECTION: A QUALITATIVE FOCUS GROUP STUDY

ORIGINAL ARTICLE

ABSTRACT

Purpose: Numerous mattress manufacturers market their products as "orthopedic" with therapeutic capabilities, claiming that the right mattress can improve an individual's sleep and quality of life. In this qualitative focus group study, we aimed to investigate how customers see the mattress brand that provides physiotherapist support services and their experiences with mattress companies with different characteristics.

Methods: Fifty participants were selected from women between the ages of 20 and 60 who were married or in preparation for marriage, and who had purchased a mattress or were in the research phase. The group discussion rules were determined and shared separately in all five groups. The data were thematically analyzed using the framework analysis approach.

Results: Customers' perceptions about mattress brands and their thoughts on physiotherapist consultancy are understood by questions such as "what do you think about mattress brands?" and "what does physiotherapist consultancy for mattress selection mean to you?" These two themes will be presented and discussed.

Conclusion: The physiotherapist consultancy was a service to satisfy consumer needs in terms of trust. An innovative service has been offered that can persuade the consumer to switch to the new and unknown New Brand. However, it is also possible that advertisements with health content, as previously experienced with other brands, have a negative effect on brand perception. For this reason, it may be more beneficial for the brand if physiotherapists who will work in the field act as life coaches rather than health professionals.

Keywords: Counseling, Focus Groups, Mattress, Physiotherapist, Qualitative Research

YATAK SEÇİMİNDE FİZYOTERAPİST DANIŞMANLIĞINA İLİŞKİN TÜRK TOPLUMUNUN GÖRÜŞLERİ: NİTEL ODAK GRUP ÇALIŞMASI

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Çok sayıda yatak üreticisi, doğru yatağın kişinin uykusunu ve yaşam kalitesini iyileştirebileceğini söyleyerek ürünlerini tedavi edici özelliklere sahip "ortopedik yataklar" olarak pazarlamaktadır. Bu nitel odak grup çalışmasında, müşterilerin fizyoterapist destek hizmeti veren yatak markasını nasıl gördüklerini ve müşterilerin farklı özelliklerdeki yatak firmaları hakkındaki deneyimlerini araştırmayı amaçladık.

Yöntem: 20-60 yaşları arasında evli veya evliliğe hazırlanan, yatak satın almış veya araştırma aşamasında olan kadınlardan 50 katılımcı seçilmiştir. Grup tartışma kuralları belirlenmiş ve beş grupta da ayrı ayrı paylaşılmıştır. Veriler, "Çerçeve Analizi" yaklaşımı kullanılarak tematik olarak analiz edilmiştir.

Sonuçlar: Tüketicilerin yatak markalarına yönelik marka algılarının ve fizyoterapist danışmanlığına yönelik düşüncelerinin "yatak markaları hakkında ne düşünüyorsunuz?" ve "yatak seçiminde fizyoterapist danışmanlığı sizin için ne ifade ediyor?" gibi sorularla anlaşıldığını gördük. Bu iki tema katılımcılara sunulacak ve tartışılacaktır.

Tartışma: Fizyoterapist danışmanlık hizmetinin tüketicinin belirttiği güven ihtiyacına yönelik bir hizmet olduğu görülmüştür. Projede, tüketiciyi yeni ve bilinmeyen yeni markaya yönelmeye ikna edebilecek yenilikçi bir hizmet sunulmuştur. Ancak daha önce başka markalarda da yaşanmış olan sağlık içerikli reklamların markaya olumsuz bir hava vermesi de mümkündür. Bu nedenle sahada çalışacak fizyoterapistlerin sağlık profesyoneli kimliğinden ziyade yaşam koçu gibi hareket etmeleri marka için daha faydalı olabilir.

Anahtar Kelimeler: Danışmanlık, Odak Gruplar, Yatak, Fizyoterapist, Nitel Araştırma

INTRODUCTION

Sleep quality plays a crucial role throughout life. Good sleep can aid in the maintenance of a balanced circadian cycle, lowering fatigue and enhancing physical recovery (1). Poor sleep quality can be attributed to a variety of environmental conditions, including temperature, light, noise, and the comfort of the mattress. It has been claimed that 7% of sleep difficulties are attributable to uncomfortable mattresses that put stress on the spine during sleep (2). Previous research has suggested that the type of mattress can alter sleep quality (3, 4). In another study, participants who slept on air mattresses had a higher body temperature than those who slept on futons (5). In addition, Tonetti et al. discovered that expanded polyurethane-viscoelastic mattresses are superior to regular spring mattresses in terms of sleep onset latency and sleep efficiency (6).

To better comprehend the comfort of the human–mattress interface, it is essential to recognize the impact of various mattress materials on comfort. It has been proposed that a mattress made of phase-change materials (PCMs) could enhance thermoregulatory performance. Compared to ordinary mattresses, PCM mattresses can boost skin temperature by 0.3–1.0°C and linen temperature by 0.2–1.6°C (7). Due to its intrinsic qualities, a mattress incorporating PCM may provide enhanced comfort and heat transfer at the human–mattress interface. It has been stated that the use of a breathable mattress with a high bounce feature can effectively prevent heat loss in the mattress and encourage restful sleep (8). There are further methods for enhancing the comfort of mattresses, including thermal blankets, water circulation systems, and thermoelectrically conditioned mattresses (9-11).

The importance of mattresses for sleep quality has been recognized in several studies, but there is no consensus on the ideal mattress design for relieving or preventing cervical or lumbar pain (12). The hardness of the mattress appears to be the most crucial factor, as it has been demonstrated in some studies that medium-firm mattresses can greatly alleviate back discomfort (13). Numerous mattress manufacturers market their products as "orthopedic" with therapeutic capabilities, claiming that the right mattress can improve an individual's sleep and quality of life. Such statements, however, are not supported by solid evidence. Therefore, it is beneficial to provide physiotherapist advice on mattress brands in order to determine which mattresses successfully alleviate or prevent back discomfort. Thus, healthcare providers will be able to recommend the appropriate mattress type to customers, thereby reducing or preventing back pain symptoms and improving their quality of life. In addition, the poor quality of numerous quantitative studies in the literature evaluating the best mattress for preventing back pain and enhancing sleep and quality of life suggests that qualitative studies are required on this topic (14).

There is no universally accepted or systematically evaluated model or guideline to help customers make consistent, transparent, customer-centered, and evidence-based decisions about choosing the right mattress. Consequently, there is a need to develop a more robust and open framework to assess the potential for establishing mattresses that customers will be comfortable with. For these reasons, we conducted a qualitative focus group study aiming to (i) examine customers' opinions about existing mattress companies and (ii) explore what a physiotherapist consulting service means to them. In previous studies, there has been no study investigating the opinions and recommendations of physiotherapists, including for the selection of medical mattresses to protect health. This study is the first to investigate the potential effect of advice provided by physiotherapists on the customer population of corporate furniture companies.

METHODS

Ethical approval

The study was reviewed by the Çankırı Karatekin University Research Ethics Committee on 28.06.2022 and approval was granted (28/06/22-26). Since the focus of the study and the main title of the ethical approval did not fully overlap, ethical approval was obtained for the main title of the subject on 10.10.2022 to investigate the ethical relevance of the main hypothesis of the study

(10/10/22-28). It has been confirmed retrospectively that it is ethically appropriate to report routine focus group meetings in scientific manuscripts. The study was conducted according to the Declaration of Helsinki. Written informed consent was obtained from all participants prior to participation and they were all assured that they could withdraw their consent at any time without consequences.

Procedure

Qualitative research is ideal for dispelling customers' mattress-related misunderstandings, because it provides direct access to people's thoughts, allowing them to openly voice their opinions on the topic. Focus groups promote group conversation through the use of open-ended questions and provide a large amount of data about how individuals make sense of the social world. Focus groups enable the production, maintenance, and sharing of knowledge that is socially shared through dynamic group conversations.

In August-September 2022, five focus groups were organized across Istanbul, Türkiye. In the research, the importance of the mattress in the lives of users, motivations for mattress selection, brand perceptions, and shopping experiences were examined. Fifty participants were selected from women between the ages of 20 and 60 who were married or in preparation for marriage, and had purchased a mattress, or were in the research phase. Those with a monthly income of the participants equal to or less than three minimum wages were accepted as "lower-middle-income customers," and those with a monthly income of more than three minimum wages were accepted as "upper-middle-income customers." The group discussion rules were determined and shared separately in all five groups. It was emphasized that the discussions in the group should be kept confidential, and the participants were asked to respect the experiences and opinions of others. The goal of these steps was to create an atmosphere where people felt safe talking about potentially sensitive topics and could freely express their opinions without fear of being castigated or uncomfortable. Research questions continued until the answers of the participants in each group were similar and consistent. The study was carried out at a market research center in Şişli, Istanbul. Data collection from focus groups was carried out by expert marketers collaborating with Brand New.

Sampling

We utilized purposeful sampling to include a range of experiences, vocations, and perspectives. Sampling and data collection were conducted simultaneously. In qualitative research, sample sizes are typically determined by the concept of data saturation (15). Guest et al. discovered that 80% of analytic themes were uncovered in two to three focus groups and 90% in three to six groups. This indicates that a sample size of between three and six groups was sufficient to identify the majority of themes (16). The average size of a focus group is between six and ten individuals. In order to achieve a total sample size of 50, ten volunteers were recruited for each of the five groups. The characteristics of the focus group participants were defined (Table 1).

Table 1. Characteristics of the Focus Group Participants

Group Name	Sex	Age	Social Status	Marital Status
Focus Group 1 (n=10)	Female	40-60	High income, high education level	Mixed
Focus Group 2 (n=10)	Female	25-45	High income, high education level	Married
Focus Group 3 (n=10)	Female	25-45	Low income, low education level	Married
Focus Group 4 (n=10)	Female	20-35	High income, high education level	Engaged
Focus Group 5 (n=10)	Female	20-35	Low income, low education level	Engaged

n: sample size

Focus Group Analysis

The data were thematically analyzed using the framework analysis approach. The framework was reviewed by the study team to ensure that the resulting codes or labels were grounded in and supported by the data. The research team consisted of physiotherapists and professional qualitative researchers. Professional qualitative researchers interpreting the qualitative data analyses then met with the physiotherapists. At this meeting, the results and the pervasive impact of these results were discussed. Audio recordings of the interviews were listened to repeatedly alongside a review of field notes. The recordings were then transcribed. Initial analytical notes, key ideas, and impressions were generated. Two physiotherapists (CT and TD) read each line of the first two transcripts, applying the codes independently under the direction of the qualitative study researchers. The framework was reviewed by the wider study team to improve rigor. This process was conducted iteratively in parallel with further focus groups. CT analyzed the remaining transcripts, developing new codes and integrating these into the analytical framework until no new codes or themes emerged. The data were charted onto a matrix where each participant's responses were listed under the themes and supported with relevant verbatim excerpts to understand how themes were replicated or differed between transcripts. Quotes were presented from individual participants and group discussions that illustrated the essence of each theme. This process allowed the data to be explored across cases and themes and for the identification of disagreements and deviant cases (17).

RESULTS

It was observed that customers' brand perceptions about mattress brands and their thoughts on physiotherapist consultancy are understood by questions such as "What do you think about mattress brands?" and "What does physiotherapist consultancy for mattress selection mean to you?" These two themes will be presented and discussed. The characteristics and descriptive identities of the mattress brands are shown in Table 2.

What do you think about mattress brands?

The participants answered this question differently depending on their socioeconomic level. When shopping for mattresses, the upper-middle-class customers stated unequivocally that they preferred Brand B and Brand D products. In addition, this upper-middle-class customer class had a high tendency to shift to brands that they associated with expertise in mattress production. Finally, some of this group preferred Brand A to buy mattresses again, as they had bought Brand A mattresses previously, which was often preferred in the early stages of their marriage, and they were satisfied with this brand.

"I know that very special technologies are used in the mattresses. With the advice from a few friends, I researched these technologies in Brand D. They said it's really comfortable and you don't feel it when your partner moves because your side remains stable." (Focus Group 4)

Table 2. Features and Descriptive Identities of the Mattress Brands

Name	Features	Client Profile	Brand Identity
Brand A	Trusted, qualified, but mattress is not their specialty	Low-middle class, dowry shoppers	Traditional, old, reliable
Brand B	Proven and well-known, specializing in mattress production	Middle-upper class, seeking expertise in mattresses	Quiet, confident, elite
Brand C	Proven and well-known, specializing in mattress production	People from all walks of life, trendy, modern	Crazy, innovative, dynamic, remembered for its advertising
Brand D	Lesser known but expert in mattress manufacturing	Upper class, people who care about their health, are educated, knowledgeable	Cool, elite, expert
New Brand	Newly established, but specialized in mattress production	Not yet formed	Not yet formed

"Brand B has been a well-known and reliable brand for years. Brand C is a very innovative brand and is constantly developing new mattresses. I am undecided between the two brands."

(Focus Group 4)

"I've known Brand A since I was a kid. That's why it gives me a first-class impression."

(Focus Group 4)

"I think it is a great success that it came to mind when there are so many long-established mattress brands. If we can count Brand C alongside Brand B and Brand D, I think the company has taken the right actions."

(Focus Group 2)

Among the lower-middle-income customers, Brand A, Brand B, and Brand C were identified as trustworthy, while Brand D was not recognized by these customers. In addition, this customer group preferred Brand A, which enables dowry shopping, because they want to buy mattresses along with other furniture.

"I can only sleep on a soft mattress because of my condition. My fiancé prefers to sleep on a harder one. Brand C provided this. For example, half of it is softer and half of it is firmer... They can make double mattresses like this."

(Focus Group 5)

"I think Brand A is better in terms of mattress bases and headboards, but Brand C is more successful in mattresses; I think it is the leading company."

(Focus Group 5)

"I remember the Brand C commercial and the famous Turkish actress very well. But it doesn't seem convincing to me. I don't think that a famous actress uses Brand C."

(Focus Group 5)

"I think Brand B is shown in advertisements; it is in our lives. It is a very well-known brand. It is a brand that has proven itself, and it is a brand with a wide variety."

(Focus Group 3)

"I wanted to buy Brand B for my son. Brand A was being sold very close to me. I saw that there was a very good discount there when I was passing by. A pillow was included as a gift. I'll replace it after five years, if necessary."

(Focus Group 3)

"Brand B and Brand D are good brands (Why are they not in your life enough?) It means they advertise less. So, they're not very common... They don't publicize themselves very well. Have you seen how Brand C peaked in 2-3 years?"

(Focus Group 3)

New Brand, on the other hand, was not remembered by either customer group. Even when reminded about it, it is a brand that most people do not know or remember. Those who try to remember the brand spontaneously may have difficulty remembering its name. Spontaneous memories about New Brand:

- Has a store in Bostancı.

- It is blue.

- The ad was on TV.

After the spontaneous knowledge was recorded, the advertisement for New Brand about the physiotherapist consultancy project was shown to the participants. Then opinions about physiotherapist counseling were collected.

What does physiotherapist consultancy for mattress selection mean to you?

Being able to choose a mattress in consultation with a physiotherapist helped consumers evaluate this brand, which they had not known about, positively. When the participants chose a mattress with the help of a physiotherapist, they thought that they had chosen the right one that was healthy and comfortable. Posture assessment by the physiotherapist in the advertisement supports the idea of "the right choice" but, for some customers, how she will meet the different needs of her husband may remain a question mark. Some eliminate this question mark by believing that it will be a "custom-made mattress". Although rare, there are those who perceive the advertisement as an endorsement by a physiotherapist. In this case, the advertisement becomes unexceptional and does

not inspire confidence.

A free physiotherapist consultation can result in the brand being perceived as "premium". There is a tendency to believe that it will be expensive but worth the money as it will be a healthy and comfortable mattress. Meetings with the physiotherapist by appointment give confidence and support the perception of professionalism. The idea that the physiotherapist will take care of them individually appeals to customers. However, those who do not suffer from any health problems may find this process tedious or they may worry that they will feel pressured into buying after making an appointment with a physiotherapist. Physiotherapist support creates a "wow" effect for customers aged 40–60. However, it may take some time for people around them to trust this brand that they have not heard of.

"I think that helping us through a physiotherapist gives people 100% confidence if it is done as a physiotherapist rather than a sales consultant. Especially neck and low back pain are definitely present in one out of every two people."

(Focus Group 2)

"The music in the ad is beautiful as well as the project. Like the Brand C commercial, this one will be immediately memorable."

(Focus Group 3)

"If New Brand didn't trust its product, it wouldn't have come up with a physiotherapist. I think he trusts the product because the company got the support of a physiotherapist. I guess people will choose their mattresses according to their body structure. It will probably be in the form of a separate mattress for the old and a separate mattress for the young..."

(Focus Group 3)

"In a sense, this is getting advice from an expert. A professional who knows both your body and the features of the mattress will help you choose the best one for your needs."

(Focus Group 1)

"If it's too expensive, I'll be disgraced at the physiotherapist if I can't afford it. Everyone there says to me, "Why did you waste our time? Are we going to mess around with you? We brought a physiotherapist here. We paid money. Are we going to mess around with you?"

(Focus Group 4)

"I'll make an appointment and then I'll have to go to that appointment. If I have to cancel I'll call back to say I won't be able to come. These are very detailed things."

(Focus Group 1)

"Sounds like a mattress for neck and back pain."

"I think it's the mattress intended for us. Mattress for my body"

"It looks like the physiotherapists are going to produce a custom mattress."

(Focus Group 4)

DISCUSSION

In this qualitative focus group study, the prominent motivations of customers when purchasing mattresses were confidence, vitality, and enjoyment. Due to the abundance of product variety, it is not easy for customers to choose suitable mattresses according to these priorities. Choosing the right mattress has been found to be confusing for customers due to the variety. Therefore, the online shopping option is not suitable for this target clientele. Moreover, according to our qualitative study results, since customers are not familiar with the terms used by the brand, they need an expert who is knowledgeable about both the product and human nature. This qualitative focus group study is the first to investigate customer opinions about the advice service provided by physiotherapists on mattress selection. According to the results of the study, the physiotherapist consultancy service was found to be a service to satisfy the need for trust mentioned by the consumer. An innovative service has been offered that can persuade the consumer to go for the new and unknown "New Brand". However, it is also possible that advertisements with health content, as previously experienced with other brands, create a negative perception towards the brand. For this reason, it may be more beneficial for the brand if the physiotherapists who will work in the field act as life coaches rather than health professionals. Karagözoğlu Coşkunsu et al.

revealed the difficulties faced by physiotherapists in finding a job in recent years and suggested that efforts should be made to solve the problem (18). Timurtaş et al. in their study on the feasibility of employing physiotherapists in primary health clinics concluded that physiotherapists should have direct communication with the community (19). The results of these studies show that physiotherapists have many opportunities in new fields of work, such as mattress selection consulting, that will directly help people and society.

Although Brand A is not a specialist in mattresses, it has been defined as a trustworthy brand due to its long history and being recommended in social environments. In particular, low-middle-income customers prefer Brand A because of its price advantages and special offers. Brand B and Brand D are seen by consumers as experts in mattress production. Although Brand D is frequently preferred by high-income consumers, its high price can create a barrier to purchase. Although Brand B is the longest-established company in terms of mattress production, it is not preferred by the consumer as much as before. Brand C stands out as the most popular brand in the most recent period. Although it is a relatively new firm, the fact that it is preferred by both socioeconomic classes indicates that it has achieved significant success. In addition, Brand C, unlike other brands, has emerged as the only brand that embraces the concepts of vitality and pleasure, not reliability. Although New Brand is still unknown, it will be able to compete with other companies in a short time, just as Brand C has done, especially with their physiotherapist consultancy project. Moreover, according to the qualitative data obtained, the physiotherapist consultancy project addresses the theme of trust rather than those of vitality and pleasure. This means that the brand executing the physiotherapist consultancy project can compete with companies considered more trustworthy with a fixed customer base to expand its customer base. This is an indication that instead of Brand C, which is on an upward trend, competition will be with companies that have already lost customers. However, although the physiotherapist consultancy project is an innovative project that addresses the theme of trust, it may cause a misconception that it only appeals to the customer group at risk of health problems. In order to avoid this misunderstanding, New Brand should support this project with additional materials, and responsible physiotherapists should inform the public that this project is for healthy people. Greval et al. argued that one of the six themes that will shape the future in the marketing sector is healthcare technology (20). Healthcare has a long history of harnessing and integrating data from numerous sources and using analytics to inform product offerings, recommendations, and the tailoring of patient experiences in order to increase client value. In this way, the changing healthcare landscape, spurred by technological advancements and legislative changes, needs a marketing strategy as it transitions from a sector that offered patient care through episodic and reactive measures to one that relies on continuous and proactive evaluations (21). Physiotherapists need to integrate into the marketing sector as soon as possible by working with mattress sales companies or other related companies, in order to keep up with the transformation in the health sector. Madan et al. investigated the basic profession-specific characteristics of physiotherapists and found that the most important feature that needed to be developed was the “ability to work under pressure” (22). It is obvious that this employment area, where competition is intense, will contribute to this aspect of physiotherapists.

Some participants were hesitant to discuss their conflicting beliefs with other members of the group. This is the most important limitation of our focus group study. In addition, the sociodemographic characteristics of the individuals were questioned only verbally and categorically. This can also be an important limitation. As a result, consumers’ views on brand perception may change over time. Mattress companies should express themselves through themes such as trust, vitality, and togetherness in order to achieve this change. The physiotherapist consultancy project of New Brand has seen a positive reaction among the public, especially with the theme of trust, regardless of income levels. However, when the answers given by some focus groups were examined, negative opinions were also seen, such as that this project only served the unhealthy group or that the project service would take considerable time. If these mis-

understandings are cleared up, it is likely that the public will adopt the physiotherapist consultancy project and meet the need for "expert help," which is a big problem when it comes to mattress selection. In future studies, cost-benefit analyses should be put forward quantitatively, and these results should be supported by qualitative data showing the benefits provided by physiotherapists in different fields, such as the furniture industry.

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THE EFFECTS OF WORK-RELATED AND SOCIO-DEMOGRAPHIC CHARACTERISTICS ON ATTITUDES TOWARDS PROFESSION AND BURNOUT AMONG PHYSIOTHERAPISTS WORKING IN TURKIYE

ORIGINAL ARTICLE

ABSTRACT

Purpose: The purpose of this study is to determine the levels of burnout and attitude of physiotherapists towards profession and to examine variables that affect these levels.

Methods: The research was conducted on physiotherapists working in different fields between November 2020 and February 2021. Professional attitude levels and burnout levels of physiotherapists were evaluated with "Attitude Scale towards physiotherapists Profession (ASP)" and "Burnout Scale-Short Form (BSSF)", respectively. In addition, socio-demographic information of the physiotherapists; their institution, working days and hours, the physiotherapy field worked; their experience in the physiotherapy field, and perceived income adequacy were recorded.. All evaluation forms were prepared electronically with GoogleDocs and delivered to participants via social media and other communication options.

Results: A total of 123 physiotherapists participated i this study. BSSF ranged from 1.20 to 6.40, while mean value was 3.44±1.14. Mean score of ASP total, professional satisfaction subscale, qualifications required by profession and general concerns about profession was 133.22±13.56; 71.33±8.28; 37.07±3.66; 24.82±3.65, respectively. Statistically significant correlations were found between burnout levels of physiotherapists and total score in the scale of attitude towards the profession (r=-0.519, p=0.001), professional satisfaction subscale (r=-0.509, p=0.001), qualifications required by the profession subscale (r=-0.374, p=0.001), profession-related concerns subscale (r=-0.397, p=0.001).

Conclusions: It is important to examine attitudes of physiotherapists towards profession and variables that affect these attitudes. Examining variables that cause negative attitudes towards profession can provide re-arrangement of these variables in a way that can lead to a positive attitude. This situation may result in an increase in professional success and satisfaction of physiotherapists.

Keywords: Attitude, Burnout, Occupation, Physiotherapist

TÜRKİYE'DE ÇALIŞAN FİZYOTERAPİSTLERDE İŞ İLE İLGİLİ VE SOSYODEMOGRAFİK ÖZELLİKLERİN MESLEĞE YÖNELİK TUTUM VE TÜKENMİŞLİK DÜZEYİ ÜZERİNDEKİ ETKİSİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışmanın amacı, fizyoterapistlerin tükenmişlik düzeylerini ve mesleğe yönelik tutumlarını belirlemek ve bu düzeyleri etkileyen değişkenleri incelemektir.

Yöntem: Araştırma, Kasım 2020 – Şubat 2021 tarihleri arasında farklı alanlarda çalışmakta olan fizyoterapistler üzerinde gerçekleştirildi. Fizyoterapistlerin mesleki tutum düzeyleri "Fizyoterapistlik Mesleğine Yönelik Tutum Ölçeği (FMYTÖ)" ile tükenmişlik düzeyleri ise "Tükenmişlik Ölçeği-Kısa Formu (TÖ-KF)" ile değerlendirilmiştir. Ek olarak, çalışmaya katılan fizyoterapistlerin sosyodemografik bilgileri ile çalışılan kurum, haftalık çalışma günü sayısı, haftalık çalışma saatleri, çalışılan fizyoterapi alanı, fizyoterapi alanındaki iş deneyimi, algılanan gelir durumu yeterliliği kaydedildi. Tüm değerlendirme formları, elektronik ortamda Google Dokümanlar ile hazırlanmış ve katılımcılara sosyal medya ve diğer iletişim yollarıyla ulaştırılmıştır.

Sonuçlar: Çalışmaya toplam 123 fizyoterapist katılmıştır. TÖ-KF 1,20 ila 6,40 puan arasında değişirken ortalama değer 3,44±1,14 idi. FMYTÖ toplam, mesleki memnuniyet alt ölçeği, mesleğin gerektirdiği nitelikler ve mesleğe yönelik genel kaygılar puan ortalamaları sırasıyla 133,22±13,56; 71,33±8,28; 37,07±3,66; 24,82±3,65'tir. Fizyoterapistlerin tükenmişlik düzeyleri ile mesleğe yönelik tutum ölçeği toplam puanı (r=-0,519, p=0,001), mesleki memnuniyet alt ölçeği (r=-0,509, p=0,001), mesleğin gerektirdiği nitelikler alt ölçeği (r=-0,374, p=0,001), mesleğe yönelik genel kaygılar alt ölçeği (r=-0,397, p=0,001) arasında istatistiksel olarak anlamlı korelasyonlar bulunmuştur.

Tartışma: Fizyoterapistlerin mesleğe yönelik tutumlarının ve bu tutumları etkileyen değişkenlerin incelenmesi önemlidir. Mesleğe yönelik olumsuz tutuma neden olan değişkenlerin incelenmesi, bu değişkenlerin olumlu tutuma yol açabilecek şekilde yeniden düzenlenmesini sağlayabilir. Bu durum fizyoterapistlerin mesleki başarılarının ve memnuniyetlerinin artmasına neden olabilir.

Anahtar Kelimeler: Tutum, Tükenmişlik, Meslek, Fizyoterapist

INTRODUCTION

Physiotherapy is a profession that is related to the promotion of health and well-being in addition to the prevention, treatment, or rehabilitation of human movement disorders or dysfunctions. Physiotherapy is to provide health services for people to develop, maintain and restore maximum motor and functional abilities throughout the life cycle (1).

Healthcare service providers are at risk of burnout. Healthcare professionals such as doctors, occupational therapists, nurses, and in particular physiotherapists are at high risk of burnout because of working in emotionally demanding situations and exposure to the psychological and physical problems of their clients (2).

The condition characterized by physical or emotional exhaustion as a result of prolonged stress or loss of energy is called burnout syndrome. Burnout which is a cause of chronic work-related stress is related to a major public health problem. It can also cause various mental and physical health problems such as burnout syndrome, depression, difficulty to concentrating, back and low-back pain, insomnia, and gastrointestinal disorders (2,3).

Burnout may adversely affect the quality of patient care. Although it is known that burnout has negative effects on professional values such as performance and satisfaction (2), its effect on the attitude towards the profession has not been examined.

The behaviours of individuals who continue the same profession towards their own profession are called professional attitude. All positive and negative professional attitudes of individuals towards their profession affect the satisfaction and success towards the profession (4). Individuals' attitudes towards their profession are usually related to their enjoying and adhering to their profession, being aware of the importance and respectability of their profession in terms of society, and that they have to constantly improve and update themselves professionally (5,6).

The attitudes of physiotherapists and physiotherapy students have been studied in a limited way in some studies (7,8). In addition, many studies have been conducted on the factors that cause or contribute to burnout (2,3,20). On the other hand, there is a limited number of studies in the literature examining the attitudes of physiotherapists towards their profession (12).

If all healthcare professionals, especially physiotherapists, feel professional burnout, they cannot establish a healthy relationship with their patients and provide them with health care (3). It is important to obtain significant findings by examining professional attitudes and burnout levels, which are important parameters that may affect physiotherapists to enjoy their profession, which has an important place in their daily lives, under healthy conditions, and for a long time. Research on burnout of physiotherapists and associated risk factors is a topical issue in the literature (23).

For these reasons, it is thought that there is a need for a study that examines the attitudes of physiotherapists towards the profession and investigates its relationship with burnout levels. Determining the physiotherapists' attitudes towards their profession and their level of burnout, examining the factors related to the work or sociodemographic characteristics that affect these levels will enable to predict their behaviours in these areas. It is thought that it can contribute to the quality of health services by measuring the levels of attitudes towards the profession and burnout among physiotherapists and taking precautions for the results obtained.

This research aims to examine whether physiotherapists' burnout and attitudes towards their profession differ across their sociodemographic and work-related characteristics. We assume that physiotherapists' burnout and attitudes towards their profession will differ according to their sociodemographic and work-related characteristics.

METHODS

Participants

Our research is a cross-sectional study whose population consists of physiotherapists working in Türkiye. The convenience sampling method was used in the research, and the research was carried out on physiotherapists living in Türkiye and working in different fields between November 2020 and February 2021. The professional attitude levels of the

physiotherapists participating in the study were evaluated with the "Attitude Scale towards Physiotherapy Profession" and their burnout levels were evaluated with the "Burnout Scale - Short Form". In addition, sociodemographic information of the physiotherapists participating in the study was recorded.

All evaluation forms in the study were electronically prepared and sent to the participants via social media and other communication channels. The ethics committee approval required for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Marmara University Faculty of Health Sciences with protocol number 59 dated 10.28.2020.

The Inclusion criteria for the study were to be an active physiotherapist within the borders of the Republic of Türkiye and to participate in the study voluntarily and to answer the questionnaire consistently and fully. Those who did not actively work as physiotherapists, who filled out the questionnaire incompletely or incorrectly, and who did not want to voluntarily participate in our research were excluded from the study.

The sample size was determined by convenience sampling method in order to availability of participants who intends to participate this study voluntarily (22). In addition, the determination of the sample size was based on the study of Horata et al. "Assessment of the Attitudes of the Physiotherapist and Physiotherapist Academicians towards Physiotherapist Profession Who Work in Türkiye" (12). In this study, the "Attitude Scale towards Physiotherapist Profession" score of those working as physiotherapists in a private institution was 135.74±14.22 and the "Attitude Scale towards Physiotherapist Profession" score of those working as a physiotherapist in a public institution was 128.97±21.69. It was calculated to include at least 107 cases in the study with 85% power and an α error coefficient of 0.05. Despite the possibility of repetitive or incomplete answers in the study, the number of cases in the study was increased by 30% to have at least 140 physiotherapists. GPower v.3.1.9.7 program was used to determine the sample size.

Data Collection Tools

The data of all participants were collected by filling in electronically prepared forms via self-report. Before the electronically prepared forms were filled by the participants, they were asked whether they read the preliminary information on the first page stating the scope and purpose of the study and whether they participated in the study voluntarily. Individuals who voluntarily agreed to participate in the study were able to access the evaluation forms by obtaining their informed consent. It took about 10 to 15 minutes to complete the questionnaire in electronic format on Google Docs. The questionnaire consisted of three different parts in order to evaluate the sociodemographic characteristics, attitudes towards the profession, and burnout levels of participants.

Work-Related and Socio-Demographic Characteristics Form

Sociodemographic and work-related characteristics of all physiotherapists participating in the study, such as age, gender, educational status, weekly working days and hours, working field and institution, work experience, perceived income adequacy, and perceived professional competence level were questioned.

The Scale of Attitude towards Physiotherapy Profession

The Scale of Attitude towards Physiotherapy Profession was developed by Turhan et al in 2018. The scale is a valid and reliable assessment tool for evaluating the attitude of physiotherapists towards their profession. The scale, which is a five-point Likert type, consists of 35 items. While the minimum score that can be obtained from the scale is 35, the maximum score that can be obtained is 175. High scores indicate a more positive attitude towards the profession of the participants, while low scores indicate a negative attitude towards the profession. The scale is divided into three different sub-categories "professional satisfaction", "qualifications required by the profession" and "profession-related concerns" (9).

Burnout Scale - Short Form

The scale, which was developed by Pines and Aronson in 1988 and is a seven-grade classification sys-

tem to measure the physical, emotional, and mental burnout level of individuals, consists of twenty-one items in total. The scale is the second most frequently used measurement tool in the literature to measure professional burnout after the "Maslach Burnout Inventory". Each item of the scale is scored as "1 - never" and "7 - always". The total score of the scale is found by summing each item's score and dividing it by the number of items. The scale total score takes a minimum of 1 and a maximum of 7 points. As the total score increases, the level of professional burnout increases. Turkish adaptation, validity, and reliability of the scale were carried out by Capri in 2006 (10).

Table 1. Sociodemographic Characteristics of the Physiotherapists Participating in the Study

Variables		Frequency (Percent)
Gender	Female	79 (64.2%)
	Male	44 (35.8%)
Education Status	Bachelor's Degree	85 (69.1%)
	Master's Degree	29 (23.6%)
	PhD Degree	9 (7.3%)
Working Institution	Academic Staff	18 (14.6%)
	Private Hospital	18 (14.6%)
	Public/University Hospital	25 (20.3%)
	Special Education and Rehabilitation Centers	28 (22.8%)
	Wellness Centers	10 (8.1%)
	Medical Centers	10 (8.1%)
	Others (Clubs, free, etc.)	14 (11.4%)
Working Field	Cardiopulmonary PT	7 (5.7%)
	Musculoskeletal/Orthopaedic PT	39 (31.7%)
	Neurologic PT	27 (22%)
	Paediatric PT	34 (27.6%)
	Sports PT	8 (6.5%)
	Others (Geriatrics, Rheumatology, Women's Health, Community Health)	8 (6.5%)
Working Hours (per week)	< 30 hours	15 (12.2%)
	31 - 40 hours	48 (39%)
	41 - 50 hours	44 (35.8%)
	51 - 60 hours	14 (11.4%)
	> 60 hours	2 (1.6%)
Working Days (per week)	1 day	2 (1.6%)
	2 days	1 (0.8%)
	3 days	5 (4.1%)
	4 days	5 (4.1%)
	5 days	69 (56.1%)
	6 days	37 (30.1%)
	7 days	4 (3.3%)
Professional Competence Perceived	Very Sufficient	6 (4.9%)
	Sufficient	72 (58.5%)
	Moderately Sufficient	38 (30.9%)
	Insufficient	6 (4.9%)
	Very Insufficient	1 (0.8%)
Work Experience	Less Than 1 Year	13 (10.6%)
	1 - 5 years	67 (54.5%)
	6 - 10 years	28 (22.8%)
	11 years and above	15 (12.2%)
Perceived Income Status	Sufficient	17 (13.8%)
	Partially Sufficient	68 (55.3%)
	Insufficient	38 (30.9%)

Statistical Analysis

The data obtained in the study were evaluated using the SPSS statistics program version 11.5 (Statistical Package for the Social Sciences Inc; Chicago, IL, ABD) at a 95% confidence interval, at a significance level of p<0.05. Descriptive statistical methods such as mean, standard deviation, percentage, and frequency were used in the study. In addition, minimum and maximum values and 95% confidence intervals were also given.

The conformity of the data to the normal distribution was evaluated with the Shapiro-Wilk Test and normal distribution graphs (histogram plot). One-way ANOVA test was applied to analyze the difference between groups, as the statistical analysis of the data provided the normal distribution conditions. Tukey's test was performed in the post-hoc analysis section to show the difference between which groups. Pearson Correlation Test was used to examine the relationship between physiotherapists' attitudes towards the profession and their burnout levels.

RESULTS

Between November 2020 and February 2021, 140 physiotherapists participated in our study by filling out our questionnaire. The answers of 17 participants were excluded from the study due to the fact that there were repetitive or incomplete answers among the 140 answers that filled out the questionnaire. Finally, the responses of 123 participants were evaluated in the study. Accordingly, 79 of the 123 physiotherapists participating in our study were female (64.2%) and 44 were male (35.8%). The age range of the participants ranged from 22 to 52 years, with a mean of 28.09±4.72 years. Of the 123 physiotherapists who participated in the study, 85 were "bachelor" (69.1%), 29 "master" (23.6%), and 9 "philosophy of doctorate-PhD"

Table 2. The Relationship between Levels of Burnout and Attitudes towards the Profession

Variables		Mean±SD	Correlation	n
			Professional Burnout	
	Professional Burnout	3.44±1.14	-	123
Subscales of Attitude Towards the Profession	**Professional Satisfaction**	71.33±8.28	r= -0.509 p= **0.001***	
	Qualifications Required by the Profession	37.07±3.66	r= -0.374 p= **0.001***	
	Profession-Related Concerns	24.82±3.65	r= -0.397 p= **0.001***	
	Total Score of Attitude Towards the Profession	133.22±13.56	r= -0.519 p= **0.001***	

Pearson Correlation Test, p<0.05, SD: Standard Deviation, n: number of participants.

Table 3. Investigation of Levels of Professional Burnout and Attitudes towards the Profession by Education Levels of Physiotherapists

	Education Status	n	Mean±SD	%95 Confidence Interval	Min - Max	p
Professional Burnout	Bachelor	85	3.62±1.18	[3.36-3.88]	1.40-6.40	**0.013***
	Master	29	3.16±0.90	[2.81-3.50]	1.40-5.40	
	PhD	9	2.62±0.95	[1.89-3.35]	1.20-4.20	
	Total	123	3.44±1.14	[3.28-3.64]	1.20-6.40	
Total Score of Attitudes Towards the Profession	Bachelor	85	131.05±14.49	[127.93-134.18]	93-164	**0.028***
	Master	29	137.82±10.06	[133.99-141.65]	120-163	
	PhD	9	138.88±9.03	[131.94-145.83]	120-154	
	Total	123	133.22±13.56	[130.80-135.64]	93-164	

One-Way ANOVA, p<0.05, SD: Standard Deviation, n: number of participants, Min: Minimum, Max: Maximum.

Table 4. Investigation of Levels of Professional Burnout and Attitudes towards the Profession by Working Field of Physiotherapists

	Working Field	n	Mean±SD	%95 Confidence Interval	Min - Max	p
Professional Burnout	Cardiopulmonary PT	7	2.97±0.82	[2.20-3.73]	2.10-4.20	0.121
	Musculoskeletal/ Orthopaedic PT	39	3.28±1.03	[2.95-3.62]	1.60-6.00	
	Neurologic PT	27	3.82±1.30	[3.30-4.33]	1.40-6.20	
	Paediatric PT	34	3.64±1.10	[3.25-4.02]	1.70-6.40	
	Sports PT	8	2.96±1.15	[1.99-3.92]	1.40-4.50	
	Others	8	2.97±1.17	[1.99-3.95]	1.20-4.80	
	Total	123	3.44±1.14	[3.23-3.64]	1.20-6.40	
Total Score of Attitudes Towards the Profession	Cardiopulmonary PT	7	141.28±16.05	[126.43-156.13]	112-163	0.565
	Musculoskeletal/ Orthopaedic PT	39	133.12±11.97	[129.24-137.01]	94-150	
	Neurologic PT	27	132.11±14.36	[126.42-137.79]	93-163	
	Paediatric PT	34	132.00±14.62	[126.89-137.10]	103-164	
	Sports PT	8	137.62±15.82	[124.39-150.85]	118-163	
	Others	8	131.25±8.77	[123.91-138.58]	118-143	
	Total	123	133.22±13.56	[130.80-135.64]	93-164	

One-Way ANOVA, p<0.05, SD: Standard Deviation, n: number of participants, Min: Minimum, Max: Maximum, Others: Geriatrics, Rheumatology, Women Health, Community Health.

(7.3%) degree (Table 1). In addition to this, working field and institution, professional competence perceived, perceived adequacy of income, work experience, and number of working days and hours per week of the physiotherapists participating in the study were examined and presented in Table 1.

While the burnout levels of the physiotherapists participating in the study ranged from 1.20 to 6.40 points, the mean value was 3.44±1.14. The total score on the scale of attitude towards the profession was 133.22±13.56; the mean scores of professional satisfaction subscale, qualifications required by the profession subscale, and profession-related

Table 5. Investigation of Levels of Professional Burnout and Attitudes towards the Profession by Working Institute of Physiotherapists

	Working Institute	n	Mean±SD	%95 Confidence Interval	Min - Max	p
Professional Burnout	Academic Staff	18	3.01±0.77	[2.62-3.40]	1.70-4.20	**0.001***
	Private Hospital	18	3.51±1.16	[2.92-4.09]	1.70-6.40	
	Public/University Hospital	25	3.01±1.00	[2.59-3.43]	1.20-5.50	
	Special Education and Rehabilitation Centers	10	4.19±1.09	[3.40-4.97]	2.40-6.00	
	Wellness Centers	28	4.01±1.05	[3.60-4.41]	1.90-6.20	
	Medical Centers	10	3.23±1.27	[2.32-4.13]	1.60-5.50	
	Others (Clubs, free, etc.)	14	3.15±1.31	[2.39-3.90]	1.40-5.50	
	Total	123	3.44±1.14	[3.23-3.64]	1.20-6.40	
Total Score of Attitudes Towards the Profession	Academic Staff	18	138.83±10.62	[133.55-144.11]	120-163	0.205
	Private Hospital	18	133.94±10.40	[128.77-139.11]	107-149	
	Public/University Hospital	25	130.88±13.89	[125.14-136.61]	94-155	
	Special Education and Rehabilitation Centers	10	131.90±12.65	[122.84-140.95]	122-163	
	Wellness Centers	28	129.07±16.66	[122.61-135.53]	93-164	
	Medical Centers	10	133.80±11.48	[125.58-142.01]	118-156	
	Others (Clubs, free, etc.)	14	138.14±13.49	[130.35-145.95]	118-163	
	Total	123	133.22±13.56	[130.80-135.64]	93-164	

One-Way ANOVA, p<0.05, SD: Standard Deviation, n: number of participants, Min: Minimum, Max: Maximum.

Table 6. Investigation of Levels of Professional Burnout and Attitudes towards the Profession by Work Experience of Physiotherapists

	Work Experience	n	Mean±SD	%95 Confidence Interval	Min - Max	p
Professional Burnout	Less Than 1 Year	13	3.78±1.30	[2.99-4.57]	1.60-6.20	0.520
	1 - 5 years	67	3.47±1.07	[3.21-3.73]	1.40-6.00	
	6 - 10 years	28	3.35±1.27	[2.86-3.85]	1.20-6.40	
	11 years and above	15	3.16±1.08	[2.56-3.75]	1.90-6.20	
	Total	123	3.44±1.14	[3.23-3.64]	1.20-6.40	
Total Score of Attitudes Towards the Profession	Less Than 1 Year	13	134.00±13.98	[125.55-142.44]	114-155	0.936
	1 - 5 years	67	133.70±12.80	[130.57-136.82]	104-164	
	6 - 10 years	28	131.82±14.36	[126.25-137.39]	94-163	
	11 years and above	15	133.06±16.06	[124.17-141.96]	93-154	
	Total	123	133.22±13.56	[130.80-135.64]	93-164	

One-Way ANOVA, p<0.05, SD: Standard Deviation, n: number of participants, Min: Minimum, Max: Maximum.

Table 7. Investigation of Levels of Professional Burnout and Attitudes towards the Profession by Perceived Income Status of Physiotherapists

	Perceived Income Status	n	Mean±SD	%95 Confidence Interval	Min - Max	p
Professional Burnout	Sufficient	17	2.42±0.82	[1.99-2.84]	1.20-3.50	**0.001***
	Partially Sufficient	68	3.34±1.01	[3.09-3.58]	1.40-6.20	
	Insufficient	38	4.08±1.12	[3.71-4.45]	2.30-6.40	
	Total	123	3.44±1.14	[3.23-3.64]	1.20-6.40	
Total Score of Attitudes Towards the Profession	Sufficient	17	140.41±11.42	[134.53-146.28]	123-163	**0.006***
	Partially Sufficient	68	134.11±14.11	[130.70-137.53]	93-164	
	Insufficient	38	128.42±11.84	[124.52-132.31]	94-148	
	Total	123	133.22±13.56	[130.80-135.64]	93-164	

One-Way ANOVA, p<0.05, SD: Standard Deviation, n: number of participants, Min: Minimum, Max: Maximum.

concerns subscale were 71.33±8.28, 37.07±3.66, 24.82±3.65, respectively (Table 2). There are statistically significant correlations between burnout levels of physiotherapists participating in the study and total score in the scale of attitude towards the profession (r=-0.519, p=0.001), professional satisfaction subscale (r=-0.509, p=0.001), qualifications required by the profession subscale (r=-0.374, p=0.001), profession-related concerns subscale (r=-0.397, p=0.001) (Table 2).

When the levels of burnout and attitudes towards the profession are examined according to education status, working field and institution, work experience, and perceived income status of physiotherapists participating in the study. According to the education status of physiotherapists participating in the study, a statistically significant difference was found in the burnout level (p=0.013) and the total score on the scale of attitude towards the profession (p=0.028) (Table 3).

According to the Tukey Test result, which was analyzed to determine the source of the difference, physiotherapists with a bachelor's degree had higher burnout scores than those with a PhD degree. Physiotherapists with a master's degree had a higher score in terms of total score on the scale of attitude towards the profession compared to those with a bachelor's degree. According to the working field of physiotherapists participating in the study, no statistically significant difference was found in the burnout level (p=0.121) and total score on the scale of attitude towards the profession (p=0.565) (Table 4). According to the working institution of physiotherapists participating in the study, a statistically difference was found in the values of burnout level (p=0.001) (Table 5).

According to the Tukey Test result, which was analyzed to determine the source of the difference, the physiotherapists working in the special education and rehabilitation center had higher burnout scores than those working as academic staff at the university and those working in the public/univer-

sity hospital. According to the work experience of the physiotherapists participating in the study, no statistically significant difference was found in the burnout level (p=0.520) and the total score on the scale of attitude towards the profession (p=0.936) (Table 6). According to the perceived income status of the physiotherapists participating in the study, a statistically significant difference was found between the level of burnout (p=0.001) and the total score on the scale of attitude towards the profession (p=0.006) (Table 7). According to the Tukey Test result, which was analyzed to determine the source of the difference, those with low perceived income status had a higher burnout score than those with partially sufficient and sufficient perceived income status. In addition, those with sufficient perceived income status had a higher total score on the scale of attitude towards the profession than those with insufficient perceived income status.

DISCUSSION

Professional burnout syndrome is a condition characterized by fatigue, which can lead to negative behaviours and attitudes towards one's self, work, and colleagues, reduce occupational satisfaction and work efficiency, and is called occupational burnout syndrome. All of the common behaviours that people working in the same profession develop towards their jobs are called professional attitudes. Physiotherapists, one of the most important occupational groups working in the field of health, spend most of their day in their professional lives (11,12).

It is important to obtain significant findings by examining the professional attitudes and burnout levels, which are important parameters that may affect physiotherapists to enjoy their profession, which has an important place in their daily lives, under healthy conditions and for a long time. Therefore, in this study, it was investigated whether having different education statuses and working experience among physiotherapists affect their levels of burnout and attitudes towards the profession.

When the sociodemographic characteristics of the physiotherapists participating in our study were examined, it was seen that they were similar to the literature. In a study by Şimşek et al. examining the burnout level of physiotherapists, 61% of the 114 physiotherapists included in the study were female and 39% were male (13). In another study by Tığlı et al., examining the burnout level of physiotherapists, approximately 62% of the 90 physiotherapists included in the study were women; the mean age of these physiotherapists was 27.56 years (14). When the education status of the physiotherapists included in this study are examined (14), it is seen that the physiotherapists who have bachelor's degree are the most in number and the physiotherapists who have PhD degree are the least, which is similar to the data in our study.

Among the physiotherapists included in our study, as the institution they work; academic staff at university, public or private hospital, private education and rehabilitation center, wellness center, medical center, other for those who work independently or in sport clubs were asked to choose one of options. The physiotherapists included in our study were approximately equally distributed among these options, and the highest distribution was special education and rehabilitation centers with 28 physiotherapists, the least distributions were in wellness or medical centers with 10 physiotherapists in each. In another study examining the burnout levels of physiotherapists, the distributions in terms of the institute where the physiotherapists worked were approximately similar to our study (15).

While many studies have been conducted examining the burnout levels of physiotherapists working in Türkiye (11,13,14,16), only one study examining the attitudes towards the profession among physiotherapists has been found (12). Controversy results have been encountered in studies examining the burnout levels of physiotherapists in the literature. The main reason for these controversial results can be shown as the use of different scales to measure the burnout levels of physiotherapists in the studies and dividing the status of physiotherapists included in the study into subgroups in different ways, not with standard methods.

While the Masclach Burnout Inventory was generally used to assess the level of burnout in studies in the literature (17,18), we used the Burnout Scale - Short Form, which is a relatively new, rapid, and easy scale to fill, in contrast to the literature.

In a study examining the burnout levels of occu-

pational therapists working in the public sector in Türkiye (19), the level of burnout was measured using the Burnout Scale - Short Form, which we also used in our study, which was developed by Pines and Aronsson and translated into Turkish by Çapri et al. The burnout level of the physiotherapists included in our study (3.44±1.14) and the burnout levels of the occupational therapists working in the public sector in the study (3.39±0.91) conducted by Abaoğlu et al. are similar (19).

In a study examining burnout levels in physiotherapists by Pustulka-Piwnik et al., it was concluded that physiotherapists working in hospitals have higher emotional exhaustion levels (20). Among the physiotherapists included in our study, those working in special education and rehabilitation center had higher burnout levels than those working in university as academic staff or working in public/university hospitals. We attribute the main reason for this situation to the fact that physiotherapists working in special education and rehabilitation centers in Türkiye do not have a job guarantee compared to those working in public and academic environments, and their salaries are relatively low.

According to the findings of our study, institutions where physiotherapists work do not statistically affect their level of attitude towards the profession. On the other hand, in parallel with their burnout levels, physiotherapists with the highest scores of attitude towards the profession were the physiotherapists working as academic staff at the university, while the lowest score belonged to those working in special education and rehabilitation center.

In a study by Corrado et al that investigated burnout syndromes of Italian physiotherapists (21), male and young physiotherapists were more prone to develop high levels of desensitization compared to their female and more experienced colleagues. In our study, unlike this study, the level of burnout did not differ according to gender and age. According to the results of our study, the field in which the physiotherapists work and their work experiences are not among the factors that significantly affect the levels of burnout and attitudes towards the profession of physiotherapists. Although the findings show that the work experience of physiotherapists does not significantly affect the level of professional burnout, it is reported that the time spent in the profession reduces the level of burnout proportionally, contrary to expectations. This is one of the important findings of our study. In our study, the highest burnout level belonged to physiotherapists with less than 1 year experience, while the lowest burnout level belonged to physiotherapists who had worked for more than 11 years. We associate the main reason why the level of burnout in the profession is higher in relatively inexperienced physiotherapists with reasons such as job anxiety, low salary, inadequacy in the profession, and new lifestyle after graduation. Although there was no statistically significant difference in the levels of attitude towards the profession, the highest score belonged to the physiotherapists who worked less than 1 year. We basically attribute this situation to the decrease in the level of attitude towards the profession with the increase in professional experience.

Unlike the studies in the literature, in our study, burnout and attitudes towards the profession of physiotherapists were also examined according to their working fields. Although there was no statistical difference between physiotherapists working in different fields in terms of burnout and attitude towards the profession, the physiotherapists with the highest burnout score and lowest score in the level of attitude towards the profession were those working in the neurological and paediatric fields. The fact that physiotherapists working in both of these fields work with their patients relatively longer compared to other fields and their patients' functional disability levels are considered to be the main reasons for this situation. As a matter of fact, it is known that the feeling of burnout can easily develop in the health sector where long-term care services are provided (3).

According to the results of our study, the levels of burnout and attitude towards the profession are affected by the education level of physiotherapists. Physiotherapists who have bachelor's degree had higher burnout levels than those who have PhD degree. Physiotherapists who have bachelor's degree had a lower score for the level of attitude towards the profession compared to physiotherapists with postgraduate education who had master's or doctorate degrees. We attribute the reason for this sit-

uation to the fact that while the physiotherapists at the doctoral level participating in our study have the opportunity to find a job easily under better working conditions in various institutions such as universities and research centers in our country, especially the academic staff, the physiotherapists at the graduate level, on the contrary, have job anxiety.

One of the important findings obtained in our study was that the perceived income levels of physiotherapists were an important parameter that affected the score of attitude towards the profession in addition to occupational burnout. Accordingly, while those with insufficient perceived income had a higher burnout score than those with partially sufficient and sufficient income, those with sufficient income had a higher occupational attitude score than those with insufficient income. The data we obtained in our study are as expected and it is thought that with the improvement of the income level of physiotherapists, more positive results will be obtained in terms of level of burnout and attitude towards the profession.

While the burnout levels of the physiotherapists included in our study were 3.44±1.14 points, the total score of the attitude scale towards the profession was 133.22±13.56 points. There is a moderately statistically significant correlation between the levels of burnout and the total score of the scale of attitude towards the profession of the physiotherapists participating in the study. This relationship between the level of burnout and the attitude towards the profession is expected and acceptable. This result shows that the burnout level of physiotherapists is one of the important factors that can change their attitudes and behaviours towards their profession. There is only one study in which we can compare the findings obtained from our study with the studies conducted in the literature in terms of the level of attitude towards the profession of physiotherapists working in Türkiye. The total score of the attitude scale towards the profession of 200 physiotherapists included in a study conducted by Taşvuran-Horata et al. was 133.94±6.72. In this study, it was reported that there was a moderate positive relationship between professional attitude and job satisfaction (12). Any study investigating the relationship between the level of burnout and the score of attitude towards the profession has not been found in the literature. Therefore, this finding of our study may shed light on future studies. However, there is also one more study which we may compare our results investigating the relationship between burnout and professional attitude. In this study by Rodriguez-Nogueira et al (24), it was found that higher levels of burnout are associated with lower levels of empathy. So if we equate empathy with professional attitude, we interpreted that we had the similar results.

In our study, unlike the studies in the literature in terms of studies examining the burnout levels of physiotherapists, working field and perceived professional competence, and perceived income status were also questioned. In terms of examining these parameters, which play an important role in the professional lives of physiotherapists, our study has the potential to shed light on future studies.

There are some limitations of our study. The most important of these limitations was that the physiotherapists were not distributed homogeneously to all groups in equal numbers. For example, while 8 physiotherapists working in the field of sports participated in the study; 34 physiotherapists working in the paediatric field took part in the study. Another important limitation was the number of physiotherapists included in our study. Although a power analysis was conducted regarding our study, considering the number of physiotherapists working in Türkiye, it is thought that the number of 140 physiotherapists who filled out the questions in the study was not sufficient. In addition, conducting the research online may have caused bias in sample selection.

In conclusion, a moderately statistically significant correlation between the levels of burnout and the total score of the scale of attitude towards the profession of the physiotherapists participating in this study. This result shows that the burnout level of physiotherapists is one of the important factors that can change their attitudes and behaviours towards their profession.

The findings of this study show that while the levels of burnout are affected by the education status, working institute, and perceived income status of the physiotherapists, the levels of attitude towards

the profession are affected by the education status and perceived income status of the physiotherapists.

This study was carried out to contribute to the understanding of the burnout syndrome experienced by physiotherapists working in Türkiye and the factors that affect and do not affect the level of professional attitude they have. The results from this study can be useful for not only physiotherapists but also other health professionals to deliver high-quality health care service. More research is needed with physiotherapists working in various settings to gain an understanding of the factors that promote burnout and attitude towards the profession.

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IS THERE ANY DIFFERENCE IN COMPUTERIZED ANALYSIS OF HANDWRITING SKILLS BETWEEN CHILDREN WITH LOW AND TYPICAL VISION?

ORIGINAL ARTICLE

ABSTRACT

Purpose: It is of great importance to evaluate children's writing skills, as this ability affects their academic achievement. Technological analysis methods can now be used to evaluate the writing skills of school-age children with low vision. The aim of this case- control study is to analyse the writing skills of children with low vision using a computerized program and to compare their results with those of their typically developing peers with normal vision.

Methods: Eighteen school-age children with low vision and 24 children with typical visual development (n=42) participated in the present study. Each of the children wrote a 20-word sample standard sentence; the samples were then analysed using the MovAlyzeR (Neuroscript LLC, USA) computerized analysis system (version 6.1) to describe the spatial and dynamic characteristics of their writing.

Results: The mean age of the children with low vision were 9.72±2.11 years and the control group were 10±2.02 years. Statistically significant differences were found in the handwriting samples in terms of the average width of the letters, horizontal start, vertical start and length (Respectively; p=0.000, p=0.010, p=0.000, p=0.030). It was found that the results obtained in children with low vision were higher in these variables. This result is in favor of typically developing children with normal vision.

Conclusion: The results indicated that the school-age children with low vision wrote letters of larger dimensions than their peers with typical vision. This may be due to the difficulty of discerning the spatial dimensions of handwritten letters or because of the diminished visual acuity in children with low vision.

Keywords: Child, Low vision, Performance and Analysis, Task Handwriting

AZ GÖREN VE TİPİK GELİŞİM GÖSTEREN ÇOCUKLAR ARASINDA BİLGİSAYARLI ANALİZDE EL YAZISI BECERİSİ AÇISINDAN FARK VAR MIDIR?

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Çocukların yazma becerilerinin değerlendirilmesi akademik başarıyı etkilediği için büyük önem taşır. Okul çağı az gören çocukların yazma becerilerini değerlendirmek için teknolojik analiz yöntemleri kullanılabilir. Bu vaka kontrol çalışmasının amacı, az gören çocukların bilgisayar programı kullanarak yazma becerilerini analiz etmek ve sonuçlarını normal görmeye sahip tipik gelişim gösteren yaşıtlarıyla karşılaştırmaktır.

Yöntem: Bu çalışmaya okul çağında az gören 18 çocuk ve tipik görsel gelişimi olan 24 çocuk (n=42) katılmıştır. Çocukların her biri 20 kelimelik örnek bir standart cümle yazdı; örnekler daha sonra yazılarının uzamsal ve dinamik özelliklerini tanımlamak için MovAlyzeR (Neuroscript LLC, ABD) bilgisayarlı analiz sistemi (versiyon 6.1) kullanılarak analiz edildi.

Sonuçlar: Az gören çocukların yaş ortalaması 9,72±2,11, kontrol grubunun yaş ortalaması ise 10±2,02 idi. Harflerin ortalama genişliği, yatay başlangıç, dikey başlangıç ve uzunluk açısından el yazısı örneklerinde istatistiksel olarak anlamlı farklılıklar bulunmuştur (Sırasıyla; p=0.000, p= 0.010, p=0.000, p=0.030). Az gören çocuklarda elde edilen sonuçların bu değişkenlerde daha yüksek olduğu saptanmıştır. Bu sonuç, normal görüşe sahip, tipik gelişim gösteren çocuklar lehinedir.

Tartışma: Sonuçlar, az gören okul çağı çocuklarının tipik görmeye sahip akranlarına göre daha büyük boyutlu harfler yazdıklarını göstermiştir. Bunun nedeni, el yazısı harflerinin uzamsal boyutlarını ayırt etme güçlüğü veya az gören çocuklarda görme keskinliğinin azalması olabilir.

Anahtar Kelimeler: Çocuk, Az Görme, Görev Performansı ve Analizi, El Yazısı

INTRODUCTION

Handwriting is an important activity for school-age children, who spend a considerable amount of time engaged in activities involving handwriting in their classes. Writing-related activities also have a significant impact on academic achievement (1). The act of writing includes fine-motor skills such as visual-motor control, legibility, speed and performance, as well as cognitive and perceptual skills and kinaesthetic perception (2,3). A child's visual acuity plays an important role in developing these skills. The writing skills of children with low vision are weakened because they cannot pick up on as many cues from their environment as their peers with typical visual development, particularly those related to visual-motor control (4). Children with low vision may need optical aids even if their visual acuity is sufficient to enable them to identify letters in writing activities (5).

When considering the decrease in visual stimuli in children with low vision, even those who use optical aids write more slowly than their peers: they have more difficulty seeing the movement of their pen or pencil and writing on a straight line (3,4,6). They must also analyse what they are writing as they write, including the width and height of and gaps between letters. It is therefore vital to assess children's writing skills regularly, as it greatly affects the academic achievement of children with low vision (7).

Despite the fact that approximately 3 million children worldwide have low vision, the number of studies conducted on the problems affecting this population is limited (7). Although some research investigating the writing skills of children with low vision has been done (3,4,8), to the best of our knowledge this is the first study to analyse the writing skills of school-age children with low vision using scan and analysis computer technology. Technological devices such as computers and tablets were used in the assessments conducted for this study and the sample population included children with different diagnoses and typical development.

In the studies, technological devices such as computers and tablets were used in children with different diagnoses (9,10), but in these studies, writing short sentences or following figures on tablets were measured. In this study, unlike their work, it is a technological analysis of their own handwriting that children are familiar with as the student role in the school setting.

In this context, the aim of this study is to compare the writing skills of children with low vision with that of their peers, who typically have a well-developed vision, using a computerized text analysis system.

METHODS

This research was approved by the Non-Interventional Ethics Committee of Hacettepe University (11th December 2018, Decision number: GO 18/880). The study protocol was explained to all children and their parents and those who provided signed informed consent were included. The study was planned as a descriptive study and was conducted between December 2018 and May 2019.

Participants

The study population comprised school age children with low vision who applied to Hacettepe University Faculty of Physical Therapy and Rehabilitation in Ankara. A group of children with typically developed vision comprised the control group. Each child who took part in the study was given information about the research, and both the children and their families read and signed a consent form indicating informed consent to participate. School-age children with low vision consulted in clinic by eye specialists. Their diagnosis and visual acuity information was obtained from the health report. All school- age children had moderate low vision. Any child with a disability other than low vision, which could affect writing, was excluded from the study. School-aged children in the same age group with typical vision and no other disabilities were also included.

Procedure

The participants were evaluated in one-on-one interviews. Each participant's age, gender, height, weight and body mass index were recorded. Each participant's dominant hand was defined as the hand he or she used most frequently. A physiother-

apy specialist performed the evaluations in a quiet environment. Each child's writing speed was measured using the Jebsen Hand Function Test (JHFT) while he or she sat at a table in a chair with hip and knee joints flexed at 90 degrees and ankles in a neutral position (11). The children were given a sentence consisting of 20 words typed in 12 point font size and Verdana type (3,4). It was placed in front of them on the table and they were asked to copy it out on a piece of paper. The time each child took to write out the sentence was recorded.

All of the children successfully completed the copying task. The sample sentences were scanned and recorded at 900 dpi resolution. The kinematic properties of the sentences (trace length, vertical size, horizontal size, vertical start, horizontal start, loop area average width, straightness rel error and slant) were analysed using MovAlyzeR (Neuroscript LLC, USA) computerized text analysis system (version 6.1) (12) (Figure 1).

The following aspects of the participants' handwriting samples were measured. The vertical and horizontal sizes were defined as the height and width of the letters. The vertical and horizontal starts were defined as the starting position on the vertical plane (Y axis) and horizontal plane (X axis). The loop area was described as the area of roundness and width of letters such as g, h, o, y, b and d. The straightness rel error was called deviations from smoothness during writing. The slant variable indicated negative values (-) to the left and positive (+) values to the right (13). The assesment of the children and the analyzing of the data took 30 minutes.

Statistical Analysis

The statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) for Windows version 22 (IBM, Armonk, NY, United States). Whether the variables were distributed normally was determined using a statistical analysis method (skewness and kurtosis, the Shapiro-Wilk test or the coefficient of variation) and a visual analysis method (detrended Q-Q plot, histogram or a normal Q-Q plot). Descriptive statistics were derived using the mean and standard deviation for parametric variables (age, height, weight and body mass index) and the median interquartile range for non-parametric variables (trace length, vertical size, horizontal size, vertical start, horizontal start, average width of loop area, straightness rel error and slant). The Mann-Whitney U test was used to determine the differences between the two groups for non-parametric variables. According to the power analysis, the number of children has been determined as at least 22 participants in the each group (Type I error<0.05, Type II error=0.80) (3).

RESULTS

The mean age, the school- age children with low vision (n=18) were 9.72±2.11 years, the control group (n=24) were 10±2.02 years, and the dominant hand for all of the participants was the right hand. In this study, it would have been sufficient to include 22 children in each group as a result of the power analysis. We aimed to include 24 people in each group. The writing analysis of 6 children with low vision could not be performed by the program then the study group was completed with 18 people. A total of 42 children participated in the study: 18 (nine boys and nine girls) in the study group and 24 (12 boys and 12 girls) in the control group. The participants' demographic data is presented in Table 1.

When the writing analyses of the groups were compared, statistically significant differences were found between the groups' writing samples

Table 1. Demographic Characteristics of Participants

	Study Group Mean±SD	Control Group Mean±SD
Age (year)	9.72±2.11	9.88±2.04
Height (cm)	140±13	142±13
Weight (kg)	32.86±9.28	35.33±9.3
BMI (kg/m²)	16.62±3.24	17.36±2.97

SD: Standard Deviation, cm: centimeter, kg: kilogram, m: meter, BMI: Body Mass Index.

Table 2. Comparisons of Data Related to Writing According to Participants' Computerized Writing Analysis

	Study Group		Control Group		p
	Median	IQR	Median	IQR	
Vertical Size	0.17	0.09	0.15	0.04	0.030*
Average Thickness	0.09	0.04	0.07	0.02	0.000**
Vertical Start	223.24	121.61	92.83	47.66	0.000**
Horizontal Start	525.78	620.62	483.04	57.27	0.010*
Loop Area	0.01	0.009	0.02	0.007	0.010*
Straightness Rel Error	0.02	0.02	0.02	0.01	0.620
Slant	-1.53	2.73	-2.61	5.92	0.370
Horizontal Size	0.28	0.16	0.23	0.05	0.240
JHFT (Writing time) (sec)	200	571.25	81.5	63.25	0.000*

IQR: Interquartile range, JHFT: Jebsen Hand Function Test, sec: second *p<0.05, **p<0.001.

in terms of vertical size, average width, vertical start, horizontal start, loop area and writing speed (p<0.05). The high results was obtained in children with low vision in these variables. There were no other statistically significant differences between the groups in terms of the other variables evaluated by computerized text analysis. The data obtained from the computerized text analysis of the participants' samples are presented in Table 2.

DISCUSSION

The evaluation of the handwriting scanned by the MovAlyzeR (Neuroscript LLC, USA) computerized writing program revealed that on average, school-age children with low vision wrote their letters longer (vertical size), wider (average width) and with starting points which were higher (vertical start) and further to the right (horizontal start). These participants also produced letters with a narrower circular area (loop area) and had a slower writing speed (measured using the JHFT) than the control group.

As the children participating in the study were all in school, the two groups formed were homogeneous in terms of age; they were also homogenous in terms of their visual diagnosis and visual acuity, and the performance of the children with low vision was similar to that of children of similar age and condition reported in previous studies.

There have also been various studies analysing the writing skills of different age groups (14-18). The kinematic properties of children's handwriting have been studied in many different ways in the literature. In such study, changes in writing characteristics, pressure, direction, velocities and acceleration were examined in order to determine the quality and smoothness of handwriting (10,13). The methods used to detect differences in these variables usually involved digital tablets. In their kinematic writing analysis of school-age children, Guilbert et al. found that sensory input, particularly visual and proprioceptive cues, is more important for children than adults (19). Atasavun and Akı emphasized that their study, visual-motor control are also effective in writing skills of students with low vision (3). Güven and Atasavun Uysal have also found that similar results of their study with kinematic analysis in children. They stated that children with low vision performed greater stroke size except for the vertical size, more dysfluent movements, and slower writing speed, than children with typical development. They made the analysis by writing the short sentence allowed by the program (10). In the present study, unlike them, traditionally, children were asked to write 20 words with paper and pencil in a way they were familiar with. The wrote- sentences were scanned and assigned to the computer, and analysed and compared by the program.

Studies analysing the writing of children with low vision often use paper and pencil writing for evaluations, as this is the most frequently used writing method in school settings (3,4). For this reason, in the present study the participants were asked to write out their sample sentences using the paper-and-pencil method they were accustomed to. The sample sentences were then scanned onto a computer and analysed using MovAlyzeR version 6.1 (Neuroscript LLC, USA) an objective assessment method. The results of this study indicate that the vertical size and average width of letters

differed significantly between the two groups. It is thought that children with low vision tend to write longer and wider letters because of insufficient sensory input. These children also tend to locate the vertical and horizontal starts of their letters very differently, a discrepancy that is statistically significant. Children with low vision write letters that are higher and start further to the right than their peers because they tend to drop the letters into the visual field. The loop area of their letters was found to be significant as well. The circular features of some letters tended to be narrower when written by these students, suggesting that when they write they are attempting to ensure the integrity of the words. Future research is being planned which analysis will be more objective and suitable in the handwriting of children with low vision using a digital tablet and non-inking pen or using their pen and paper with computerized analyses systems.

In the previous studies conducted on the writing speed of children with low vision, the children's writing speed was evaluated with JHFT, and the results of all these studies indicated that children with low vision write more slowly than their peers (3,4,8). In the present study, it was found that school- age children with low vision wrote more slowly than the control group, which confirmed the trend reported in the literature. As they mentioned, we agreed that these difficulties may be due to a lack of visual cues (3,4,8). In a study on how writing is taught to children with low vision and typical development, it was found that children in both groups had difficulty writing a sentence in a straight line and their letters were oblique (3,4). The results of the present study confirm these findings in terms of straight rel error and slant: This may be because school-age children are taught the same the education program for their age group in Turkey, regardless of the school they attend. There was also no difference between the groups in terms of the average length of their sentences. The reason for this may be that children with low vision write most of their letters wider and their round letters narrower.

School-age children with low vision are used in line with the needs of writing training, with their optical devices, using contrast equipment, and in large font paper in proper posture should be included in the rehabilitation program.

The inability to analyze the writing of some children can be considered as a limitation of this study. However, the results among the data are significant.

This research is important because it is the first study to examine the handwriting written on paper by school- age children with low vision using a scan and computerized writing analysis system. The aim of the study was to use a computer program to analyse the writing characteristics of the participants' sentences written with paper and pencil. It was found that school- age children with low vision wrote thicker pencil lines, higher writing points, higher letters and narrower letters with a circular character; they also had a slower writing speed than their peers with typically developed vision.

Writing is an important factor for the academic achievement of low vision students. It is important that technological writing and evaluation training programs become more widespread in order to be more present in the society without lagging behind their peers. However, there are some criteria determined by the program for the analysis of the text. It should be kept in mind that the requirements with these encodings are important in the analysis of the text.

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ROTATOR CUFF DISORDERS: A SURVEY OF CURRENT PHYSIOTHERAPY PRACTICE IN TURKIYE

ORIGINAL ARTICLE

ABSTRACT

Purpose: One of the most important factors guiding the physiotherapy program for rotator cuff disorders (RCD) is the clinical preferences of the physiotherapist in light of the evidence. However, the management parameters are remarkably variable between physiotherapists. It was aimed to describe the current physiotherapy practice of Turkish physiotherapists for the management of RCD and to explore its parallelism with the research evidence, and with the clinical perspective in European countries.

Methods: A cross-sectional online survey based on a clinical scenario that describes a typical patient with symptoms of RCD was conducted during July/August 2020. Descriptive responses of 104 physiotherapists were reported and analyzed by grouping physiotherapists with special interest (SI) who have further clinical experience or specialized training on RCD and no special interest (NSI).

Results: The most preferred approaches were mobilization (82), scapular stabilization exercises (82), advice/education (71), and taping (62). The preference rate of cold therapy ($x2=4.303$, $p=0.038$) and isometric exercises ($x^2=4.248$, $p=0.039$) were significantly higher for physiotherapists with SI rather than NSI group.

Conclusions: The most preferred management strategies of mobilization, exercise, and advice/education have been aligned with the preferences of physiotherapists from European countries and the current research evidence. However, passive modalities were also highly preferred. The management strategies differ between the physiotherapists who have SI and NSI. The high degree of practice variability and passive treatment preference of physiotherapists for the patients with RCD might be due to a lack of following the current literature evidence regularly.

Keywords: Rotator Cuff, Shoulder, Survey/s

ROTATOR MANŞET PATOLOJİLERİ: TÜRKİYE'DE MEVCUT FİZYOTERAPİ UYGULAMALARI

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Rotator manşet patolojilerinde (RMP) fizyoterapi programına yön veren en önemli faktörlerden biri, bilimsel kanıtlar ışığında fizyoterapistin klinik tercihleridir. Bununla birlikte yönetim parametreleri fizyoterapistler arasında oldukça değişkendir. Bu çalışmada Türk fizyoterapistlerin RMP tedavisi için kullandıkları mevcut fizyoterapi uygulamalarının tanımlanması ve bu uygulamaların literatür kanıtları ve Avrupa ülkelerindeki klinik bakış açısı ile paralelliğinin incelenmesi amaçlandı.

Yöntem: RMP semptomları olan tipik bir hastayı tanımlayan bir klinik senaryoya dayalı kesitsel bir online anket Temmuz/Ağustos 2020 tarihleri arasında uygulandı. Yüz dört fizyoterapistin tanımlayıcı yanıtları, RMP ile ilgili daha fazla klinik deneyime veya eğitime sahip olan (SI) ve olmayan fizyoterapistler (NSI) olarak iki gruba ayrılarak raporlandı ve analiz edildi.

Sonuçlar: En çok tercih edilen yaklaşımlar mobilizasyon tercih edilen yaklaşımlar mobilizasyon (82), skapular stabilizasyon egzersizleri (82), tavsiye/eğitim (71) ve bantlamaydı (62). Soğuk uygulama ($x2=4,303$, $p=0,038$) ve izometrik egzersiz ($x^2=4,248$, $p=0,039$) tercih oranı SI grubundaki fizyoterapistler için NSI grubuna göre anlamlı olarak yüksekti.

Tartışma: En çok tercih edilen yönetim stratejileri olan mobilizasyon, egzersiz ve tavsiye/eğitim Avrupa ülkelerindeki fizyoterapistlerin tercihleri ve güncel literatür kanıtlarıyla uyumlu olarak bulundu. Ancak pasif modaliteler de yüksek oranda tercih edilmişti ve SI ve NSI gruplarındaki fizyoterapistlerin yönetim stratejileri de farklılık gösteriyordu. RMP hastaları için fizyoterapistler arasındaki yüksek oranda uygulama değişkenliği ve pasif tedavi tercihi, güncel literatür kanıtlarının düzenli olarak takip edilmemesine bağlı olabilir.

Anahtar Kelimeler: Rotator Manşet, Omuz, Anket

INTRODUCTION

Shoulder pain is one of common musculoskeletal problems encountered in primary healthcare institutions and it affects 15-30% of the general population (1,2). Of all cases of shoulder pain, up to 80% are derived from rotator cuff disorders (RCD) (3). The symptoms of pain and functional limitations according to RCD cause difficulties during activities of daily living, work, and sport (4,5). Over 40% of individuals with RCD reported continuing or recurring symptoms 12 months after onset (6).

Physiotherapy approaches constitute an important and comprehensive part of the treatment program for RCD (7). However, there has been considerable variability relating to the current physiotherapy practice (8-12). Along with the inadequacies in applying for evidence-based physiotherapy, the results of studies investigating the effectiveness of exercise therapy alone and exercise therapy combined with manual therapy are contradictory. (13, 14). In addition, recently the application of kinesiotaping has not been recommended and it was concluded that there is a lack of evidence of electrotherapy in the management of RCD (14-17).

As physiotherapists play a key role in the management of RCD, they should practice their profession based on current, valid, and relevant evidence. In this context, Littlewood et al. conducted a survey on physiotherapists to investigate the clinical practice for RCD and it was emphasized that the clinical practice of physiotherapists has a wide range of different perspectives which is limitedly supported by recent scientific evidence (19). Bury and Littlewood repeated the same survey after 5 years to understand whether the practice has been updated considering current evidence and they concluded that the practice had evolved in line with research evidence (20). It was reported that physiotherapy practice aligns with current evidence-based recommendations for the management of RCD by the studies, conducted in Belgium & Netherlands (BE & NL) and Italy (21,22).

To our knowledge, no similar research has been conducted to determine existing physiotherapy approaches for RCD in Türkiye. Hence, we aimed to identify the current physiotherapy practices of Turkish physiotherapists and investigate how their practices correspond with the current evidence, and additionally compare the results with circumstances in other European countries. Moreover, it was aimed to analyze the potential practice variabilities between physiotherapists with special interest (SI) who have further clinical experience or special education (i.e., specific training course in the management of RCD) and have no special interest (NSI).

METHODS

Study Design

This study was designed as a cross-sectional observational study. An online survey developed by Bury and Littlewood is based on a clinical scenario that describes a typical patient with symptoms of RCD and consisted of 11 questions about physiotherapy practice for the patient (20). The survey was adapted to the Turkish language with the permission of the authors. The translated survey was piloted by four senior clinicians, to have a clear translation before dissemination. According to feedback from the pilot process, some items of the open-ended question about prescribed exercise instructions (Question 8) were modified. The item of ''frequency'' was asked separately as daily and weekly frequency and the item of ''quality of movement'' was detailed as "pace" and "fluidity" in parentheses.

This study was approved by the Ethical Committee of Marmara University Health Science Faculty, with protocol number 25.06.2020/38 and conducted in accordance with the Declaration of Helsinki.

Sampling and Recruitment

The inclusion criteria comprised Türkiye-based physiotherapists. Several online sources were used to invite potential participants: a mail newsletter promoted by the Turkish Physiotherapy Association, community groups of physiotherapists on social media, and the researchers' professional contacts. Informed consent was implied through voluntary completion of the survey and hence written consent was not requested from participants.

Sample Size

The study aimed to reach the maximum number of participants collected during the data collection period: similar to the previous studies (20-22).

Table 1. Respondent's Experience and Practice Settings

Variables	SI (36)	NSI (68)	Total (%)
Years Qualified (n=104)			
<5 Years	16	37	53 (51.00 %)
5 Years to 10 Years	11	18	29 (27.90 %)
10 Years to 15 Years	7	7	14 (13.50 %)
15 Years to 20 Years	1	4	5 (4.80 %)
>20 Years	1	2	3 (2.90 %)
Practice Setting (n=104)			
Public Hospital	5	9	14 (13.50 %)
Education/Research Hospital	2	4	6 (5.80 %)
Private Clinic / Private Hospital	15	25	40 (38.50 %)
Sport Club	2	3	5 (4.80 %)
University/Research Center	7	17	24 (23.10 %)
Family Practice Center	1	0	1 (1.00 %)
Others	4	10	14 (13.50 %)

SI: Special interest in Rotator cuff disorders; NSI: No special interest in Rotator cuff disorders.

Data collection

As a precedent, the previous studies indicated that the total duration of one month was the optimal period for data collection (20-22). The survey was online, available via SurveyMonkey, during July/August 2020 for a month period.

Statistical Analysis

All responses were downloaded into Excel 2016 (Microsoft Corp. Redmond, WA, USA) from Survey Monkey. Descriptive statistics were shown by dividing into two groups as participants having a SI in RCD and those who had NSI. Chi-square tests were applied to investigate any between-group differences in the SAS Statistics version 9.4 (SAS Institute, Inc., Cary, NC). Qualitative data obtained from the open-ended questions were reviewed and discussed by researchers (B.A. and B.Ö) and summarized by constituting thematic categories and subcategories.

RESULTS

In total, 104 physiotherapists completed the survey. There were not any excluded participants due to the voluntary nature of filling out the survey. The data of the physiotherapists in terms of years qualified and practice setting are shown according to the distribution in Table 1.

Would you request any further information or undertake any further clinical tests?

Overall, 44.2% (46/104; 14 SI, 32 NSI) of Turkish physiotherapists would carry out further physical examination tests, 43.3% (45/104; 16 SI, 29 NSI) would require more subjective information, 36.5% (38/104; 9 SI, 29 NSI) would carry out further investigations and 34.6% (36/104; 16 SI, 20 NSI) would undertake further rehabilitation classification (Figure 1).

Which management strategies would you typically recommend for this patient?

The most preferred management strategies were mobilization (82/104; 78.8%; 29 SI, 53 NSI), advice/education (71/104; 68.3%; 27 SI, 44 NSI), taping (62/104; 58.7%; 22 SI, 40 NSI) and some form of exercise therapy (Figure 2).

Within the type of exercises 78.8% (82/104; 30 SI, 52 NSI) would use scapular exercises, 53.4% (55/104; 20 SI, 35 NSI) would use kinetic chain exercises, 50.0% (52/104; 23 SI, 29 NSI) would prescribe isometric exercises, 50.0% (52/104; 19 SI, 33 NSI) would prescribe isotonic exercises. While isometric exercises were frequently preferred by the SI group (63.9%), physiotherapists in the NSI group generally do not prefer this type of exercise (57.4%) (x^2=4.248, p=0.039).

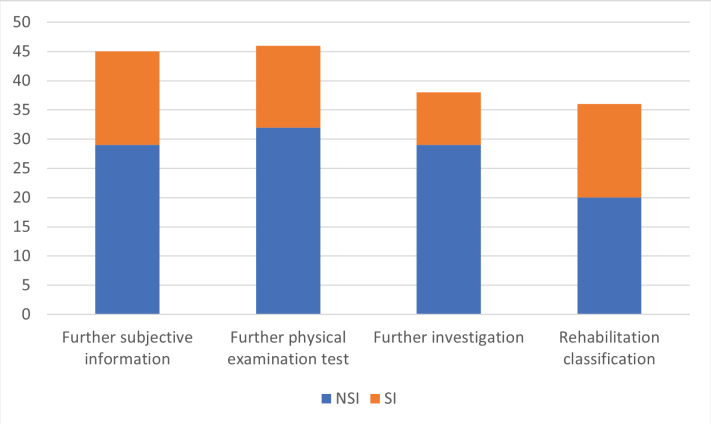

Figure 1. Would you request any further information or undertake any further clinical tests?

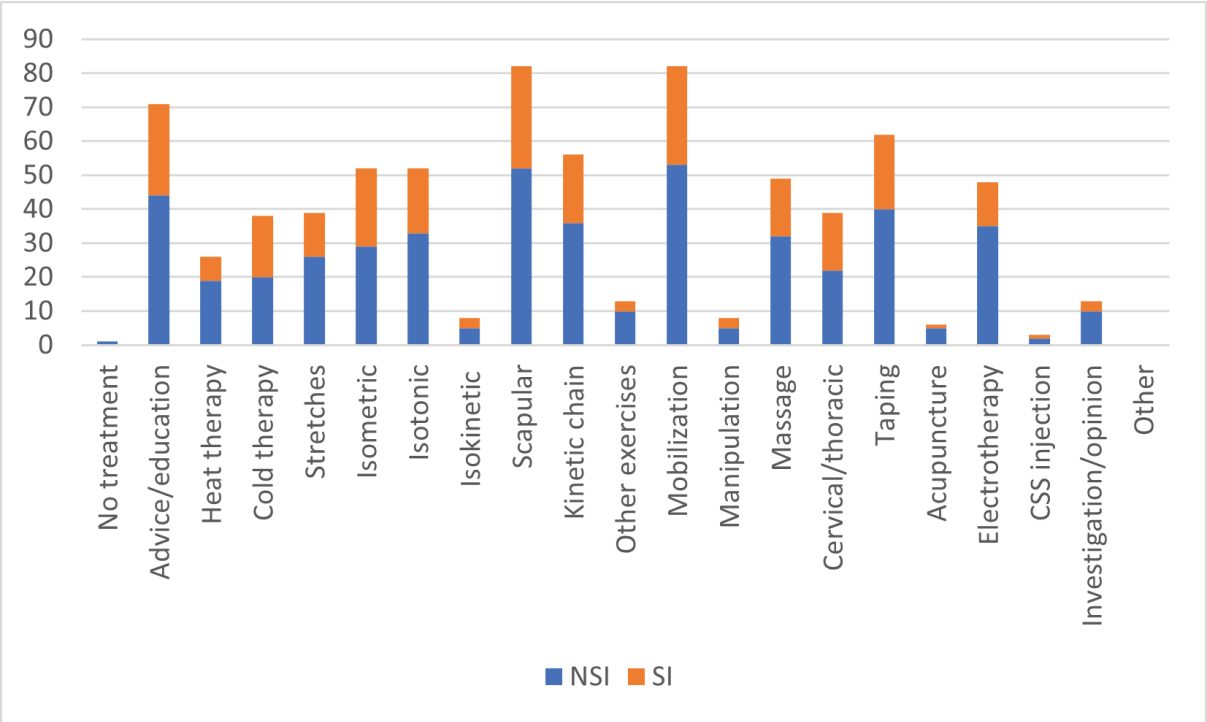

Figure 2. Which management strategies would you typically recommend for this patient?

Massage (49/104; 47.1%, 49/104; 17 SI, 32 NSI), electrotherapy (48/104; 46.2%, 13 SI, 35 NSI) treatment directed at cervical/thoracic spine (39/104; 37.5%, 17 SI, 22 NSI) and cold therapy (38/104; 36.5%, 18 SI, 20 NSI) were other used treatment modalities. A significantly greater proportion of the NSI group did not prefer cold therapy when compared to the SI group (x^2=4.303, p=0.038).

When prescribing exercises, what instructions do you generally give to the patient?

The first item of the open-ended question that addressed pain, 42% (42/100; 11 SI, 31 NSI) of respondents would recommend exercising with pain that is around the patient's pain threshold, 15% (15/100; 7 SI, 8 NSI) would instruct the patient to perform exercises with a pain that is below a certain value on the visual analog scale (e.g., below 5 or 6). A minority (9/100; 9%; 1 SI, 8 NSI)

Table 2. Treatment Delivery

Variables	SI (36)	NSI (68)	Total (%)
Treatment Setting (n=104)			
Face-to-face Appointments	10	16	26 (25.00%)
Home-based Program	2	1	3 (2.90%)
Face-to-face and Home-based Program	31	65	96 (92.30 %)
Group Class(es)	0	3	3 (2.90 %)
Other	2	0	2 (1.90 %)
Number of Times Typically Seen (n=104)			
Once	0	0	0 (0.00 %)
Twice	2	2	4 (3.80 %)
3 or 4 Times	7	13	20 (19.20 %)
5 or 6 Times	10	12	22 (21.20 %)
7 or 8 Times	5	7	12 (11.50 %)
9 or 10 Times	2	20	22 (21.20 %)
More than 10 Times	10	14	24 (23.10 %)
Typically, Duration of Treatment (n=104)			
Up to 3 Weeks	6	20	27 (26.00 %)
Up to 6 Weeks	18	21	39 (37.50 %)
Up to 8 Weeks	5	14	19 (18.30 %)
Up to 3 Months	4	7	11 (10.60 %)
Up to 6 Months	2	4	6 (5.80 %)
Up to 12 Months	1	1	2 (1.90 %)
Other	0	0	0 (0.00 %)

SI: Special interest in Rotator cuff disorders; NSI: No special interest in Rotator cuff disorders

would advise exercising with some level of pain if the symptoms disappeared in the following 3-12 hours, of which a higher proportion belonged to the NSI group.

Regarding the exercise load, the most common suggestions were loading under the guidance of pain (22/86; 25.5%; 10 SI, 12 NSI) and the patient's tolerance to load (19/86; 22%; 7 SI, 12 NSI). 16.2% (14/86; 4 SI, 10 NSI) of respondents suggested gradual progression when exercise loading. In relation to resistance, 15.1% (13/86; 6 SI, 7 NSI) of respondents would use some level of resistance.

In relation to exercise repetitions, the instructions were repetitions of less than ten (16/97; 16.4%; 9 SI, 7 NSI), ten repetitions (33/97; 34%; 10 SI, 23 NSI), and repetitions of greater than ten (24/97; 24.7%; 11 SI, 13 NSI), and "up to three sets" (19/97; 19.5%; 9 SI, 11 NSI).

In terms of daily exercise frequency, the most common responses were more than 3 times, (12/95; 12.6%; 3 SI, 9 NSI), 2 to 3 times (11/95; 11.5%; 7 SI, 4 NSI) or once (8/95; 8.4%; 3 SI, 5 NSI). On a weekly basis, most of the respondents would suggest every other day (47/91; 51.6%; 14 SI, 27 NSI) or 3 to 6 days (40/91; 43.9%; 15 SI, 25 NSI).

Concerning the exercise position, the most frequent response was prescribing exercise in terms of body position (e.g., standing, sitting) (37/72; 51.3%; 13 SI, 24 NSI). Another common response was using pain-free positions (17/72; 23.6%; 7 SI, 10 NSI). 9.7% (17/72; 7 SI, 10 NSI) of respondents mention the exercise position should depend on the exercise type. In relation to the quality of movement, the most common responses were slow (48/78; 61.5%; 20 SI, 28 NSI), controlled, and/or smooth (28/78; 35.8%; 12 SI, 14 NSI).

Concerning the progression of exercises, 31.6% (19/60; 9 SI, 10 NSI) of respondents stated that they would progress as pain or fatigue allows, and 16.6% (10/60; 2 SI, 8 NSI) would progress after be-

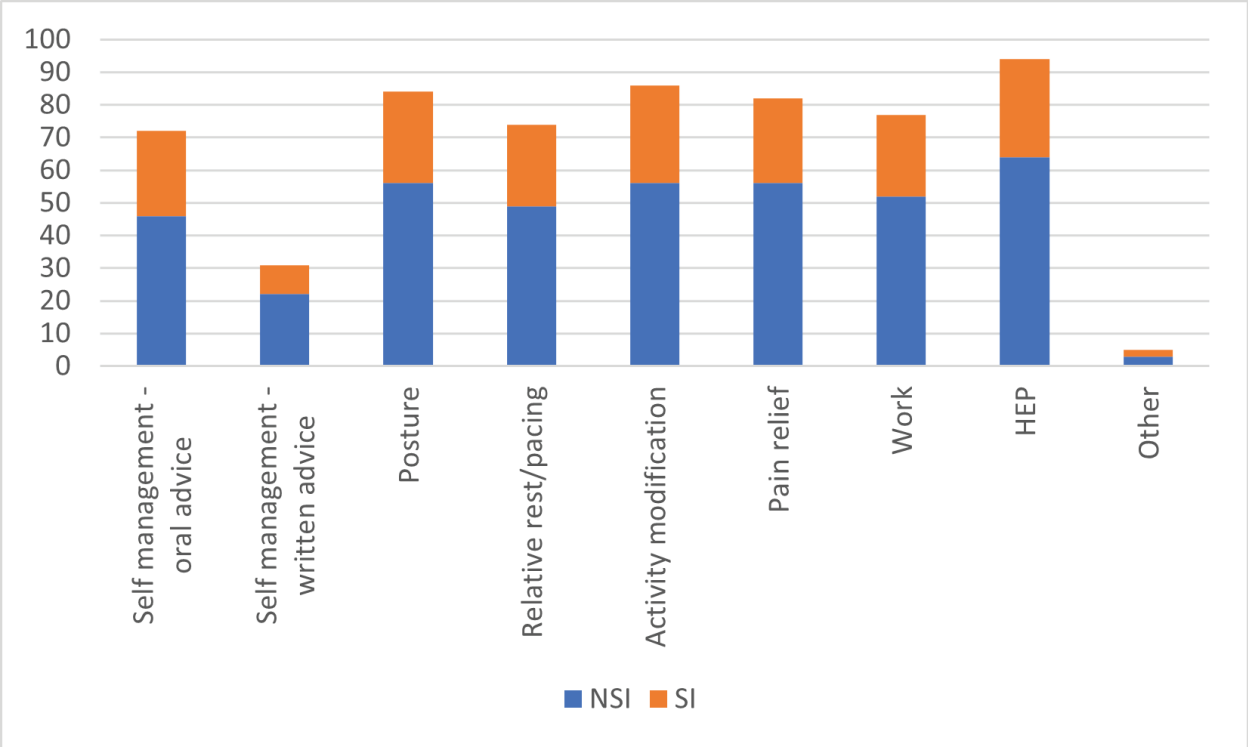

Figure 3. What advice would you typically offer this patient?

ing comfortable during exercises. In relation to the regression of exercises, the most common theme was regressing the exercises if the symptoms flare up or are worsening (32/51; 62.7%; 14 SI, 18 NSI).

What advice would you typically offer this patient?

While home exercise programs (94/104, 90.3%) were the most popular advice for Turkish physiotherapists, the use of written advice was less prevalent (31/104, 29.81%) (Figure 3).

Table 2 presents an overview of how the respondents would typically deliver treatment for this patient. The majority would use a combination of face-to-face appointments and a home-based program, seeing this patient more than 10 times and over 6 weeks.

Would you expect this person to recover with the prescribed physiotherapy?

In response to this question, 62.5% (65/104; 23 SI, 42 NSI) considered that this person would recover within 3 months and 28.8% (30/104; 9 SI, 21 NSI) considered recovery would be achieved within 6 months (Figure 4).

What would be your main treatment goals for this patient?

All respondents, %100 (36 SI, 68 NSI) stated at least one treatment goal in this open-ended question. The most frequent treatment goals were a decrease in pain/symptoms; an increase in the range of motion; improvement of RC muscle strength and/or scapular stabilization.

Would you consider referring this patient for a surgical opinion and if so, when?

Most of the respondents' stated to consider referral for a surgical opinion (65/104; 62.5%; 23 SI 42 NSI) Surgical options following a specified period of conservative treatment first or with certain stipulations were the most common subthemes.

Do you think that further research could benefit your practice with regard to rotator cuff disorders?

Most of the respondents (92/104; 88.5%; 33 SI, 59 NSI) considered that further research could benefit their practice. The suggestions for further research predominantly were focused on revealing which exercise type is more useful to treat RCD, the effec-

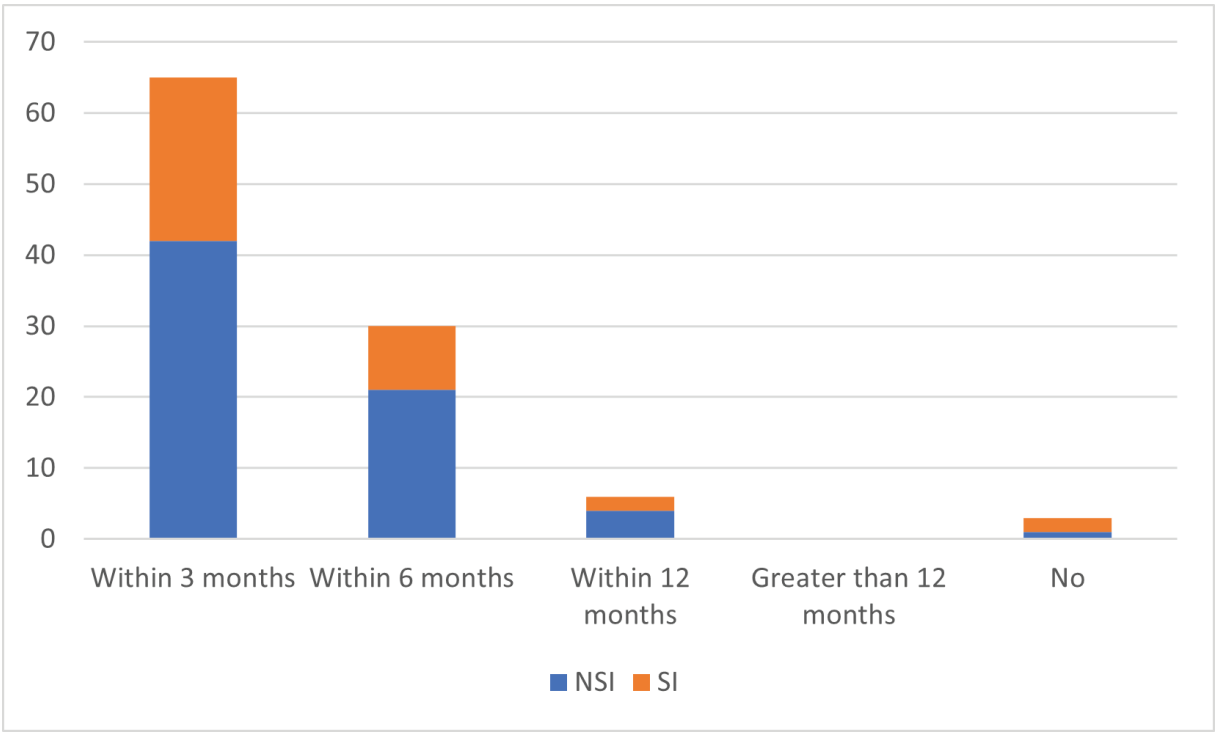

Figure 4. Would you expect this person to recover with the prescribed physiotherapy?

tiveness of manual therapy techniques and investigation of other muscle activity around the shoulder joint, beyond the RC muscles.

DISCUSSION

The results of this study showed that Turkish physiotherapists constitute physiotherapy programs for RCD by using a wide variety of interventions including advice/education, exercise therapy, mobilization as well as other passive treatment modalities such as taping, massage, and electrotherapy. In addition, preferred rate differences for cold therapy and prescribing isometric exercises were detected between the SI and NSI groups.

In relation to clinical examination, some of the respondents particularly would perform special clinical tests of the shoulder in the line with the findings of previous studies (20-22), but contrary to current evidence that suggests the poor diagnostic accuracy and reliability of those clinical tests (23-25). Furthermore, 36.5 % of the respondents would request further investigation by imaging methods. This preference of Turkish physiotherapists was parallel to the responses shown in BE & NL and Italy (21,22), contrary to responses from the United Kingdom (UK) (20). However, an uncertain relationship between the source of the pain and the structural examination via imaging techniques has been indicated (23,26,27).

In addition, only 34.6 % of respondents stated using rehabilitation classification approaches such as shoulder symptom modification procedure or McKenzie in the clinical evaluation. This result has constituted a contradiction to the UK results (%53) (20) which most of the physiotherapists indicate that they would use rehabilitation classification, however, the current result was parallel with the BE & NL (21) and Italy results (22). This result might be potentially explained by the possibility of those classification approaches are rarely included in undergraduate education in Türkiye.

The most preferred management strategies by Turkish physiotherapists were mobilization, exercise therapy, and advice/education. The preferences for advice and exercise therapy were similar to previously conducted studies and research evidence (13,20-22,28). Particularly, mobilization was highly preferred by Turkish physiotherapists

(78.8%) comparable to BL & NL (21) and Italian physiotherapists (22). This result has shown that the preferences of physiotherapists in different countries towards the mobilization approach are at different rates. In addition, while the preference for joint mobilization has decreased in the UK over the years (35% vs 23%) (12,20), it is remarkable that rate is quite high in Türkiye in the current situation. Although a recent systematic review suggests that manual therapy combined with exercise may have short-term benefits in reducing pain and improving function, the findings of another meta-analysis indicate that combining manual therapy with exercise did not demonstrate superior effectiveness compared to exercise alone in adult patients with RCD. These contrasting results highlight the need for further research to reconcile the conflicting findings and explore optimal manual therapy approaches for the management of RCD (13,14). The reason why this approach is detected at high rates in Türkiye may be that it can also be applied in combination with exercise, however, the lack of such an option in the survey may have affected the answers of the participants.

The use of other passive treatment modalities such as taping, massage, and electrotherapy was also frequently preferred. Nonetheless, the lack of high-quality evidence for the clinical effectiveness of these passive modalities has been reported (13). The possible preference reasons for the passive treatment modalities might be that those passive modalities are still considered core elements of conventional musculoskeletal physiotherapy practice, ordered by physicians, or requested by patients in Türkiye. Although physiotherapists answered the questions independently as decision-makers, any physiotherapists working in Türkiye, especially those working in a private or public hospital, are not able to work with the direct access option while it is possible in private practice in European countries (29). Thus, the obligation of physiotherapists to work with physicians, the standard orders used in the health system in Türkiye, and the expectations of the patients may require the use of some ordered passive modalities and may accordingly affect the physiotherapists' perspectives on treatment alternatives. It was concluded that greater technical autonomy resides in countries where individuals can self-refer to physiotherapists in a review on direct access and contemporary practice (29). Another possible reason why passive modalities are preferred more frequently by Turkish physiotherapists may be the variable professional knowledge of the graduates due to the probability of different contents of each curriculum of universities. Moreover, physiotherapists with SI were significantly more likely to use cold therapy (x^2=4.303, p=0.038), although there is no clear clinical recommendation for this method in the management of RCD in the relevant literature.

When the preferred exercise type is examined; most Turkish physiotherapists (78.8%) would prefer scapular exercises, similar to the physiotherapists in BL & NL (21) and Italy (22). Despite reported wide use in clinical practice, recent systematic reviews have revealed conflicting results regarding the effectiveness of scapular exercises (30-32). One possible motive behind the preference for scapular exercises is their recognition as a core aspect of exercise prescription for achieving and maintaining optimal alignment and movement of the scapulohumeral joint. This preference is supported by previous studies that consistently establish a relationship between altered scapular kinematics and various shoulder pathologies (33-35). Isotonic, isometrics, and kinetic chain exercises were also suggested by half of the respondents. Physiotherapists of the SI group were significantly more likely to use isometric exercises in their treatment than the NSI group (x^2=4.248, p=0.039). This difference in the preferences of the SI group may be due to the earlier demonstration of the positive effects of isometric exercises on pain perception and their ability to help control pain (36-38).

There was a large variety in responses in terms of exercise prescription parameters. While respondents mostly describe the parameters in terms of pain, load, sets, and repetitions, responses to other parameters such as fatigue, quality of movement, progression, and regression were relatively low. For example, 70% of respondents would advise exercising with varying levels of pain during exercises while only 11% stated they would specifically work within the pain-free range. Besides the current evidence has been uncertain regarding pain production or avoidance during exercise yet (12), Smith et

al. reviewed systematically that shoulder exercises into pain are superior to pain-free exercises for patient-reported pain level with moderate quality of evidence (39). In relation to sets and repetitions, 3 sets and/or repetitions of ≤10 were the most frequently suggested. Overall, stated instructions for exercise parameters were inconsistent and reflected current uncertainty in the literature. Further research is needed to put forth the optimal exercise prescription parameters specifically for RCD.

While Turkish physiotherapists preferred a wide variety of treatment delivery options, the home exercise program was the most popular one. In addition, Turkish physiotherapists would provide fewer group classes (2.9%) and more visits (56%; between 5 and 10 times), opposite to physiotherapists in the UK (14%; group classes, 36.5% 5-10 times of visit) (20). This may be expected to be due to differently designed healthcare systems or Turkish physiotherapist's perspectives on recovery rate, in which 81.1% of Turkish physiotherapists would complete the treatment of patients up to an 8-week period, whereas only 32.1 % of UK physiotherapists would complete up to 8 weeks (20).

One strength of the presented study was the inclusion of participants from variable roles /settings, which increases the likelihood of representative samples. Furthermore, it is worth noting that a slight majority of respondents (51%) had been qualified for under 5 years, indicating a group that completed their undergraduate education more recently and may have been exposed to the latest evidence in the field. While this could be seen as a strength of the study, allowing for insights into the practice preferences of younger physiotherapists in managing RCD, it also poses a limitation. The relative lack of clinical experience among this group raises questions about the level of expertise and hands-on knowledge they may possess in effectively addressing the complexities of RCD. In addition, the percentage of the respondents who had been qualified for more than 10 years was only 21.1%. Therefore, the combination of limited experience among younger practitioners and a relatively low percentage of highly experienced professionals raises concerns about the overall proficiency and depth of knowledge within the field.

The evident limitation of this study was probably the low number of participants, which may be due to the announcement of the survey during the Coronavirus Disease 2019 pandemic. The lack of motivation or harsh working conditions of Turkish physiotherapists might have had a negative effect on the idea of participation in a clinical survey in that period. However, the participant number was still comparable to the other studies from Europe. However, updated work including a larger number of physiotherapists can be carried out in further years.

The present study is the first study to provide insight into Turkish physiotherapy practice for RCD. Advice, scapular exercises, and mobilization were the most preferred treatment strategies by Turkish physiotherapists, reflecting the current literature and similar to the results of previously conducted surveys in European countries, apart from a different point of view in terms of joint mobilization. However, passive modalities, with limited effectiveness in the literature, such as taping, massage, and electrotherapy were also preferred by most Turkish physiotherapists. The possible reasons why passive modalities are preferred more frequently than physiotherapists in other countries may be variable professional knowledge of the graduates due to the possibility of different contents of the university education, the different health system procedures & the nonapplication of direct access. Additionally, it was detected that physiotherapists who have a SI in RCD significantly preferred to prescribe cold therapy and isometric exercise. Although the responses were generally parallel to current evidence-based strategies, the wide variety of selected interventions and lack of consensus on exercise prescription parameters indicates that current physiotherapy practice and management were clinician-dependent. The high degree of practice variability and passive treatment preference of physiotherapists might be due to a lack of reading the current research evidence regularly. Thus, we recommend that physiotherapists consider the current literature more frequently in addition to their clinical experience in RCD management. In addition, regular workshops and seminars can be organized by healthcare organizations to improve evidence-based practices, especially in RCD. More

research is needed to determine definite exercise parameters including type, frequency, duration, and intensity, and to establish optimal management strategies for RCD.

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Author Contributions: BA: Conceptualization, Methodology, Investigation, Analyzing, Literature Review, Writing. BÖ: Conceptualization, Methodology, Investigation, Analyzing, Writing, Review & Editing. JB: Methodology, Review & Editing. MGP: Review & Editing, Supervision, Project Administration.

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THE EFFECTS OF CALISTHENIC EXERCISES ON SLEEP QUALITY, FATIGUE, AND DEPRESSION IN ELDER ADULTS

ORIGINAL ARTICLE

ABSTRACT

Purpose: The physical, psychological, even economic and environmental changes emerged with age cause problems in sleep. The lack of exercise habits could increase the incidence of unfavorable sleep disorders with depression and fatigue. The aim of this non-randomized controlled study was to investigate the considerable effects of calisthenic exercises on sleep disorders, depression, and fatigue in elder adults.

Methods: The study was conducted at Pamukkale University and Hatay Mustafa Kemal University. Sixty-two individuals participated in the study between May 2018-October 2019. While the Calisthenic Group (n=32) performed calisthenic exercises for 30-45minutes/session and 3days/6weeks, and Control Group (n=30) did not performed. Fatigue, depression, and sleep quality levels were assessed using the Fatigue Severity Scale (FSS), Beck Depression Scale (BDI), and Pittsburgh Sleep Quality Index (PSQI), respectively.

Results: Statistically significant differences among FSS (p≤0.001), BDI (p=0.022), and PSQI (p=0.006) scores were found in the Calisthenic Group after the intervention, while there were differences only in fatigue (p=0.035) and total sleep quality (p=0.035) for the Control Group. We found that the Calisthenic Group's PSQI latency, PSQI sleep duration and PSQI total scores decreased in post-treatment. Both fatigue severity (p≤0.001) and depression levels (p≤0.001) were highly correlated with PSQI-subscores, except for sleep duration subscore (FSS p=0.934, BDI p=0.276).

Conclusion: Regular calisthenic exercise programs may enable elders to better manage changes in the aging process. Physiotherapists should consider including calisthenic exercises in the rehabilitation programs for its effects on all parameters of sleep, fatigue, mental and emotional status in this population.

Keywords: Calisthenics, Depression, Exercise, Fatigue, Older Adults, Sleep

YAŞLI ERİŞKİNLERDE KALİSTENİK EGZERSİZLERİN UYKU KALİTESİ, YORGUNLUK VE DEPRESYON ÜZERİNE ETKİLERİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Yaşla birlikte ortaya çıkan fiziksel, psikolojik, hatta ekonomik ve çevresel değişiklikler uykuda sorunlara neden olmaktadır. Egzersiz alışkanlığının olmaması, depresyon ve yorgunluk ile birlikte olumsuz uyku bozukluğu insidansını artırabilir. Bu randomize olmayan kontrollü çalışmanın amacı, yaşlı erişkinlerde kalistenik egzersizlerin uyku bozuklukları, depresyon ve yorgunluk üzerindeki önemli etkilerini araştırmaktı.

Yöntem: Bu çalışma Pamukkale Üniversitesi ve Hatay Mustafa Kemal Üniversitesi'nde yapıldı. Çalışmaya Mayıs 2018-Ekim 2019 tarihleri arasında 62 kişi katıldı. Kalistenik Grup (n=32) 30–45 dakika/seans ve 3 gün/6 hafta kalistenik egzersizler yaparken, Kontrol Grubu (n=30) yapmadı. Yorgunluk, depresyon ve uyku kalitesi düzeyleri sırasıyla Yorgunluk Şiddet Ölçeği(YŞÖ), Beck Depresyon Ölçeği(BDÖ) ve Pittsburgh Uyku Kalitesi İndeksi(PUKİ) kullanılarak değerlendirildi.

Sonuçlar: Müdahale sonrası Kalistenik Grup'ta YŞÖ(p≤0.001), BDÖ(p=0.022) ve PUKİ(p=0.006) puanlarında istatistiksel olarak anlamlı fark bulunurken, Kontrol Grubu için sadece yorgunluk(p=0.035) ve toplam uyku kalitesinde (p=0.035) bulundu. Kalistenik Grubunun PUKİ latansı, PUKİ uyku süresi ve PUKİ toplam puanlarının tedavi sonrasında azaldığını saptadık. Hem yorgunluk şiddeti (p≤0.001) hem de depresyon düzeyleri (p≤0.001), uyku süresi alt puanı (YŞÖ p=0.934, BDÖ p=0.276) hariç, PUKİ-alt puanları ile yüksek oranda ilişkiliydi.

Tartışma: Düzenli kalistenik egzersiz programları, yaşlıların yaşlanma sürecindeki değişiklikleri daha iyi yönetmelerini sağlayabilir. Fizyoterapistler uykunun tüm parametreleri, yorgunluk seviyeleri, mental ve emosyonel durum üzerindeki etkileri nedeniyle bu popülasyonda kalistenik egzersizleri rehabilitasyon programlarına dahil etmeyi düşünmelidirler.

Anahtar Kelimeler: Kalistenik egzersizler, Depresyon, Egzersiz, Yorgunluk, Yaşlı Erişkinler, Uyku

INTRODUCTION

Aging is a natural process that causes physiological, biological, and psychological decline. Muscle weakness, sensorial problems, cardiovascular diseases, cognitive impairment, and psychological problems affect elder adults in the aging process (1). These changes cause decreased physical activity and performance, poor sleep quality, and deterioration in the emotional state more frequently aged 65 years and older. Although depression can be seen in all ages, prevalence and severity of depression increase with aging, negatively affecting the quality of life (QoL) of both elders and their relatives. It reduces the pleasure of life and causes social communication disruptions; therefore, depression and fatigue make it difficult to cope with changes during the aging process (2).

Fatigue is a chronic and multidimensional problem in older adults. Its' complicated content could be related to short-term memory, insufficient concentration, and sleep disorders (3). Besides these, the energy of elder adults and tolerance to daily activities decrease, too. Almost half of the elders complain of moderate-to-severe fatigue (4). Muscle fatigue and weakness could be seen, especially in the lower extremity and trunk extensor muscles. Muscle weakness can lead to overuse of the remaining muscle strength. An earlier onset of fatigue causes an increased need for support and a dependent life (5). These physical, psychological, economic, and environmental changes along with aging, cause sleep-related problems, such as falling asleep, being unable to maintain sleep, waking up early in the morning, and excessive daytime sleepiness (6). Sleep disturbances can cause increased mortality risk, metabolic problems, headache, fatigue, perceptual disorders, drowsiness, learning disabilities, concentration problems, cognitive problems, increased health problems, and accidents. Furthermore, medicine is the commonly chosen solution to promote sleep. In addition to these, sleep disturbances, and the medicine used to sleep, increase the fall risk. Additionally, owing to adverse and diffuse reflection of sleep, balance, cognitive and emotional problems, the overall QoL of elder adults diminishes dramatically (7).

Exercise plays a key role in the healthy aging process. In recent literature, studies have focused on the effects of resistive, aerobic, endurance, flexibility, and balance exercises on elder adults. The most highlighted results showed that elder adults should do regular physical activity and exercises to manage the changes in physical, psychological, and social aspects of aging (8). Aerobic calisthenic programs could provide the maintenance of healthy physical, mental, and cognitive status in elder adults (9). The aerobic calisthenic exercises, which are performed in sitting and standing positions in addition to squatting, could increase exercise tolerance.

Calisthenics causes improvements in balance, muscle strength, mobility, cognition, sleep disorders, aerobic capacity, and emotional problems (9, 11–13). While the effects of different kinds of exercises on depression, fatigue, and sleep disorders in elders have been widely discussed (1, 14–16), it has been recorded that calisthenic exercises for elders are not as focused on young adults. It is well known that those, especially the elders, without exercise habits, have depression and fatigue as a causal effect (17, 18). Furthermore, inactivity generally causes sleep disturbances, which could affect physical, mental, and psychological health negatively (15). Calisthenic exercises are among the most effective, cheap, easy-to-applicable, and non-pharmacologic treatment approaches with no/little side effects. Because of this reason, the study focused on the effects of calisthenic exercises in elder adults. However, exercise needs to be planned through a comprehensive approach, consisting of aerobic and resistance training to improve aerobic capacity and sleep quality and to decrease fatigue and depression levels (4, 18). Thus, the interaction between depression, fatigue, sleep problems, and exercise should be clarified for the assessment and management of rehabilitation programs for elder adults. This study aimed to determine the effects of calisthenic exercises on sleeping problems, and emotional and fatigue levels in the elderly adult population multi-dimensionally.

METHODS

All participants gave written informed consent before participation by themselves, and the study

protocol conformed to the standards for human experiments set by the Declaration of Helsinki. Approval for the study was also obtained from the Pamukkale University Non-Interventional Clinical Studies Ethics Committee (4298783–050/26).

Participants

The study was conducted at Pamukkale University and Hatay Mustafa Kemal University,. Sixty-two elder adults participated in the study between May 2018-October 2019. The inclusion criteria were being ≥65 years old, having no regular exercise habits, having the cognitive level to follow commands and exercises, and being a resident in a nursing home. Exclusion criteria were having a severe systemic, orthopedic, neurologic disease, or cognitive disorder. The elder adults who could not perform the orders were also excluded from the study. Participants were categorized into the Calisthenic (n=32) and Control (n=30) Groups in a non-randomized sequencing manner. A non-randomized sequencing could not be done for the study, as physiotherapists followed elder adults in different cities of Türkiye. Physiotherapists included the elder adults according to the order of participation into the firstly Calisthenic Group, and than the Control Group. In this way, it was ensured that before the intervention, the Calisthenic and Control Groups had similar mean age and gender.

Outcome Measures

Each participant was evaluated at baseline and at the end of the 6th week. Sociodemographic data were recorded, followed by the assessment of fatigue level with the Fatigue Severity Scale (FSS), emotional status with the Beck Depression Inventory (BDI), and sleep quality with the Pittsburgh Sleep Quality Index (PSQI).

FSS was used to assess fatigue severity and its effects on daily living activities. The scale consists of nine items and each item scores 1–7 points. Lower scores show a low level of fatigue severity. The total score can be calculated by dividing total points by nine. The cut-off value for pathological fatigue was accepted as 4 (19, 20).

BDI was developed to quantitatively assess the depressive findings that participants perceive. The BDI includes 21 questions. Each item scores 0–3 points. The maximum score of the inventory is 63. A score ≥17 points is suggested to be a risk factor in terms of depressive symptoms (21, 22).

PSQI was developed to evaluate sleep quality and obtain a quantitative measurement of sleep. The scale consists of 7 components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and day dysfunction) with 24 questions. Total score (0–21) increases as the sleep quality decreases. A total score ≥5 indicates poor sleep quality (23, 24).

Intervention

The Calisthenic Group (n=32) participated in a regular six-week calisthenic exercise program. The program consisted of three sessions in a week, 30–45 min/session, and 10 sets/each exercise. Elder adults rested 5 minutes between the calisthenic exercise sets.

The program included warm-up exercises at the beginning and a cool-down period at the end of the session. The warm-up and cool-down program included posture, breathing and gentle stretching exercises, respectively. The Calisthenic Group performed breathing exercise and large muscle group exercises (including gross muscles such as upper and lower muscle groups and trunk muscles) combined with breathing patterns in the work-out period. Calisthenic exercises were performed in the standing and long-sitting position. The elder adults in the Calisthenic Group reached out forward to their thumbs and backward in the sitting position. The second exercise was in the standing position. The Calisthenic Group started by grabbing their waist on either hand. They opened their arms wide and squatted stepping forward. Then, they stood back from squatting and stepped back while grabbing their waist again. All exercises were done with the supervision of the physiotherapist. The physiotherapists particularly selected the mentioned two exercises to improve balance, core strength, and coordination. The beginning criteria for the exercise program were being a volunteer for the program and not having any systemic, cardiovascular, or pulmonary disease. The physiotherapists set up the exercise load according to the exercise tolerance of the elder adults. The exercise program was

Table 1. Demographics of the Participants

		Calisthenic Group		Control Group			
		n	%	n	%	x^2	p
Gender	**Female**	14	43.75	13	43.30	0.001	0.974
	Male	18	56.25	17	56.70		
Marital Status	**Married**	24	75.00	21	70.00	0.195	0.659
	Widowed	8	25.00	9	30.00		
Occupation	**Housewife**	13	40.60	12	40.00	0.413	0.813
	Officer	6	18.80	4	13.30		
	Worker	13	40.60	14	46.70		
Chronic Disease	**Cardiovascular**	13	40.625	16	53.33	3.090	0.521
	Type2 DM	10	31.25	7	23.33		
	Osteopenia	0	-	2	6.67		
Educational Level	**Illiterate**	11	34.38	6	20.00	3.010	0.698
	Elementary	14	43.75	19	63.33		
	High school	4	12.50	3	10.00		
	University	3	9.37	2	6.67		

DM: Diabetes Mellitus, x^2: Chi-Square Test.

terminated when the elder adults started to wind while counting forward while they were exercising. The other termination criteria for the program were feeling palpitations more and different from usual and tired. The physiotherapists informed all participants to give information if they had started a new rehabilitation or physical activity program. The elder adults were free to give up the program when they would like to. The Control Group did not participate in any rehabilitation program, but they were enrolled in a rehabilitation program with calisthenic exercises at the end of the study.

The Calisthenic Group started the program with five repetitions for each exercise in the first week. They performed each exercise seven times in the second and third weeks, and ten times in the following weeks from the fourth week. Physiotherapists conducted all programs.

Statistical Analysis

Statistical analysis was performed with SPSS-IBM Statistics 21 (SPSS Inc., Chicago, Illinois, USA). As a result of the power analysis, when the alpha value was set to 0.05, it was calculated that 95% power would be obtained when 38 people were included in the study (25). - The sample size was calculated with the Pittsburgh Sleep Quality Index-sleep quality subscore.

The mean, standard deviation (X, SD), frequency (n) and percentile (%) were used for the descriptive analysis. The Kolmogorov-Smirnov Test was used to decide if the data followed a normal distribution. Significant differences in qualitative data of demographics between groups were analyzed using the Chi-Square Test. The Mann–Whitney U test was used to analyze significant differences in pre- and post-treatment results between groups. Significant differences between pre- and post-treatment results of each group were analyzed through the Wilcoxon signed-rank test. Analysis of covariance was performed to analyze the difference between groups at the 6th week of assessment for the data, which were significantly different at the baseline assessment. Correlations between fatigue, depression, and sleep quality scores were analyzed through the Spearman correlation test. A correlation coefficient (r) higher than 0.40 was accepted as a moderate correlation, while higher than 0.70 was accepted as a strong correlation.

RESULTS

The mean age of the Calisthenic and Control Groups were 69.50±3.53 (range 65–76) years and 69.87±4.81 (range 65–81) years, respectively (t=-0.12, p=0.904). There were no differences in gender, marital status, chronic disease, occupation, and education level between the two groups (Table

Table 2. Comparison of Pre- and Post-Treatment Scores of Fatigue, Depression and Sleep Quality in and between the Groups

	In Groups								Between Groups			
	Calisthenic Group				Control Group				Pre-treatment		Post-treatment	
	Pre-treatment X ± SD	Post-treatment X ± SD	z	p	Pre-treatment X ± SD	Post-treatment X ± SD	z	p	z	p	z	p
FSS	4.81 ± 1.65	4.33 ± 1.57	3.64	**0.001****	4.61 ± 1.28	4.51 ± 1.30	2.11	**0.035***	-0.78	0.434	0.06	0.955
BDI	20.59 ± 11.76	17.66 ± 11.56	2.30	**0.022***	18.37 ± 12.32	17.37 ± 12.03	1.66	0.097	-0.61	0.540	-0.09	0.927
PSQI-Total	8.63 ± 3.38	6.84 ± 2.87	2.75	**0.006***	6.00 ± 3.97	6.33 ± 3.92	2.11	**0.035***	-2.81	**0.005****	6.06[a]	**0.017***
PSQI-Use of sleeping medication	1.06 ± 0.91	0.88 ± 0.75	1.60	0.109	0.67 ± 0.96	0.73 ± 0.98	1.00	0.317	-1.86	0.063	-1.15	0.249
PSQI-Sleep latency	2.31 ± 1.31	0.69 ± 1.12	2.91	**0.004****	1.40 ± 1.30	1.50 ± 1.31	1.34	0.180	-2.62	**0.009***	6,79[a]	**0.012***
PSQI-Sleep duration	0.47 ± 0.84	0.31 ± 0.69	2.24	**0.025***	0.13 ± 0.43	0.13 ± 0.43	0.00	1.000	-2.04	**0.042***	2.14[a]	0.149
PSQI-Habitual sleep efficiency	0.00 ± 0.00	0.00 ± 0.00	0.00	1.000	0.00 ± 0.00	0.00 ± 0.00	0.00	1.000	0.00	1.000	0.00	1.000
PSQI-Sleep disturbances	2.06 ± 0.67	1.75 ± 0.62	2.50	**0.012***	1.73 ± 0.69	1.77 ± 0.73	1.00	0.317	-1.89	0.059	-0.02	0.981
PSQI-Subjective sleep quality	1.53 ± 0.72	1.16 ± 0.57	2.83	**0.005****	1.30 ± 0.65	1.37 ± 0.61	1.00	0.317	-1.23	0.218	-1.44	0.149
PSQI-Day dysfunction	1.19 ± 0.90	1.06 ± 0.80	0.92	0.356	0.77 ± 0.97	0.83 ± 0.91	1.00	0.317	-1.95	0.052	-1.19	0.235

FSS: Fatigue Severity Scale, BDI: Beck Depression Inventory, PSQI: Pittsburgh Sleep Quality Index, z: Wilcoxon Signed Ranks Test, [a]: Analysis of Covariance (ANCOVA), * p<0.05; ** p≤0.005.

1). The number of medicines used did not also differ (t=- 0.54, p=0.063).

There were no significant differences in pre-treatment FSS and BDI scores between the groups (Table 2). Although, PSQI-total score (p=0.005), PSQI-sleep latency (p=0.009), and PSQI-Sleep duration (p=0.042) subscores were higher in Calisthenic Group in pre-treatment assessment. To eliminate the pre-treatment differences between the groups in these scores we conducted an Analysis of Covariance. We found significant differences in PSQI-Total (P=0.017), PSQI- Sleep latency (p=0.012) between the groups.(Table 2). Although there was a slight decrease in the post-treatment score, Control Group's depression level was recorded as borderline clinical depression for both pre- and post-treatment results. Meanwhile, Calisthenic Group's depression level changed significantly from middle-level depression (20.59±11.76) to borderline-clinical depression (17.66±11.56). Other considerable improvements recorded were FSS and PSQI-total scores in the Calisthenic Group. Interestingly, almost all PSQI-subscores slightly deteriorated in the Control Group, this deterioration was not statistically significant, except for PSQI-total score. There was a slight decrease in FSS (p=0.035) in addition to the deterioration recorded for sleep quality with a slight increase in PSQI-total score (p=0.035) for the Control Group (Table 2). Consequently, statistically significant differences between pre-and post-treatment scores of Calisthenic Group for FSS (p<0.001), BDI (p=0.022), sleep latency (p=0.004), sleep duration (p=0.025), sleep disturbances (p=0.012), and subjective sleep quality (p=0.005) subscores and total score of PSQI (p=0.006) (Table 2) showed the considerable improvement in fatigue, emotional status, and sleep quality level after calisthenic exercises.

We compared results of difference between pre-treatment and post-treatment (post-treatment scores minus pre-treatment scores) of Calisthenic Group and control group to eliminate the statistical significance results in the pre-treatment results. We found that the Calisthenic Group's latency, sleep duration, sleep disturbances, and subjective sleep quality subscores and total score of PSQI significantly decreased than the Control Group's at the 6th week of assessment (Table 3).

Significantly moderate correlations were found between fatigue, depression, and sleep quality (Table

Table 3. Comparison of the Difference between Pre-Treatment and Post-Treatment PSQI Results of the Calisthenic and Control Groups

	Calisthenic Group	Control Group		
PSQI	**X ± SD**	**X ± SD**	**z**	**p**
Total	-1.7812 ± 3.09	0.3333 ± 0.99	-4.395	**0.001****
Use of sleeping medication	-0.1875 ± 0.64	0.0667 ± 0.37	-1.823	0.068
Sleep latency	-0.6250 ± 1.01	0.1000 ± 0.40	-3.728	**0.001****
Sleep duration	-0.1563 ± 0.37	0.0000 ± 0.00	-2.240	**0.025***
Habitual sleep efficiency	0.0000 ± 0.00	0.0000 ± 0.00	0.000	1.000
Sleep disturbances	-0.3125 ± 0.64	0.0333 ± 0.18	-2.881	**0.004***
Subjective sleep quality	-0.3750 ± 0.66	0.0667 ± 0.37	-3.185	**0.001****
Day dysfunction	-0.1250 ± 0.75	0.0667 ± 0.37	-1.487	0.137

PSQI: Pittsburgh Sleep Quality Index, z: Mann–Whitney U Test, *p<0.05, **p≤0.001.

Table 4. The Correlation between the Scores of Fatigue, Depression and Sleep Quality

		BDI	PSQI						
		Total	**Total**	**USM**	**SL**	**SD**	**HSE**	**SDist**	**SSQ**	**DD**
FSS-Total	**r**	0.610	0.526	0.620	0.235	-0.011	n/a	0.651	0.623	0.358
	p	**0.001****	**0.001****	**0.001****	0.066	0.934	n/a	**0.001****	**0.001****	**0.004****
BDI-Total	**r**	1	0.694	0.730	0.440	0.140	n/a	0.615	0.623	0.542
	p	-	**0.001****	**0.001****	**0.001****	0.276	n/a	**0.001****	**0.001****	**0.001****
PSQI-Total	**r**	0.694	-	0.719	0.825	0.354	n/a	0.822	0.762	0.779
	p	**0.001****	**-**	**0.001****	**0.001****	**0.005****	n/a	**0.001****	**0.001****	**0.001****

FSS: Fatigue Severity Scale, BDI: Beck Depression Inventory, PSQI: Pittsburgh Sleep Quality Index, USM: Use of sleeping medication, SL: Sleep Latency, SD: Sleep Duration, HSE: Habitual sleep efficiency, SDist: Sleep Disturbances, SSQ: Subjective sleep quality, DD: Day Dysfunction, r: Spearman Correlation Test, *p<0.05, **p≤0.001.

4). Both fatigue severity (use of sleeping medicine r=0.620, sleep disturbances r=0.651, subjective sleep quality r=0.623, day dysfunction r=0.358; p<0.005) and depression levels (use of sleeping medicine r= 0.730, sleep disturbances r=0.615, subjective sleep quality r=0.623, day dysfunction r=0.542; p≤0.001) were highly correlated with PSQI-subscores, except for sleep duration subscore (p>0.05). Additionally, although the sleep latency subscore-PSQI moderately correlated with the depression level, no correlation was obtained with FSS (Table 4).

DISCUSSION

We conducted this study to examine considerable effects of calisthenic exercises on sleeping problems, fatigue and emotional levels in elder adults. Calisthenic exercise was found to have positive effects on sleep quality, fatigue, and emotional levels, although the Control Group only showed improvements in fatigue and total sleep quality. We observed that the sleep quality and latency significantly improved in the Calisthenic Group than the Control Group at the 6th week of assessment. Sleep quality of the Control Group worsened significantly. On the other hand, fatigue results decreased significantly in favor of the Calisthenic Group, which did not reach the significance level between the groups.

A sedentary lifestyle, sleep-related problems, and metabolic dysfunctions have a strong relationship with aging. In a study, calisthenic exercises in sitting and standing positions were applied to the elderly through 12 weeks, two sessions per week. The program, which was focused on the trunk and lower extremities, improved general health and physical functionality (9). Although we applied a similar calisthenic exercise procedure for only six weeks, our study supports the importance of personalized and regular calisthenic exercises in elder

adults and emphasizes a holistic perspective for health professionals working with elders.

The inappropriate sleep process causes cytokine concentration changes, increased energy consumption/metabolic rate, a prominent increase in cortisol level, central nervous system fatigue, changes in heart rate and heart rate variability in addition to the changes in mood and anxiety symptoms (26, 27). It was recorded that the participants in this study had much worse sleep quality, fatigue severity, and depression than expected. The literature indicates a relationship between fatigue and sleep quality (16). Emotional state is associated with sleep quality in older adults, as is the age associated with sleep duration (18). Our results support knowledge about the presence of poor sleep quality, fatigue and emotional problems with aging and the relationship among them. Thus, focusing on these factors with a multi-dimensional approach is important in geriatric rehabilitation (16).

There were some studies in the literature showing significant improvement in total and subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, day dysfunction and total sleep quality subscores after an exercise program implemented for elders (28). It was reported that considerable effects of exercise on sleep quality are maintained for 3 months (29). A six-month follow-up study on aerobic exercise training showed a significant increase in total sleep duration, sleep efficiency and sleep onset latency in older adults (14). We found that there was a statistically significant improvement in sleep latency (p=0.004), sleep duration (p=0.025), sleep disturbances (p=0.012), and subjective sleep quality (p=0.005) subscores and total scores of PSQI (p=0.006) after just 18-sessions of calisthenic exercise program, too.

Before the calisthenic exercise program, the Control Group's sleep latency (p=0.009), and duration subscores (p=0.042) and total scores of PSQI (p=0.005) were significantly lower than those of Calisthenic Group's in our study. The aforementioned sleep quality results were significantly lower in favor of the Control Group. In the Control Group, only a significant difference was observed in the PSQI-total score (p=0.035), which indicated deteriorated sleep quality after a six-week study period. Meanwhile, it was obtained that the sleep quality of elders in Calisthenic Group was significantly improved more than Control Group. In addition to the positive effects of exercise on PSQI-total score, it also significantly increased subjective sleep quality (p=0.005) and shortened sleep latency (p=0.004) in Calisthenic Group.

No difference was found in the baseline scores of FSS and BDI between two groups. Additionally, the post-treatment results were not different between the groups, except for PSQI total and sleep latency subscore. The literature offers a longer exercise period and follow-up than six weeks (9, 11, 14, 30). While the calisthenic exercise program was applied for only 6 weeks, improvement was recorded in PSQI's total and sleep latency scores. Considering the literature, we thought that if a longer exercise program could be applied, the sleep quality of the elderly individuals could be increased further with the positive developments that could be obtained in other parameters of sleep, fatigue and depression. Because, our data showed that Calisthenic Group's FSS ($p \leq 0.001$), BDI (p=0.022), and PSQI (p=0.006) scores significantly improved, whereas only the FSS improved in the Control Group (p=0.035). Meanwhile, the fatigue decreased significantly in both groups. Although the literature supports the effects of any type of aerobic exercise on fatigue and the severity of fatigue was significantly decreased in the Calisthenic Group, there was no difference between the groups at the 6th week assessment in our study.

Together with other factors, fatigue is an important factor, which affects QoL negatively (4). It was observed that both of the groups have considerable fatigue levels in this study. Maintaining an individual's physical capacity is crucial to reduce fatigue severity in elder people. Because of this reason, individualized regular exercise programs were suggested for elders to cope with fatigue experience as a regenerative compensation (16). Unfortunately, no difference was observed between the groups. It is thought that the change in the Control Group, may have been caused by the multidimensionality of fatigue and its relationship with many factors that we did not consider in our assessment protocol. Meanwhile, concordantly with the literature, it was recorded that the FSS score decreased

from 4.81±1.65 to 4.33±1.57 in Calisthenic Group ($p<0.001$), which was significantly higher than that of the Control Group. A meaningful and active life increases the personal subjective vitality, while decreasing the fatigue level, which was an early indicator of aging-related decline (31). Especially, calisthenic exercise could be a kind of suitable physical activity for inactive elder adults. The calisthenic exercises were performed with warm-up and cool-down periods, breathing patterns, and individualized progression protocols in this study. Researchers recommend weight-bearing calisthenic exercises because body weight provides resistance to movement (8). The calisthenic exercise program was individualized according to the participants' conditional status and aimed to improve the total aerobic capacity. We did not assess the aerobic capacity, but the reduction in perceived fatigue severity in ADLs by elders in our Calisthenic Group, as far as we experienced, this indirectly supports the positive effects of calisthenic exercises on aerobic capacity. Exercising, positively affects the emotional status of all individuals, not just in elders. Inactivity is a major problem that causes sleep disturbance, which is thought to be related to depression (32) is also considered in our study. Aerobic exercises, endurance programs, high-intensity progressive resistance training, and Tai Chi and Qi Gong exercises have beneficial effects on the depression in elders (33, 34). Especially, moderate exercise programs could reduce resting plasma concentrations of pro-inflammatory cytokines and increase anti-inflammatory cytokines (35). We recorded that participants in Calisthenic Group had moderate-level depression before the treatment, which improved to borderline-clinical depression after an 18-session exercise program ($p=0.022$). It was recorded that the PSQI's total ($p=0.017$) and sleep latency subscore ($p=0.012$) difference between the groups at the 6th week of assessment reached to significance level. It was stated that exercise is an effective intervention for those who do not experience adequate sleep quantity or quality, and may assist in alleviating symptoms of anxiety, arousal, or poor mood in a recent systematic review (26). Therefore, in parallel with the literature, physiological changes mentioned above, and our results, calisthenic exercises could be chosen as a non-pharmacological treatment to reduce sleepiness, improve sleep quality, fatigue, and emotional levels, especially in elders (36).

Performing calisthenic exercises for 30–40 min daily could improve sleep quality by building a bridge between longtime sleep and need a little time to go to sleep, as found in many studies and in our study. We demonstrated that fatigue severity was significantly associated with emotional status, total and subjective sleep quality, use of sleeping medicine, sleep disturbance ($p\leq0.001$), and day dysfunction ($p=0.004$). If elders participate in an exercise program, especially that consisting of calisthenic exercises, they could have better emotional status, sleep quality, and aerobic capacity, which could decrease the experienced fatigue severity level during performing ADLs. Eventually, QoL of elders and their families would increase. Thus, risks of the occurrence of secondary problems that may occur with the aging process could be reduced, with less energy, workforce and financial resources spent. The effects of calisthenic exercises on QoL of elders and their families, and risks of the occurrence of secondary problems associated with aging could be the focus in future studies with long-term follow-up.

Asymptomatic individuals who are physically inactive but otherwise healthy may begin light to moderate-intensity exercise without medical clearance, and in the absence of symptoms, the intensity may gradually progress as recommended in current American College of Sports Medicine's exercise prescription guidelines (37). General exercise testing guidelines, such as exercise testing, are no longer universally offered. Instead, clinicians are encouraged to assess the need for medical examination (a simple checklist that indicates the absence of any acute, severe or uncontrolled medical problems that may put the individual at risk for exercise), a brief physical assessment (especially, cardiovascular, musculoskeletal, balance, falls and fatigue concerns), exercise stress testing, diagnostic imaging or a structured and individualized self-screening, using their clinical judgment and on an individual basis (37, 38). In our study callisthenic exercises were chosen as a safe and an aerobic exercise with light-to-moderate intensity. Fatigue, emotional status and sleep quality were questioned in addition to the medical history. Unfortunately, no

exercise stress test or diagnostic imaging were done before and during the physiotherapy and rehabilitation sessions. In future studies prescreening protocols, and secreening during and after the program could be done to assess the effectiveness with objective methods.

A limitation of this study was that our participants were non-randomly categorized. Secondly, the lack of measurements for vital values was another limitation of the current study. Meanwhile, the main limitation of this study was focusing on the homogeneity of demographic parameters between the groups, no similarity could be achieved between groups in other parameters assessed, such as PSQI-sleep latency, PSQI-sleep duration, and PSQI-total scores. It was noted that there was a significant difference in these parameters between the two groups in favor of the Control Group. Therefore, detailed statistical analyses were performed to eliminate this problem and found that the Callisthenic Group's PSQI's total score and sleep latency subscore improved significantly after the 18 sessions calisthenic exercise program. Lower scores define better sleep quality in PSQI. As a result, we thought that calisthenic exercises have positive effects on sleep quality. One of the strong sides of this study was the inclusion of a sufficient number of older adults. The second one was that calisthenic exercises are easy-to-applicable, cheap, no-risky, and suitable for all age groups. We offer future studies to be conducted with randomized groups with follow-up assessments at 3 months, 6 months, and 1 year after the treatment program to investigate long-term results of calisthenic exercises in elders. Calisthenic exercises could also be combined with physiotherapy and rehabilitation programs, which consist of strengthening programs, such as aerobic and balance exercises, yoga, Pilates, and Tai Chi, and Qi Gong exercises (18, 26, 28, 29).

Maintaining optimum physical activity and functional performance in elder adults is essential during the aging period. Regular and personalized calisthenic exercises could be beneficial for the many aspects of health, such as sleep quality, depression, and fatigue levels. Physiotherapists should assess these parameters while planning an effective rehabilitation program. Improvements in sleep problems, emotional status, and fatigue levels could increase the participation of elder adults in ADLs. Follow-up studies and randomized-controlled trials are needed to determine the long-term effects of the calisthenic exercise program on sleep quality, fatigue, and depression levels in this population.

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HOW PILATES EXERCISES AFFECT SPORTS PERFORMANCE? A SYSTEMATIC REVIEW

SYSTEMATIC REVIEW

ABSTRACT

Purpose: This systematic review aims to describe and summarise the effects of Pilates exercises (PE) on athletic performance in athletes.

Methods: The published literature was reviewed in the electronic databases of PubMed, Web of Science, and SCOPUS between 01.01.2010 and 01.01.2022. The articles were determined according to the PICO criteria (population, application, comparison, and results) using the keywords "pilates training", "pilates exercises", and "pilates and athlete performance" in the title and abstract sections. The titles and abstracts of articles were screened for relevance to the main research topic of this study.

Results: A total of 151 articles were identified from the database search. Twelve articles were included in the systematic review. The results showed that the studies carried out PE practice between four weeks and 14 weeks. Also, it was found that , PE helps to improve postural stability, static and dynamic balance, agility, muscle strength, flexibility, core strength, muscular endurance, general sprint performance, VO2 max level, coordination, and technical skills in athletes.

Conclusion: Coaches and sports performance specialists can help athletes improve their physical performance and core strength levels by including PE in their training programmes.

Keywords: Athletes, Athletic Performance, Exercise, Exercise Movement Techniques, Movement

PİLATES EGZERSİZLERİ SPOR PERFORMANSINI NASIL ETKİLER? SİSTEMATİK DERLEME

SİSTEMATİK DERLEME

ÖZ

Amaç: Bu sistematik derlemenin amacı, pilates egzersizlerinin sporcularda atletik performans gelişimi üzerindeki etkisini incelemektir.

Yöntem: Mevcut araştırmada, Pubmed, Web of Science (WOS) ve Scopus gibi veri tabanlarında başlık, ve özet kısımları içerisinde "pilates antrenmanı", "pilates egzersizleri" ve "pilates ve sporcu performansı" anahtar kelimeleri kullanılarak 01.01.2010 ile 01.01.2022 tarihleri arasında yayımlanan bilimsel hakemli dergilerdeki makalelerin bir listesi çıkarılmıştır. Makaleler PICO kriterlerine (popülasyon, uygulama, karşılaştırma ve sonuçlar) göre belirlenmiştir.

Sonuçlar: Veri tabanlarında yapılan tarama sonucunda yüz elli bir (151) makaleye ulaşılmıştır. Ulaşılan makalelerin başlıkları ve özetleri daha sonra bu çalışmanın ana araştırma konusuyla ilgisi açısından taranmış ve sonuç olarak dahil edilecek makale sayısı on ikiye (12) indirilmiştir. Araştırma bulgularına incelendiğinde, çalışmalarda pilates egzersiz uygulamaları dört hafta ile on dört hafta arasında gerçekleştirilmiştir. Aynı zamanda araştırmalarda pilates antrenmanının sporcularda postüral stabilite, statik ve dinamik denge, çeviklik, kas gücü, esneklik, core kuvveti, kas dayanıklılığı, genel sprint performansı, VO2 max seviyesi, koordinasyon ve teknik beceriyi geliştirmeye yardımcı olduğu görülmüştür.

Tartışma: Bu sistematik derlemenin sonuçlarına göre antrenörler ve fizyoterapistler, pilates egzersizlerini antrenman programlarına dahil ederek sporcuların fiziksel performanslarını ve core kuvvet seviyelerini geliştirmelerine yardımcı olabilirler.

Anahtar Kelimeler: Atletik Performans, Egzersiz, Egzersiz Hareket Teknikleri, Hareket, Sporcu

INTRODUCTION

Pilates activates the musculoskeletal system by using versatile movements in different starting positions, which helps improve strength, endurance, flexibility, and neuromuscular coordination (1). Movements, starting from the center and focusing on the whole body, help the body improve its physical and mental performance by providing strength, posture, balance, and coordination with more breath control (2,3). However, Pilates exercise (PE) is based on six core principles: control, flow, concentration, precision, breathing, and centering (4). Exercises consist of a group of functional moves destined to be performed using only body weight and then with the help of equipment (5,6). Owsley explained that PE can be performed on a mat or with various apparatuses, including a trapeze table, cadillac, wunda chair, reformer, barrel, and the spinal corrector.

Pilates benefits pain control, body posture, flexibility, muscular strength, endurance, body composition, functional autonomy, static balance, motor skills, and specific sports activity components (1). Nevertheless, PE increases muscle strength, endurance, and flexibility and improves balance (8). PE can be an essential tool for improving dynamic balance and precise movement control for physiotherapists and exercise coaches (1). Besides positive contributions to athletes, PE has been reported to reduce pain and improve functional movements in people with low back pain (9,10,11). In addition, PE improves scoliosis by maintaining body balance and strengthening weak muscles that cause postural disorders (12). Furthermore, PE positively affects mood, quality of life, and psychological illnesses including anxiety and depression (13).

Athletes, coaches, and physiotherapists aim to achieve sporting success by improving athletic performance (14). While muscle strength improves athletic skills such as jumping, sprinting, and changing direction, increasing athletic performance reduces the risk of athletic injury (15). The neuromuscular system's abilities, such as maximal power production, sprinting, jumping, and throwing, are important for achieving maximum performance (16). PE is generally observed to be increasingly included in athletic training programs aimed at improving performance and preventing injuries (2). There is no previous systematic review study investigating the effect of Pilates on sports performance. However, the literature lacks a systematic review of the influence of PE on sports performance. A systematic review of the effects of PE on sports performance could help to identify the lack of management of such effects, thereby optimizing athlete performance. This systematic review aimed to identify the influence of PE on sports performance.

METHOD

This study was a systematic review of articles published in various scientific and peer-reviewed publications. This study proposes a systematic review of peer-reviewed literature on the effects of PE on athletic performance. In this respect, a keyword search for "Pilates training", "Pilates exercises", and "Pilates and athlete performance" was performed in databases such as Web of Science (WOS), PubMed, and Scopus to extract a list of journal articles published between 01.01.2010 and 01.01.2022. Following the database search, the reference lists of the extracted articles were reviewed.

Data collected from databases were blended and standardized in such a way as to create a new

Table 1. PICO Criteria

	Criteria
Population	Athletes
Application	Pilates exercise application for athletes
Comparison	Control group The experimental group (mat pilates, reformer/Cadillac pilates, swiss ball)
Outcome	Physical and physiological responses (posture, static and dynamic balance, agility, muscle strength, flexibility, chorea strength, muscular endurance, running performance, coordination, technical skill, VO2max)

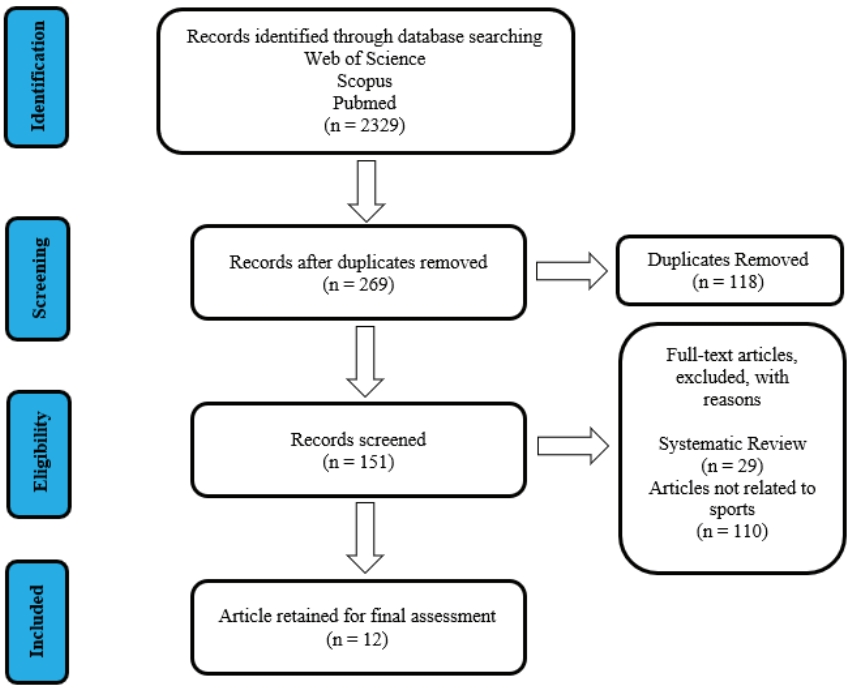

Figure 1. PRISMA flow diagram

dataset relevant to the purposes of the present study. The databases were limited to peer-reviewed journals published in English only. A systematic literature review was conducted following PRISMA recommendations (17). The search in databases using the keywords yielded a result of hundred and fifty-one (151) journal articles. The titles and abstracts of the retrieved articles were then screened in terms of relevance to the research topic of the present study, namely, the athletic performance of athletes. As a result, the number of articles included was reduced to 12 (12). Articles were included according to the PICO criteria (18).

FINDINGS

This part of the study is devoted to presenting an overview of relevant findings about the impact of PE on athletic performance.

Training Practices

Recent research has shown that various interventions can be used to improve athletic performance. Pilates practices incorporated in training programs include: i) Mat Pilates (19, 20,2, 21, 22, 23, 24, 25, 26, 27), ii) Reformer (or Cadillac) Pilates (23, 28), (iii) Swiss ball exercises (20), and (iv) Plyometric training (19).

Physical and Physiological Performance Evaluation

PE has been reported to improve athletic performance in various sports. Pal et al. showed that PE improves balance and core strength in Karate athletes. Similarly, Kamatchi et al. reported that PE efficiently increased the core strength of cricket players. On the other hand, Park et al. demonstrated that PE increases muscle mass, body, and shoulder strength, and the hamstring-to-quadriceps strength ratio in baseball players. Preeti et al. reported significant improvements in lower-extremity dynamic balance, agility, strength, and coordination regarding performance increase in badminton athletes due to the incorporation of PE in training programs. The findings of Montesano and Mazzeo indicate that PE helps improve flexibility, muscular endurance, and serving and shooting skills in volleyball players. Furthermore, surveys by Ahearn et al. and Amorim et al. suggest that incorporating PE in training programs improves strength, flexibility, and postural stability in dancers. While PE helps in-

Table 2. Physical and Physiological Responses to Pilates Exercise Intervention

Reference	Sample	Treatment Group	Duration of Intervention (weeks/frequency)		Type of Pilates	Certificated Instructor	Outcome Measure	Results
Pal et al. 2021	Karate Athletes (M=120)	PG=40 (21.10±1.48) PTG=40 (21.00±1.77) CG=40 (21.10±1.87)	Eight weeks	3 days/60 min	Mat Pilates	NA	Star Excursion Balance Trunk Flexor Test Trunk Extensor Test Lateral Musculature Test	Plyometrics and PT improved karate athletes' balance and core strength. However, plyometric training positively affected core strength and dynamic balance more than the pilates group.
Park et al. 2020	Baseball Athletes (N=8)	PG=8	Eight weeks	3 days/ 50 min	Reformer/Cadillac Pilates	NA	BIA Isokinetic Testing	PT increased muscle mass, hamstring/ quadriceps ratio, and trunk and shoulder strength.
Kamatchi et al., 2020	Cricketer Athletes (M=30)	PG=15 SBG=15	Six weeks	4 days/ 30 min	Mat Pilates	NA	Double Leg Lowering Test Sphygmomanometer	It has been observed that PEs are more effective in improving core muscle strength than Swiss ball exercises.
Preeti et al., 2019	Badminton Athletes (M=20)	PG=10 CG=10	Five weeks	2 days/25 min	Mat Pilates	NA	10 m Shuttle Run Test Vertical Jump Test Star Excursion Balance Test Hand and Eye Coordination Test	PEs have improved lower body strength, agility, dynamic balance and coordination skills.
Greco et al., 2019 a	Volleyball Athletes (FM=56)	PG=28 (15.1±1.6) VTG=28 (15.9±1.8)	The experimental group (n=28) has been utilizing the team physiotherapist's PT program in addition to the volleyball team's training for at least two years.		NA	NA	Sit and Reach Test Vertical Jump Test Countermovement Jump Test	It has been observed that PT does not improve hamstring flexibility and lower extremity explosive strength.
Greco et al., 2019 b	Volleyball Athletes (FM=20)	PG=10 (15.3±0.7) VTG=10 (14.9±0.7)	Eight weeks		3 days/30 min	Mat Pilates	NA	Sit and Reach Test Vertical Jump Test
Finatto et al., 2018	Runner Athletes (N=32)	PG= 16 (18.42±0.51) CG=16 (18.44±0.52)	Twelve weeks		21 hours weekly	Mat Pilates	NA	BIA Electromyographic Variables
Ahearn et al., 2018	Dancer Athletes (FM=20)	PG=20	Fourteen weeks		7 days Reformer: 50 min Mat:45 min	Mat/Reformer Pilates	YES	Aligna Posture Assessment Double Leg Power Test Upper Abdominal Muscle Test Modified Thomas Test Hamstring Flexibility Test
Montesano and Mazzeo, 2018	Volleyball Athletes (M=20)	PG=10 CG=10	Eight weeks		NA	Mat Pilates	NA	Service and Smash Accuracy
Park et al. 2016	Archer Athletes (N=20)	PG=10 (17.30±1.06) CG=10 (17.00±0.67)	Twelve weeks		3 days/60 min	Mat Pilates	NA	Static and Dynamic Balance Test
Chinnavan et al. 2015	Football Athletes (FM/M=30)	PG=15 CG=15	Four weeks		5 days/30 min	Mat Pilates	NA	Goniometer Test Sit and Reach Test
Amorim et al., 2011	Dancer Athletes (FM=12) (M=3)	PG=7 (15.7±0.8) CG=8 (11.0±2.7)	Eleven weeks		2 days/60 min	Mat Pilates	NA	Muscular Strength Measurement Flexibility Measurement

PG: Pilates Group, CG: Control Group, SBG: Swiss Ball Group, PLG: Plyometric Group, VTG: Volleyball Training Group Min: Minute, NA: Not Available, BIA: Body Impedance Analysis, N: Sample, F: Female, M: Male.

crease hamstring flexibility in football players (26), it has also been reported to be efficient in facilitating static and dynamic balance in archers (25). According to the conclusions of Finatto et al. PE helps increase the Vo2 max level and sprint performance in sprinters. PE is not efficient in improving hamstring flexibility or lower limb explosive strength in volleyball players (29). However, while PE did not positively affect explosive strength, flexibility was improved (21).

DISCUSSION

This study proposes a systematic review of peer-reviewed literature on the impact of PE on athletic performance. In today's world, in sports competitions at the national or international level or in Olympic games, trainers and coaches must apply scientific methods and approaches to maximize athletic performance. Kordi argued that trainers and coaches need to utilize the best exercise methods to help athletes reach optimal performance levels. Providing support to this argument, Amtmann et al. demonstrate that workout programs involving adequate strength and conditioning contribute to higher athletic performance levels. The literature offers further evidence to support these arguments. For instance, Preeti et al. reported significant increases in lower extremity dynamic balance, strength, coordination, and agility in badminton athletes' physical performance due to the incorporation of a five-week Pilates workout in training programs. Similarly, Park et al. argued that a twelve-week Pilates workout improved the static and dynamic balance in archers. Several studies have found that PE improves balance performance in baseball athletes (32). PE can significantly improve abdominal endurance, hamstring flexibility, and upper-body muscular endurance in active middle-aged men and women. However, it did not significantly improve posture or balance (33). PE was performed slowly and with control. This helps to improve balance by allowing focus on body alignment and preventing loss of balance.

Similarly, Park et al. demonstrated that PE increases muscle mass, body, and shoulder strength, and the hamstring-to-quadriceps strength ratio in baseball players. Similar results have shown that PE positively affects trunk strength in baseball athletes (32). Another study showed that a 12-week study was conducted to assess the effects of mat Pilates on running efficiency. Sixteen participants were randomly assigned to either the experimental group, which performed mat PE two days a week for 60 min, or the control group, which did not perform any exercise. At the end of the study, the experimental group showed significantly improved running efficiency compared to the control group (22). In addition, PE improves abdominal and back muscle strength in sedentary women (34). On the other hand, comparing the effects of Swiss ball exercises and Pilates workouts on athletic performance, Kamatchi et al. indicated that PE appears more efficient in increasing core strength. Pilates involves more dynamic movements, such as single-leg stretches, double-leg stretches, and double straight-leg stretches, which may be more effective in improving core strength than Swiss ball exercises. Comparing the impact of PE and plyometric training on karate athletes' performance, plyometric training yields better results in improving balance and core strength (19). Eight weeks of PE significantly improved agility and functional mobility but did not significantly improve VO2 max in elderly women (35). A 5-week study was conducted to assess the effects of mat pilates on lower limb strength, dynamic balance, agility, and coordination in male athletes. Twenty male athletes were randomly assigned to either the experimental group, which performed mat PE two days a week for 60 min, or the control group, which did not perform any exercise. At the end of the study, the experimental group showed a significant difference from the control group in terms of lower limb strength, dynamic balance, agility, and coordination (2). The dynamic balance ability of the exercise group significantly improved after 12 weeks of mat PE, which was applied 3 days a week for 60 min each time (25). A study compared the effects of mat Pilates and Swiss ball exercises on core strength. The study included 30 randomly assigned participants to either the mat Pilates or Swiss ball group. Both groups exercised for 30 minutes, 4 days a week, for 6 weeks. At the end of the study, the mat Pilates group had significantly improved core strength compared with the Swiss ball group (20). Futsal athletes who performed mat PE for 25 minutes, 3 days a week for 4 weeks showed signif-

icant improvements in flexibility (36). PE strengthens the core muscles, which support the spine and pelvis. Strong core muscles help improve balance by providing a stable support base. Furthermore, good posture and balance depend on core muscles that support the spine and pelvis.

Regarding the relationship between PE and performance increase in dancers, Amorim et al. showed that PE yields improved muscular strength and flexibility. Similarly, Ahearn et al. reported that Pilates workouts helped improve dancers' posture, strength, and flexibility. PE also helps increase hamstring flexibility in football players (26). Another study showed that Pilates positively affected flexibility in futsal athletes (36) and sedentary individuals (33). According to Finatto et al., incorporating PE in sprinters' training programs can improve muscular strength, Vo2 max level, and overall sprint performance. In contrast to these findings, Gildenhuys et al. reported in a study on sedentary individuals that eight weeks of PE did not improve VO2 max capacity, and that an additional training model should be used in addition to PE for improvement. The results showed that PE had a positive effect on athlete performance. This effect can be observed in sedentary individuals with additional exercises that improve their motor characteristics.

PE does not improve 13-18 aged young female volleyball players' hamstring flexibility or lower extremity explosive strength (21). In another study of 14-16 aged young female volleyball players for eight weeks, PE enhanced flexibility but did not increase the explosive strength of female volleyball players (29). Although both studies were conducted on young female volleyball athletes, the age ranges of the two studies differ significantly. However, Considering the effects of relative age, biological maturation, and training experience on athlete performance, such a difference seems likely. In contrast to these findings obtained in lower extremity explosive strength, El-Sayed et al. stated that PE improved lower extremity explosive strength in young volleyball players. PE has been reported to improve muscular endurance, flexibility, serving, and shooting in volleyball players (24). PE can help improve the range of motion and flexibility in all major muscle groups. This can help athletes move more freely and efficiently, which can reduce their risk of injury. Pilates is a great way for athletes to improve their lower and upper body strength, balance, and flexibility. This low-impact workout can be tailored to the needs of individual athletes. However, Pilates can help athletes improve their sports performance and reduce the risk of injuries.

This systematic review aimed to reveal the effects of PE on sports performance. According to the studies conducted in this context, PE positively improved posture, static and dynamic balance, agility, muscle strength, flexibility, core strength, muscular endurance, running performance, VO2 max, coordination, and technical skills in athletes. The effects of PE on sports performance revealed that coaches and experts can improve the physical performance characteristics of athletes by including PE in their training programs. Although studies have investigated its effect on physical performance, no study has investigated its effect on the technical development of athletes. Researchers' reflections on the impact of Pilates and technical skills will create different perspectives on sports performance.

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