IJSETS
2015

INTERNATIONAL JOURNAL OF SPORT, EXERCISE & TRAINING SCIENCES

ISSN: 2149-8229

VOLUME 6, ISSUE 2, JUNE 2020
CİLT 6 SAYI 2, HAZİRAN 2020

INTERNATIONAL JOURNAL OF SPORT, EXERCISE & TRAINING SCIENCES

This journal has been indexed by **DOAJ (Directory of Open Access Journal), Tubitak Ulakbim, Google Scholar, Eurasian Scientific Journal Index, Index Copernicus (ICV 2016, 69.46), Turkish Citation Index, ASOS Index, Turkish Education Index, Academic Resource Index, Scientific World Indexing, SOBIAD, Cosmos Impact Factor, Academic Keys, Erih Plus, CrosReff, Root Indexing, Science Library Index, InfoBase Index (IBI Factor 2017, 2.8), U.S. National Library of Medicine - National Institutes of Health, Electronic Journals Library, WorldCat, MIAR, Arastirmax Scientific Publication Index, Akademik Dizin (Akademik Türk Dergileri İndeksi), CABI Abstracts, IdealOnline, Turk Medline, ROAD (Directory of Open Access Scholarly Resources), BASE (Bielefeld Academic Search Engine), International Innovative Journal Impact Factor (IIJIF), and Genamics JournalSeek.**

Bu dergi DOAJ (Directory of Open Access Journal), Tubitak Ulakbim, Google Scholar, Eurasian Scientific Journal Index, Index Copernicus (ICV 2016, 69.46), Turkish Citation Index, ASOS Index, Turkish Education Index, Academic Resource Index, Scientific World Indexing, SOBIAD, Cosmos Impact Factor, Academic Keys, Erih Plus, CrosReff, Root Indexing, Science Library Index, InfoBase Index (IBI Factor 2017, 2.8), U.S. National Library of Medicine - National Institutes of Health, Electronic Journals Library, WorldCat, MIAR, Arastirmax Scientific Publication Index, Akademik Dizin (Akademik Türk Dergileri İndeksi), CABI Abstracts, IdealOnline, Turk Medline, ROAD (Directory of Open Access Scholarly Resources), BASE (Bielefeld Academic Search Engine), International Innovative Journal Impact Factor (IIJIF), and Genamics JournalSeek tarafından indekslenmektedir.

ISSN: 2149-8229

INTERNATIONAL JOURNAL OF SPORT, EXERCISE & TRAINING SCIENCES

VOLUME 6, ISSUE 2, June 2020 **CILT 6, SAYI 2, HAZIRAN 2020**

Official Languages / Yayın Dili

English – Turkish

International Journal of Sport, Exercise & Training Sciences / Uluslararası Spor, Egzersiz & Antrenman Bilimi Dergisi
Published Electronically 4 times a year / Yılda 4 kez elektronik olarak yayınlanır.

http://dergipark.gov.tr/useeabd
ISSN: 2149-8229

INTERNATIONAL JOURNAL OF SPORT, EXERCISE & TRAINING SCIENCES

EDITORIAL BOARD / YAYIN KURULU (2020)

(ALPHABETICAL ORDER / ALFABETIK SIRA)

ISSN: 2149-8229

INTERNATIONAL JOURNAL OF SPORT, EXERCISE & TRAINING SCIENCES

IJSETS

INTERNATIONAL JOURNAL OF SPORT, EXERCISE & TRAINING SCIENCES 2015

CONTENTS
VOLUME 6, ISSUE 2 June 2020

İÇINDEKILER
CILT 6, SAYI 2, Haziran 2020

PAGE / SAYFA

MOVEMENT & TRAINING SCIENCES

SCIENCE OF SPORTS MANAGEMENT

Uluslararası Spor, Egzersiz & Antrenman Bilimi Dergisi

e-ISSN 2149-8229 Cilt 4, Sayı 4, 45–56, (2020) *Orjinal Makale*

http://dergipark.gov.tr/useeabd

Sosyal medya kullanımının spor ürünü satın almaya etkisi: Spor Bilimleri Fakültesi akademisyenleri üzerine nitel bir çalışma

Halil Erdem AKOĞLU[1], Seçkin DOĞANER[2]

Özet

Amaç: Araştırma, sosyal medya kullanımının sportif ürün satın almaya etkisinin neden – sonuç zinciri teorisi ışığında incelenmesi amacıyla planlanmıştır.
Materyal ve Metot: Araştırmada nitel yöntem tercih edilmiş ve fenomolojik teknik kullanılmıştır. Formda, demografik bilgilerin dışında 9 adet soru bulunmaktadır. Araştırma grubu, Ankara'da bulunan farklı üniversitelerin Spor Bilimleri Fakültelerinde görev yapan toplam 13 öğretim elemanından oluşmaktadır. Katılımcılar amaçlı örnekleme yöntemlerinden homojen (benzeşik) örnekleme yöntemi ile seçilmiştir. Formlardan elde edilen veriler içerik analizi yöntemi ile analiz edilmiştir. Çalışmadan elde edilen veriler sistematik bir biçimde betimlenmiş, daha sonra neden – sonuç ilişkilerini belirleyen kodlar oluşturularak, belirli temalar altında sınıflandırılmıştır.
Bulgular: Katılımcıların sosyal medya hesaplarını takip ederken karşılaştıkları sportif ürünlerden etkilenerek, ürünü hemen satın alma isteğinde olduğu, bazılarının ise, bu ürünleri satın almada çekingen davrandıkları anlaşılmıştır. Katılımcıların bazıları, ürünleri satın alırken, sosyal medya hesaplarında yer alan yorumları incelediklerini ve kalite, fiyat gibi kıyaslamaları okuduktan sonra spor ürünü satın almaya karar verdiklerini belirtmişlerdir. Sosyal medya hesapları üzerinden yapılan yorumları çok fazla güvenilir bulmayan bazı katılımcılar ise, buna rağmen ilgili hesapları yine de takip etmeye devam ettiklerini belirtmişlerdir.
Sonuç: Katılımcılar genel olarak sosyal medya hesaplarının, sportif satın alma süreçlerine etkisi olduğu anlaşılmıştır. Katılımcılar, internet üzerinden yapılan alışverişi rahat ve kolay bir yöntem olarak nitelendirirken, sosyal medya yorumlarına karşı temkinli olduklarını belirtmişlerdir. Katılımcılar, gelecekte sosyal medya hesaplarının sportif satın alma sürecinde daha fazla etkili olacağını vurgulamışlar ancak bu hesaplardan yapılan reklam ve yorumların daha gerçekçi olması gerektiğini belirtmişlerdir.

Anahtar Kelimeler
Sosyal medya,
Sportif satın alma,
Akademisyen
Tüketici Davranışı

Yayın Bilgisi
Gönderi Tarihi:14.08.2019
Kabul Tarihi:09.05.2020
Online Yayın Tarihi:19.06.2020

DOI:10.18826/useeabd.605334

The effect of using social media on purchasing of sports products: a qualitative study on faculty of sport sciences academicians

Abstract

Aim: The study was planned to examine the effect of social media use on sportive purchasing based on the Mean End Chain Theory.
Methods: Qualitative method was preferred from scientific research methods and phenomological technique was used. The research group consists of 13 faculty members working in the faculties of Sport Sciences. Participants were selected by simple random sampling method. Data obtained from the forms were analyzed by content analysis method. The data obtained from the study were described systematically, and then codes that determine the cause and effect relations were formed and classified under specific themes.
Results: It was understood that some of the answers of the participants were affected by the sporty products they encountered while following these accounts and that they wanted to buy the product immediately, while others were hesitant to buy these products. Some of the participants stated that they purchased the products, examined the comments in their social media accounts and decided to buy the sports product after reading the comparisons such as quality and price.
Conclusion: The participants' social media accounts, in general, had an impact on their sporting purchasing processes. Online shopping as a convenient and easy method, they stated that they were cautious against social media comments. Participants emphasized that in the future, social media accounts will be more effective in the sporting purchasing process, but the advertisements and comments made from these accounts should be more realistic.

Keywords
Social media,
Sports purchasing,
Academician
Consumer Behavior

Article Info
Received: 14.08.2019
Accepted: 09.05.2020
Online Published: 19.06.2020

DOI:10.18826/useeabd.605334

GİRİŞ

Sosyal medya ağları, günlük yaşam ve iş hayatı ile entegreli olarak milyonlarca kullanıcıyı cezbetmektedir (Wang, Yu ve Wei, 2012). 2019 yılında dünya çapındaki internet kullanıcılarının sayısı yıllık %9 artışla yaklaşık 5.112 milyar olurken, sosyal medya kullanıcılarının sayısı %9 artışla yaklaşık

The study designing; collecting, analyzing and interpretation data and manuscript preparation were undertaken by 1. and 2. author.
[1]Spor Bilimleri Fakültesi, Ankara/Türkiye, ORCID ID: 0000-0002-0818-7143
[2]Sorumlu Yazar: Spor Bilimleri Fakültesi, Ankara/Türkiye, ORCID ID: 0000-0001-9475-8338

3.484 milyar sayılarına ulaşmıştır (Global Digital Report, 2019). Global Web Index (2019) raporuna bakıldığında en fazla internette vakit geçiren ülke olarak Filipinler (10 saat 2 dk) yer alırken en düşük ülke ise Japonya (3 saat 45 dk) olarak belirlenmiştir. Bu raporda Türkiye'nin günlük ortalama internette geçirdiği süre 7 saat 15 dk olarak yayınlanmıştır.

Sosyal medya teknolojisinin ortaya çıkışı ve sosyal medya platformlarının popüler olmasındaki en büyük etken, insanların doğası gereği sosyal varlıklar olmasıdır. İnsanlar kendileri için önemli olan bilgileri toplamaya veya paylaşmaya meyilli varlıklardır. Sosyal medya, bilgi paylaşımı ve bu bilgilerin tartışılması için en önemli araç olarak günümüzde yerini almıştır. Aynı zamanda sosyal medya, insanların satın alma eğilimlerine ve karar verme süreçlerine de etki etmektedir (Chen ve Lien, 2017).

Pazarlamacılar ve tüketiciler günümüzde iletişimlerini sosyal ağ denilen yeni bir dinamik olan sosyal medya aracılığıyla genişletmektedirler (Shareef, Mukerji, Dwivedi, Rana ve Islam, 2019). Kullanıcısı katlanarak artan sosyal medyayı, dünya şirketleri ve devlet kurumları da önemli bir iletişim aracı olarak kullanmaktadır. Bireysel sosyal ağların aksine, kuruluşlar da aktif olarak reklam ve pazarlama için sosyal medyayı kullanmaktadır (Kim ve Ko, 2012). Tüketici davranışlarını etkilemek için gittikçe daha fazla şirketin sosyal medyada aktif olarak yer aldığı açıkça görülmektedir. (Chen ve Lien, 2017). En yeni pazarlama konsepti olan sosyal medya pazarlaması, insanların sosyal ağlar aracılığıyla birbirleriyle bağlantı kurmasına da olanak sağlamaktadır. Günümüzde, sosyal ağları dikkate almadan pazarlama stratejisini oluşturmak neredeyse imkânsız hale gelmiştir. Bazı çevrimiçi pazarlama yöntemlerini sosyal medya üzerinden uyarlamak tüm işletmeler için kilit rol oynamaktadır. Sosyal medya, satıcı ve alıcılar arasında zamanında ve etkileşimli olarak iletişim sağlayan yeni pazarlama / tanıtım platformu işlevi görmektedir (Shareef ve ark., 2019).

2017 yılında yayımlanan rapora göre ev eşyaları ve beyaz eşya, mobilya, ev dekorasyonu ve spor malzemeleri online tüketimde en yüksek büyüme potansiyelini göstermektedir. Katılımcıların önümüzdeki yıl için planlanan çevrimiçi alışverişlerine göre, ev eşyaları ve ev aletlerinin çevrimiçi satışlarının 3,5 puan, mobilya ve ev dekorunu 4,3 puan, spor malzemeleri ve ekipmanlarını 4,4 puan artacağı belirtilmiştir (Global Online Consumer Report, 2017). Bu noktadan da anlaşılacağı gibi spor ürünleri online tüketicilerin ilgisini çekmekte ve günden güne online sektörde artışına devam ederken bu sektördeki firmalarıda çezbedebilmektedir.

Şirketler sosyal medyayı çeşitli platformlar üzerinden (Facebook, Instagram vb.) müşterileriyle iletişim kurmak için kullanmakta iken, bu hesaplar şirketlerin kendi resmi hesapları olabileceği gibi bireyselde olabilmektedir (Mangold ve Faulds, 2009). Sosyal medya, Facebook, LinkedIn veya Twitter gibi sosyal ağ platformları ile metinler, videolar, bloglar, resimler ve durum güncellemeleri aracılığıyla tüketicilerin ve işletmelerin birbirleriyle iletişimi kolaylaştırmaktadır (Nedra, Hadhri ve Merzani, 2019).

Pazarlama sosyal medyanın ortaya çıkmasından sonra tek boyutlu olmaktan çıkmış, artık bir marka ile müşteri arasındaki iletişimi sağlayan iki yönlü bir süreç haline gelmiştir. Sosyal medyada pazarlama sadece bir mesaj söylemek ve vermek değil, aksine algılara ve fikirlere ulaşmak ve bu fikirlerin karşılıklı değiş tokuşuyla ilgilidir (Drury, 2008). Tüketiciler artık görüşlerini, anlık düşüncelerini ve deneyimlerini sosyal medya aracılığıyla arkadaşlarıyla paylaşabilmekte ve satın alma kararlarını vermeden önce şirketler ve ürünleri hakkında bilgi toplayabilmektedir (Nedra ve ark. 2019). Tüketicilerin bu davranışı literatürde ağızdan ağıza (word of month) iletişim olarak kavramsallaştırılmıştır.

Sosyal medyanın ortaya çıkışı, müşterilerin ağızdan ağıza (WOM) bilgi aktarma şeklini önemli ölçüde değiştirmiş ve internet üzerinden yapılan alışverişlerde sosyal paylaşım siteleri kişilerin deneyimlerini paylaşmalarına olanak sağlamıştır. Bu nedenle internet üzerinden gerçekleşen elektronik ağızdan ağıza iletişim (EWOM) kavramı online pazarlamada yerini almış ve insanların ürün ve hizmet seçeneklerinde oldukça etkili hale gelmiştir. Özellikle, olumsuz sözlü iletişim, müşterilerin tutumlarını ve satın alma niyetlerini ve bir firmanın marka imajını olumsuz yönde etkileyebilmektedir (Balaji, Khong ve Chong, 2016). Ağızdan ağıza iletişimin tüketici davranışları üzerinde diğer pazarlama stratejileri veya reklam kampanyalarından daha fazla etkili olduğu yapılan birçok çalışmayla tespit edilmiştir (Hussain, Guangju, Jafar, Ilyas, Mustafa ve Jianzhou 2018; Zhang, Craciun ve Shin., 2009; Okazaki, 2009; Breazeale, 2009; Maxham and Netemeyer, 2002).

Araştırmada Neden-Sonuç Zinciri Teorisi temel alınarak, spor bilimlerinde görev yapan akademisyenlerin sosyal medya kullanımının sportif satın almaya etkisinin incelenmesi amaçlanmıştır.

Neden-Sonuç Zinciri teorisi, tüketici davranışlarının özelliklerini ortaya çıkarmak için müşterilerin düşünce biçimlerini analiz etmeye yarayan ve bu doğrultuda istenen sonuca götüren davranışları belirleyen bir teknik olarak görülmektedir (Gutman, 1982; Jiang, Scott ve Ding 2018; Lin, Fu ve Chen, 2019). Tüketici ürünlerinin pazarlanması literatürde iki perspektif ile açıklanmaktadır. Bunlar sosyolojik bakış açısı sunan "makro" ve psikolojik bakış açısı sunan "mikro" perspektiflerdir. Neden-Sonuç Zinciri Teorisi ise, tüketimde "mikro" yaklaşımın sunduğu psikolojik bakış açısına dayanan nedenler ve sonuçlar ile ilgilenmektedir (Reynolds ve Gutman, 1988). Neden-Sonuç Zinciri Teorisine göre, müşteriler seçtikleri ürünü sadece bir tüketim aracı olarak değil, kendi amaçlarını, değerlerini ve ulaşmak istedikleri hedeflerini ortaya koyabildikleri psikolojik ve işlevsel bir sonuç olarak görmektedir (Costa, 2004). Bu nedenle Neden-Sonuç Zinciri Teorisinin, üç ana bölümden oluştuğu varsayılmaktadır. Bunlar, fiyat, renk, ağırlık gibi somut nitelikler taşıyan "özellik" bölümü, inanç, motivasyon, mutluluk gibi soyut nitelikler taşıyan "değer" bölümü ve tüketicilerin ürünü satın aldıktan sonra elde ettikleri psikolojik ve fiziksel göstergeleri betimleyen "sonuç" bölümüdür (Li ve ark, 2016).

Sosyal medya kişilerin görüşlerine doğrudan etki eden ve diğer tüketicilerle ürün hakkında iletişime geçebileceği bir ortam sağlamaktadır. Özellikle son yıllarda şirketlerinde sosyal medya ticaretine önem vermesiyle birlikte sosyal medya online alışverişte etkin bir platform haline gelmiştir. Bir çok spor firması da pazarlama ağını genişletmek adına bu alana yönelmekte ve tüketicileri etkilemeye çalışmaktadır. Neden-Sonuç Zinciri Teorisinde de tüketim eyleminin sonuçları istenen veya istenmeyen nitelikte olabilir. İstenen veya istenmeyen sonuçlar, doğrudan ürün tüketiminden kaynaklanabileceği gibi, dolaylı olarak daha ileri bir tarihte veya diğer kişilerin bu tüketim davranışına tepkisinden dolayı ortaya çıkabilmektedir (Gutman, 1984). Bu nedenle tüketiciler sportif ürünleri tercih ederken sosyal medyada karşılaştığı reklamlardan, bir ürünü satın alma aşamasında ürün hakkındaki yorumlardan ne derece etkilendiği ayrıca bu yorumlara veya sosyal medya hesaplarına güvenip güvenmediği bu araştırmayla ortaya konulmaya çalışılmıştır.

MATERYAL VE YÖNTEM

Bu araştırmada ayrıntılı ve derinlemesine veri toplama, katılımcıların bireysel algılarını, deneyimlerini ve bakış açılarını doğrudan öğrenme, mevcut durumları anlama ve açıklama amacıyla nitel araştırma yaklaşımı kullanılmıştır. Nitel yöntem gözlem, röportaj ve toplantı notları ya da tarihi kayıtları içeren inceleme türlerini kapsamakla beraber, kelimeler, kavramlar ve değişkenler arasındaki ilişkilerin dikkatlice tanımlanması olarak açıklanabilir. Nitel verilerde güvenirlik değerlendirmelerinde dikkat gerekmektedir çünkü elde edilen veriler, insanların yorumuna ve değerlendirmelerine dayanmaktadır (Walliman, 2017, s.73). Nitel araştırmalarda birden çok kişinin görüşüne başvurulduğundan, bu verilerin yorumlanması ve yaşadıkları deneyimlerin aktarılması oldukça önemlidir. Bu tip bir durumda, nitel araştırma içerisinde yer alan fenomolojik teknik tercih edilmelidir çünkü fenomolojik teknik, tek bir kişinin yorumunu değil, birden çok kişinin ilgili kavram ya da olgu ile ilgili yaşadıkları deneyimlerin anlamını ortaya koyabilmektedir. Dolayısıyla tüm katılımcıların deneyimledikleri bir olgu ile ilgili ortak noktalarının tespit edilmesi kolaylaşmaktadır (Creswell, 2007, s.56-57).

Nitel araştırmalarda analiz yapılmadan önce, seçilen konunun araştırma problemi ile ilgisi belirtilmeli ve oluşturulan temalar ile kodlar dikkatli bir incelemeden geçmelidir. İnceleme esnasında öncelikle katılımcı görüşlerinin kontrolleri, sınıflandırmaları ve yorumlama yöntemleri öne çıkarılmalıdır. Nitel araştırmalarda metin içerisinde çok miktarda bilgi yer alır ve bu bilgiyi doğru analiz edebilmek için, veri azaltma, veri görüntüleme ve sonuçlandırma/doğrulama aşamalarının kullanılması gerekmektedir (Walliman, 2017, s.132).

Görüşmeler, kaynakların ulaşılabilirliğine ve araştırmada toplanmak istenen verilerin özelliklerine göre; yapılandırılmış görüşme, yapılandırılmamış görüşme, yarı yapılandırılmış görüşme, etnografik görüşme ve odak görüşmesi olarak sınıflandırılmaktadır (Büyüköztürk ve ark., 2014).

Veri Toplama Aracı

Araştırmanın verileri "yarı yapılandırılmış görüşme formu" ile elde edilmiştir. Bu kapsamda görüşme formu aşağıdaki süreçte hazırlanmıştır:

- Öncelikle ilgili literatür taranmış ve araştırma konusuna ilişkin yapılan çalışmalar incelenmiştir.
- Görüşme formu hazırlanırken açık-net ve kolay anlaşılabilir, özelden genele sıralamayla giden kişileri yönlendirmeden kaçınacak açık uçlu sorular olarak hazırlanmıştır.
- Görüşme formu, görüşme yapılacak bireylerin sosyo-demografik özellikleri, hangi tür sosyal hesapları takip etmeyi tercih ettikleri, sportif satın alma konusundaki düşünceleri, internet üzerinden yapılan alışverişlerin cinsi, miktarı ve yöntemleri ile sosyal medya ve sportif satın alma konusundaki gelecek beklentilerini içeren sorular üzerine hazırlanmıştır.
- Konu ile ilgili uzman görüşü alınmış, gerekli düzenlemeler yapılarak form yeniden yapılandırılmıştır.

Görüşme formunda, demografik bilgiler dâhil 9 adet soru yer almaktadır. Demografik bilgilerde katılımcıların yaşı, cinsiyeti, medeni durumu, düzenli olarak yaptığı fiziksel aktivite, gün içerisinde internette harcanan süre, kullanılan sosyal medya hesapları ve gün içerisinde sosyal medyada geçirilen süre gibi sorular sorulmuştur. Bu sorularda katılımcıların düşünceleri yer almaktadır. Araştırma verileri katılımcılarla araştırmacılar tarafından yüz yüze yapılan görüşmeler ile toplanmıştır. Bu kapsamda araştırmacılar ile katılımcılar görüşme için önceden yer ve zaman konusunda randevulaşmışlardır. Ayrıca bu ön görüşmede katılımcılara araştırmanın kapsamı ve amaçları ile ilgili bilgi verilmiştir. Araştırmacılar görüşmeye herhangi bir zorlama olmadan gönüllü olarak katılmışlardır. Görüşmeler daha çok katılımcıların şahsi çalışma odalarında gerçekleştirilmiştir. Görüşmeler 20 - 40 dakika arasında sürmüştür.

Geçerlik ve Güvenirlik

Nitel araştırmada geçerlik, araştırmacının ilgilendiği konuyu olabildiğince tarafsız gözlemesine dayanmaktadır. Nitel araştırmalarda geçerlik genellikle iki bölümde incelenmektedir. Bunlardan birincisinde araştırmanın gerçekliğini ortaya çıkarmak için sonuçlara ulaşmada izlenen yolun yeterliğine bakılır ve buna "iç geçerlik" denilmektedir. İkincisinde ise sonuçların benzer gruplara ya da çevrelere aktarılabilirliği test edilmekte ve bu durum ise "dış geçerlik" olarak adlandırılmaktadır (Karataş, 2015; Yıldırım ve Şimşek, 2008, s.289). Araştırmada geçerlik konusunda, sorulardaki duygu ve düşünceler arasındaki ilişkilerin incelenmesi, katılımcı teyidi alınması ve verilerin kontrol edilmesi amacıyla alanında üç uzman kişinin görüşleri alınmış ve kendilerinden soru ve cevapları değerlendirmeleri istenmiştir. Nitel araştırmalarda araştırmacının olayları algılama ve yorumlama biçimi farklı olmaktadır. Bu durumda güvenirlik için "gözleme bağlı güvenirlik" ve "zamana bağlı güvenirlik" konularında araştırma öncesi birden fazla önlem alınmıştır (Yıldırım ve Şimşek, 2008, s.289). Bunları saymak gerekirse, araştırmaya benzer konular incelenmiş, kavramsal çerçeve birden fazla uzman tarafından kontrol edilmiş ve son olarak görüşmelerin hangi koşullarda elde edildiği ve dökümanların nasıl analiz edildiği gibi konular açıkça ifade edilmiştir.

Katılımcılar

Veriler, Ankara ilinde eğitim ve öğretimine devam eden ve farklı Spor Bilimleri Fakültelerinde görev yapan akademisyenlerden elde edilmiştir. Toplam 13 katılımcı araştırmaya dâhil edilmiş olup, bunlardan 11 tanesi erkek, 2 tanesi ise kadındır. Katılımcılar, amaçlı örnekleme yöntemlerinden homojen örnekleme yöntemi ile seçilmiştir. Homojen (Benzeşik) örnekleme, küçük benzeşik bir örneklem oluşturma yoluyla belirgin bir alt-grubu tanımlamaktadır (Yıldırım ve Şimşek, 2016, s.135). 27 ve 38 yaş aralığında olan katılımcıların tamamının birden fazla sosyal medya hesabı bulunmakta ve tamamı düzenli olarak fiziksel aktivitelere katılmaktadır. Katılımcılar sportif ürünlere (spor ayakkabı, eşofman, t-shirt, yapılan branşa özgü ekipmanlar, vb.) aylık 100 TL ile 500 TL arasında harcama yaptıklarını belirtmişlerdir.

İstatistiksel Analiz

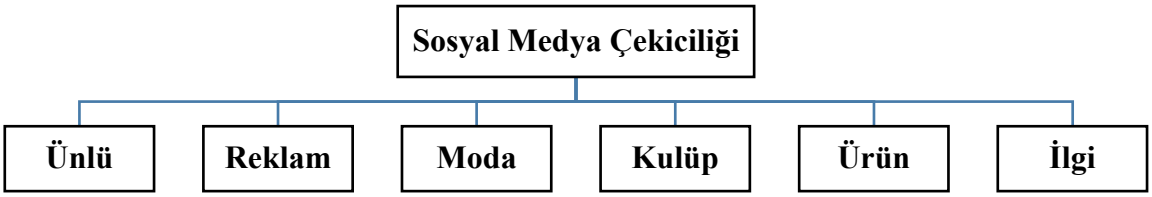
Araştırmada içerik analizi tekniği kullanılmıştır. İçerik analizi, metnin içeriğine odaklanan esnek bir araştırma aracı olmakla beraber, bu analizde bir veya birden çok metnin içindeki sözcüklerin, kavramların, temaların, deneyimlerin veya karakterlerin varlıkları belirlenmeye çalışılır (Seggie ve

Bayyurt, 2017, s.253). İçerik analizi yapılırken, görüşme metinleri detaylıca okunmuş ve öncelikli olarak kodlamalar oluşturulmuştur. Kodlamalar, verilere bir tür etiket atamak anlamı taşımaktadır. Nitel araştırmalarda kodlamalar veri yığınının düzenlenmesine yardımcı olur ve kavramsallaştırma adına ilk adımı sağlayarak, veri yükünü hafifletir. Kod tasarlarken dikkat edilmesi gereken en önemli husus, metin parçalarının veya kodladığınız her şeyin yalnızca bir koda sığabilmesini sağlamaya çalışmaktır (Walliman, 2017, s.133). Bu nedenle, araştırmanın bulgular bölümünde, elde edilen kodlamalar, oluşturulan temalar altında sırasıyla kullanıcı görüşleri ile birlikte verilmiştir.

BULGULAR

Kullanıcılardan elde edilen veriler incelendiğinde ilk olarak "Sosyal Medya Çekiciliği" teması oluşturulmuştur. İlgili tema altındaki görüşler incelendiğinde, "ünlü", "reklam", "moda", "kulüp", "ürün" ve "ilgi" başlıklı kodları elde edilmiştir (Şekil 1).

Şekil 1. Sosyal Medya Çekiciliği Teması

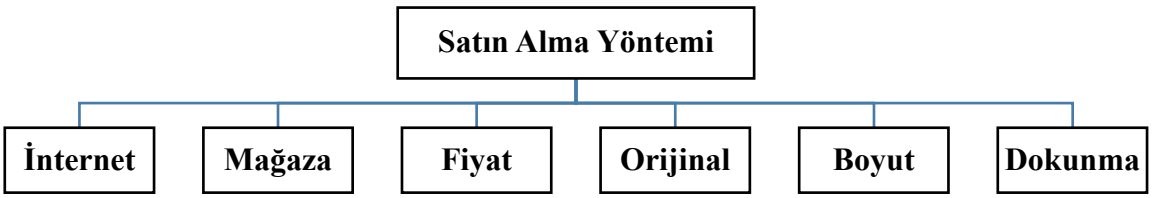


Katılımcılar, oluşturulan bu tema altında genel olarak, ünlü markaların dikkat çekiciliğinden, spor kulüplerine ait ürünlerin kaliteli olmasından ve spor ürünlerine ait moda akımlarının ilgi çektiğinden bahsetmişlerdir. Katılımcıların tema ve kodlara özgü verdikleri bazı cevaplar aşağıda sunulmuştur:

- *"Ünlü kişilerin sosyal medya hesaplarında kullandığı ürünler benim satın almamda çok etkili oluyor. Spor ürünleri alımlarında şu anki moda trendlerini bu hesaplardan takip ediyorum (Katılımcı 1)".*
- *"Ünlü markaların sosyal medya hesaplarındaki ilanlara oldukça ilgi duyuyorum. Bu ürünleri almaya karar verirken, eşimle birlikte incelemek ve öyle satın almak istiyorum (Katılımcı 2)".*
- *"Spor kulüplerine ait sosyal medya hesaplarından yeni çıkan spor ürünlerini takip ediyorum. Bu ürünleri gördüğümde satın almak için hemen resmi satış sitelerine girerek ürünü detaylıca inceliyorum (Katılımcı 5)".*
- *"Bazı ünlü markaların modellerini sosyal medyada takip edip, beğendiklerimi izlemeye alıyorum. Resmi web sitesinden takip ettiğim ürünleri fiyatları uygun olduğunda hemen almaya çalışıyorum (Katılımcı 6)".*
- *"Ünlü futbol kulüpleri ya da antrenman metotları ile ilgili sosyal medya hesaplarını sürekli takip ediyorum. İlgimi çeken ürünleri inceliyorum ancak hemen satın almıyorum (Katılımcı 7)".*

İkinci olarak "Satın Alma Yöntemi" teması oluşturulmuştur. İlgili tema altındaki görüşler incelendiğinde, "internet", "mağaza", "fiyat", "orijinal", "boyut" ve "dokunma" başlıklı kodları elde edilmiştir (Şekil 2).

Şekil 2. Satın Alma Yöntemi Teması



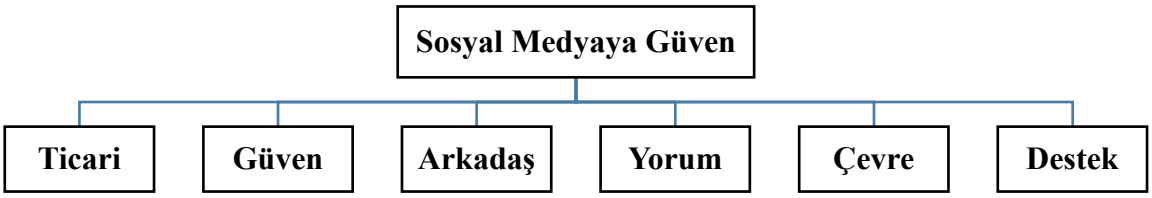
Katılımcılar, oluşturulan bu tema altında genel olarak, internet üzerinden yapılan alışverişlerin daha ucuz olduğundan, ürünlerin orijinal olmasının ve ürün boyutlarının tercih nedeni olduğundan ve ürün

satın alırken ürünü dokunarak deneyimlemenin öneminden bahsetmişlerdir. Katılımcıların tema ve kodlara özgü verdikleri bazı cevaplar aşağıda sunulmuştur:

- *"İncelediğim spor ürünlerini hem internetten hem de mağazadan satın alıyorum, ancak ürünün boyutlarını görmem ve istediğim ürüne mutlaka dokunmam gerekiyor. Ayrıca satın alacağım ürünün orijinalliğinden de emin olmak zorundayım (Katılımcı 3)".*
- *"Öncelikle sosyal medya üzerinden seçtiğim ürünün boyutlarından emin olmak için mağazada üzerimde deniyorum. Ürünü denedikten sonra internetten satın alıyorum, çünkü benim için bu yöntem daha ucuza geliyor. Ancak, sosyal medya üzerinden seçtiğim spor ürünlerinin üzerime uygun olacağından eminsem beklemeden hemen satın almayı tercih ediyorum (Katılımcı 2)".*
- *"Seçtiğim spor ürünlerini hem mağazadan hem de internetten satın alabiliyorum. Ancak ürünün sosyal medya yorumlarını incelediğimde bazen bunları mağazada görmek ve deneyimlemek istiyorum. İnternetten olsun, mağazadan olsun, her iki yöntemin de kolaylıkları ve zorlukları var (Katılımcı 1)".*
- *"Sosyal medyadan takip ettiğim ürünleri mağazada görsem bile, internet üzerinden almayı tercih ediyorum çünkü bu yöntem bana daha kolay geliyor. Takip ettiğim ürünlerin hesaplarına ise, günde en az bir kere girip bakıyorum (Katılımcı 10)".*
- *"İnternet üzerinden alışveriş yapmak benim için daha kolay. İlgimi çeken ürünleri birçok yönden inceleyip daha sonrasında satın alıyorum. Ürünün orijinal ve kaliteli olması benim için çok önemli. Ayrıca kullanıcıların yaşadığı sıkıntıları da araştırmam ve çok güvenli bulmasam da ürüne ait yorumları okumam gerekiyor (Katılımcı 12)".*

Üçüncü olarak "Sosyal Medyaya Güven" teması oluşturulmuştur. İlgili tema altındaki görüşler incelendiğinde, "ticari", "güven", "arkadaş", "yorum", "çevre" ve "destek" başlıklı kodları elde edilmiştir (Şekil 3).

Şekil 3. Sosyal Medyaya Güven Teması



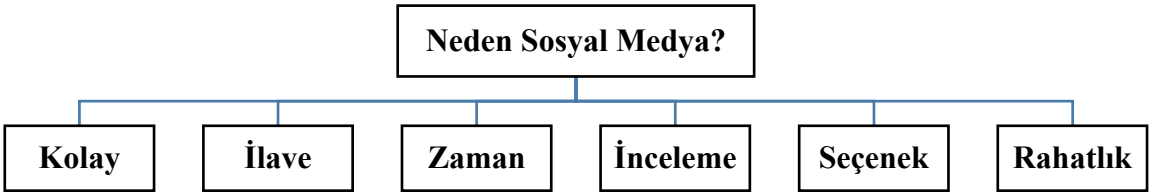
Katılımcılar, oluşturulan bu tema altında genel olarak, ticari kaygıların sosyal medya üzerinden yapılan yorumları etkilediğinden, arkadaş çevresi tarafından anlatılan ürün deneyimlerine daha sıcak bakıldığından ve sosyal medya üzerinden yapılan ürün yorumların güvensiz olduğundan bahsetmişlerdir. Katılımcıların tema ve kodlara özgü verdikleri bazı cevaplar aşağıda sunulmuştur:

- *"Sosyal medya üzerinden yapılan ürün incelemelerine maalesef güvenemiyorum. İlgi duyduğum sportif ürünü kullanan arkadaşlarımın yorumları benim için daha önemli ve güvenilir (Katılımcı 4)".*
- *"Sosyal medyada karşılaştığım ürün yorumları bence çok güvensiz. Satışı etkilemek için sosyal medya üzerinden yapılan çeşitli yorumlar bende biraz şüphe uyandırıyor. Ürünü kullanmış olan yakın çevreme ve arkadaşlarımın yorumlarına daha çok güveniyorum. (Katılımcı 5)".*
- *"Sosyal medya yorumlarının ticari kaygılar ile yapıldığını düşünüyorum. Bence bu tip yorumlar her zaman ürüne yakın belirli kişiler tarafından yapılıyor. Bu nedenle yorumlara güvenemiyorum (Katılımcı 6)".*
- *"İnternet üzerinden alışverişlerimi yapıyorum çünkü bu yöntem bana çok kolay geliyor. Genel olarak ayakkabı, tişört ve eşofman gibi ürünleri almayı tercih ediyorum. Bu ürünleri alırken yakın çevreme çok güveniyorum ve fikir alışverişinde bulunuyorum. Arkadaşlarımdan aldığım tavsiyeler bana güvenilir geliyor (Katılımcı 7)".*
- *Alışveriş yaparken eşimden çok destek alıyorum çünkü onun zevklerine güveniyorum. Sosyal medyada yapılan yorumların gerçeği çok fazla yansıtmadığını düşünüyorum. Bu nedenle kendi yakın çevremin önerileri benim için daha önemlidir. Alışveriş yaparken takip ettiğim ürünlerin*

resmi web sitelerini incelesem bile, güvenilir bulduğum farklı web sitelerinden alışverişimi yapıyorum (Katılımcı 8)".

Dördüncü olarak "Neden Sosyal Medya?" teması oluşturulmuştur. İlgili tema altındaki görüşler incelendiğinde, "kolay", "ilave", "zaman", "inceleme", "seçenek" ve "rahatlık" başlıklı kodları elde edilmiştir (Şekil 4).

Şekil 4. Neden Sosyal Medya? Teması

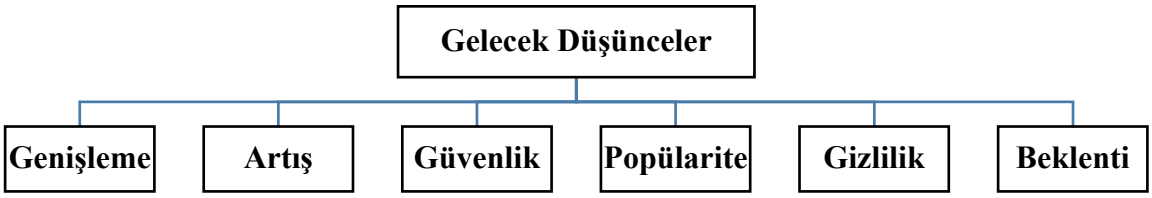


Katılımcılar, oluşturulan bu tema altında genel olarak, sosyal medya üzerinden yapılan ürün satışlarının işlerini kolaylaştırdığından, çok fazla çeşit olan ürünlerde inceleme süresini azalttığından ve geniş ürün yelpazesinin mükemmel bir konfor sunduğundan bahsetmişlerdir. Katılımcıların tema ve kodlara özgü verdikleri bazı cevaplar aşağıda sunulmuştur:

- *"Almak istediğiniz tüm ürünleri sosyal medya üzerinden kolayca takip edebiliyorsunuz. Özellikle sportif ürünlerde çeşitlilik çok fazla ve bu sosyal medya bu konuda beni oldukça rahatlatıyor (Katılımcı 8)".*
- *"Sosyal medya da takipçi sayısı ürünü etkiler. Bu sayede seçtiğim ürüne daha az zaman ve enerji harcıyorum. Çünkü sosyal medya üzerinde en çok incelenen ya da yorum yapılan ürünler genel olarak en çok takipçisi olan kişilerin ürünlerinden oluşuyor (Katılımcı 9)".*
- *"Sosyal medyada canlı destek ve ürün çeşitliliği benim için çok önemlidir. Herkes sosyal medyada ürünleri tanıtıyor ve paylaşıyor. Bu tip bir yaklaşım benim almayı planladığım ürünlere karşı seçimlerimi ve görüşlerimi kolaylaştırıyor (Katılımcı 10)".*
- *"Sosyal medya üzerinden bir ürünü takip etmek ve incelemek oldukça rahat. İlginizi çekebilecek birçok ürün var ve bu ürünlere ait çok sayıda seçenek mevcut. İnceleme yapmak ve bu seçenekler arasında ürünü satın almak oldukça kolay (Katılımcı 1)".*
- *"İnternet üzerinden ürün satın almak hem konforlu hem de kullanıcıya ilave birçok seçenek sunuyor. Sosyal medyada çıkan reklamlar ise, takip ettiğiniz ürünleri size tekrar hatırlatıyor. Bu nedenle reklamlar üzerinden çeşitli ürünlere de yönelebiliyorsunuz (Katılımcı 4)".*

Araştırmada son olarak "Gelecek Düşünceler" teması oluşturulmuştur. İlgili tema altındaki görüşler incelendiğinde, "genişleme", "artış", "güvenlik", "popülarite", "gizlilik" ve "beklenti" başlıklı kodları elde edilmiştir (Şekil 5).

Şekil 5. Gelecek Düşünceler Teması



Katılımcılar, oluşturulan bu tema altında genel olarak, gelecek dönemlerde sosyal medya tabanlı satışların artacağından, güvenlik ve gizliliğin daha önemli olacağından ve sosyal medya desteğinin daha da popüler bir hale geleceğinden bahsetmişlerdir. Katılımcıların tema ve kodlara özgü verdikleri bazı cevaplar aşağıda sunulmuştur:

- *"Sosyal medyada gördüğümüz reklam ve ürün pazarlaması sistemi bence gelecek için umut vericidir. Gelecekte spor pazarlamasının sosyal medya hesapları ile daha da genişleyeceğini düşünüyorum (Katılımcı 11)".*
- *"E-ticaret dünyada zaten gelişmekte olan bir sektör. Sosyal ağlar ise bu konuda inanılmaz destekler sunuyor. Gelecekte ülkemizde ve dünyada sosyal medya üzerinden yapılan satışlar konusunda daha fazla projeler geliştirileceğini bekliyorum (Katılımcı 12)".*
- *"Gelecekte dünyada sosyal medya aracılığıyla satışlar daha da artacak. Sosyal medya üzerinden yapılan satışlarda dünya standartlarına ulaşmamıza rağmen, satış güvenliği konusunda biraz daha çalışmamız gerektiğini düşünüyorum. (Katılımcı 8)".*
- *"Farklı ülkelerde satın alma süreçlerinin daha güvenli ve kolay olduğunu gözlemledim. Bu tekniklerin ülkemizde de geliştirilmesi gerektiğini düşünüyorum. Özellikle ürün satın alan kişilerin gizliliği daha fazla korunmalı ve bunlar standart hale getirilmeli (Katılımcı 4)".*
- *"Kuruluşların kendi kurumsal kimliklerini oluşturmaları ve sosyal medya hesapları ile bu kimliklerini sağlamlaştırmaları gerekiyor. Bu sayede insanların sosyal medya üzerinden satın alma eğilimlerinin de artacağını düşünüyorum. Elbette gizlilik olmalı ancak olumlu ve olumsuz yorumlara da mutlaka ürün hesaplarında yer verilmedi. Bu tarz yaklaşımlar ürüne ve hesaba karşı güven duyulmasına neden olacaktır (Katılımcı 3)".*

TARTIŞMA

Araştırmanın sonuçları incelendiğinde, sosyal medya üzerinden yapılan satışların, spor bilimlerinde görev yapan akademisyenler tarafından oldukça ilgi çektiği, ürün incelemelerine ve yapılan yorumlara dikkat edildiği ancak satış güvenliği ve gizlilik gibi konularda katılımcıların şüpheleri olduğu tespit edilmiştir. Gelecekte sosyal medya üzerinden yapılan satışların artacağı konusunda ortak görüşler belirten katılımcıların, spor ürünlerini incelemek ya da satın almak için internetin sunduğu kolay ve rahat imkânları kullanmaktan dolayı memnun oldukları görülmüştür. Literatürde araştırma sonuçlarımız ile benzerlik taşıyan bazı sonuçlara ulaşılmış ve elde edilen bu sonuçlar, araştırmamızın sonuçları ile tartışılmıştır.

Dugalić ve Lazarević (2016) tarafından yapılan bir araştırmada ünlü sporcuların insanlar tarafından ilgi ile takip edildiği ve bu sporcuların kullandığı ürünlerin ise onu takip eden kişiler tarafından özellikle kullanılmak istendiği tespit edilmiştir. Bu tip bir sonuç araştırmamızda yer alan sonuçlar ile benzerlik taşımaktadır. Katılımcıların ilgi duydukları sporcuların ürünlerine karşı daha fazla hassasiyet gösterdikleri araştırma sonuçlarımızda da görülmektedir. Do, Ko ve Woodside (2015) tarafından yapılan bir araştırmada ise marka ve sosyal medya arasında güçlü bir ilişki olduğu görülmüş ve bu ilişki aynı zamanda tüketimi de etkileyen bir algı olarak gösterilmiştir. Araştırmacı, sosyal medyanın sportif markalar üzerinde satın alma gücü olduğu gibi, sponsorluk ve tüketici bağlılığında da önemli bir ilişki gösterdiğini vurgulamaktadır. Bu durum araştırma sonuçlarımız ile benzerdir. Araştırmamızda marka bağlılığının bir tercih sebebi olduğu tespit edilmiş ancak katılımcıların fiyat-performans eğrisine dikkat ettiği de yapılan yorumlarda görülmüştür.

Crespo-Hervas, Alguacil ve Núñez-Pomar (2018) tarafından yapılan bir araştırmada ise, benzer konuda cinsiyet açısından önemli sonuçlar elde edilmiştir. Söz konusu araştırmaya göre, kadınların sosyal medya üzerinden satın alma isteklerinin, erkeklere oranla daha fazla olduğu görülmüştür. Bu tip bir durum kadınların alışverişe olan düşkünlüğü ile yorumlanabilir ancak araştırma, aynı zamanda erkeklerin, kadınlara oranla marka ve kalite düşkünlüğünde önde olduğunu da göstermektedir. Bu tip bir sonuç araştırma sonuçlarımız ile benzerdir çünkü her ne kadar erkek katılımcıların araştırmamızda sayıca fazla olduğu görülse de yorumlara bakıldığında eşlerinden fikir alma yönünde istekli oldukları görülmektedir.

Neden-Sonuç Zinciri Teorisinde tüketici eğilimlerini belirleyen birtakım davranışlar vurgulanmaktadır. Bunlar genel olarak ihtiyacın farkındalığı, ürünü incelemek ve ürün hakkında yapılan yorumların analizini yaparak satın alma davranışını gerçekleştirmektedir (Gutman, 1982). Araştırmamızda katılımcıların teoride bahsedilen davranışları sergilediği gözlenmiştir. Katılımcılar, sosyal medya platformlarını temel alarak belirledikleri ihtiyaçları, fiyat-performans eğrisi gözeterek incelemişler ve son olarak ürünü satın alma kararı vermişlerdir. Neden-Sonuç Zinciri Teorisinde bahsedilen bu davranış eğilimi İşlek (2012) tarafından yapılan bir araştırmada da vurgulanmıştır. Araştırmacı, insanların öncelikle almak istediği ürünün farkında olma, almaya karar verme, ürünü

inceleme, ürün hakkında fikir sahibi olma, ürünü satın alma ve en sonunda ürün hakkında yorum yapma eğiliminde olduğu tespit edilmiştir. Literatürden ve araştırmamızdan elde edilen bu sonuçlar Neden-Sonuç Zinciri Teorisinde vurgulanan davranış eğilimlerine benzer yapı gösterse de katılımcıların güvenilir markalara ait spor ürününü sosyal medyadan alıp kullanan bireylerden sözlü olarak geribildirim almayı daha fazla tercih etmektedir. Ancak literatürde bu konu ile ilgili etik olmayan bazı sonuçlar elde edilmiştir. Örnek olarak Abeza, O'Reilly ve Reid (2013) tarafından yapılan bir araştırmada, sosyal medya üzerinden satış yapan bazı kişiler tarafından, sosyal medya platformları üzerinden gelen ve markanın güvenirliğini tehlikeye atan tüketici mesajlarının kaldırıldığı tespit edilmiştir. Bu durum, sosyal medya üzerinden alışveriş yapan kişiler için güvensiz ve etik olmayan bir davranış olarak görülmektedir. Erkan ve Evans (2018) tarafından yapılan bir başka çalışmada da sosyal medyadaki kullanıcı bilgilerinin, tüketicilerin online satın alma niyetleri üzerinde alışveriş web sitelerindeki bilgilerinden daha güçlü bir etkiye sahip olduğunu bulunmuştur. Bu sonuç araştırma sonuçlarımızda yer alan ve katılımcıların hassasiyetle üzerinde durduğu konular ile benzerlik taşımaktadır.

Lim, Hwang, Kim ve Biocca (2015) tarafından yapılan bir araştırmada sosyal medya üzerinden sosyal ağ sitelerine katılımların daha çok spor organizasyonlarının yapıldığı zamanda artış gösterdiği vurgulanmış ve katılımcıların sosyal medya bağımlılıklarının; işlevsel, duygusal ve sosyal sonuçlar yarattığı açıklanmıştır. Bu tip bir etki, katılımcıların seçtikleri ürünlerde marka olmuş bir sporcudan doğrudan ya da dolaylı olarak etkilendiklerini ve tercihlerini bu yönde yaptıklarını göstermesi açısından önemlidir ve araştırma sonuçlarımız ile benzerdir. Chen ve arkadaşları (2019) yaptıkları çalışmada markaların tanıtımında ünlü kullanımının tüketicinin satın alma niyetini olumlu yönde etkilediği sonucuna varmışlardır. Sosyal medya üzerinden satış yapan kişiler elbette sadece spor organizasyonları ile sınırlı kalmayıp, farklı satış stratejileri de uygulayabilmektedir. Nitekim Kim ve Ko (2012) yaptıkları bir araştırmada, ünlü markaların sosyal medya pazarlama faaliyetleri ile müşterilerin satın alma davranışlarını etkilediğini ortaya koymuştur. Ayrıca araştırma, tüketicilerden elde edilen sosyal medya pazarlama davranışlarının, gelecekteki satış stratejilerini etkilediğini tespit etmiştir. Alalwan ve arkadaşları (2018) tarafından yapılan benzer bir araştırmada ise müşteriler sosyal medya reklamlarının kendi tercihleri ve ilgi alanlarıyla ilgili olduğunu düşündükleri sürece, sosyal medya reklamlarında sunulan ürünleri almaya daha yatkın olacaklarını ifade etmişlerdir. Dolayısıyla müşterilerin sosyal medya reklamlarını değerli bir bilgi kaynağı olarak algıladıkları ve bir ürünü satın alma konusunda daha fazla motive oldukları tespit edilmiştir. Bu sonuçlar sosyal medya üzerinden yapılan satışların ilgi çekmesi ve katılımcıların motive edilmesi gibi konuların spor ürünleri pazarlanmasında önemli bir yere sahip olduğunu göstermekte ve araştırma sonuçlarımız ile benzerlik taşımaktadır.

Parganas, Anagnostopoulos ve Chadwick, (2015) ise sosyal medya aracılığı ile ortaya çıkan ürün ve hizmetlerin, müşteriler ile iletişim kurma konusunda bir yöntem olarak görülebileceğini belirterek, günümüzde sadece spor alanında değil birçok farklı sektörün sosyal medya üzerinden pazarlama stratejileri geliştirdiğini vurgulamaktadır. Wang ve arkadaşları (2012) yaptıkları bir araştırmada, ürün tanıtımları ve promosyonların sosyal medyada paylaşılmasının spor organizasyonlarda profesyonel bir yaklaşım sunacağından bahsederek, özellikle sosyal medya aracılığı ile yapılan soru-cevap tarzındaki iletişim kanallarının ürün satışını ve değerlendirmesini kolaylaştıracağını vurgulamaktadır. Neden-Sonuç Zinciri Teorisinde bahsedilen duygusal, işlevsel ve kişisel değer seçimlerinin sosyal medyada daha fazla görüldüğü, araştırma sonuçlarından anlaşılmaktadır. Söz konusu sonuçlar araştırma sonuçlarımız ile benzerdir ve insanların sosyal medya aracılığı ile yapacağı seçimlerin gelecekte daha fazla gelişeceği ve bu tip bir yöntemle ürün pazarlanmasının artacağı düşünülmektedir.

SONUÇ

Araştırmadan elde edilen sonuçlara bakıldığında, katılımcıların yoğun olarak sosyal medya üzerinden sportif ürün (spor ayakkabı, eşofman, t-shirt, yapılan branşa özgü ekipmanlar, vb.) satın aldığı görülmüştür. Araştırmada, tercih edilen ürünler hakkında detaylı araştırma yapan ve bu deneyimleri diğer insanlarla paylaşan katılımcıların, benzer yorumlara ve incelemelere sıklıkla dikkat ettiği tespit edilmiştir. Bu tip bir durum, katılımcıların sosyal medya üzerinden yaptıkları alışverişlere karşı güven duygusunu da açıklamaktadır çünkü ürün hakkındaki olumlu ya da olumsuz yorumlar, katılımcıların satın alma isteğini etkilemektedir. Sosyal medya üzerinden yapılan bu alışverişler, katılımcıların markaya olan bağlılıklarını da göstermesi açısından önemlidir. Çünkü katılımcılar sıklıkla tanıdık bir

sporcunun ya da kulübün ürününü satın almak istemektedir. Bu durumun, sportif ürün reklamlarında tanınmış sporcuların kullanılması olgusunu desteklediği düşünülmektedir. İnsanların herhangi bir spor ürününü kullanırken ya da bu ürünü üzerinde taşırken, ait olduğu kulübe ya da markaya olan duyguları, onun satın alma davranışını da etkilemektedir. Araştırma sonuçlarına bakıldığında gelecekte sosyal medya üzerinden daha fazla alışveriş yapılacağı öngörülebilmektedir. Sportif ürün pazarlayan firmaların son zamanlarda sosyal medya üzerinden yaptıkları paylaşımlar ise bunların bir göstergesi olarak düşünülebilir.

ÖNERİLER

Araştırma Sonuçlarına Yönelik Öneriler: Araştırmadan elde edilen verilere bakıldığında araştırmaya yönelik olarak, spor odaklı markaların sosyal medya hesaplarının geliştirilmesi ve artırılması önerilebilir. Araştırma sonuçlarında sosyal medya üzerinden yapılan yorumların güvenilir olmadığı ve gerçekleri yansıtmadığından bahsedilmiştir. Bu anlamda sosyal medya hesaplarını yöneten kişilerin alanında uzman kişilerden oluşması ve yorumları onların değerlendirmesi güvenilirlik açısında doğru bir seçim olabilir. İnternet ortamı, kullanıcılara geniş bir ürün seçeneği sunmaktadır. Bu nedenle artan ürün yelpazesi, sosyal medya hesapları tarafından desteklenebilir ve ilgi gösterilen ürünler çeşitlendirilebilir.

Gelecekte Yapılacak Olan Benzer Araştırmalara Yönelik Öneriler: Araştırmaya, gelecekte farklı mesleklerden insanlar dâhil edilerek genişletilebilir ve nicel ölçekler eklenerek farklı boyutlar analiz edilebilir. Araştırma Ankara İli ile sınırlandırılmıştır. Gelecekte yapılacak olan benzer bir araştırmada farklı illerden katılımcılar kullanılabilir. Literatürde özellikle pazarlama alanında çok farklı teoriler yer almaktadır. Bu araştırmada bunlardan bir tanesi kullanılmıştır. Gelecekte yapılacak olan benzer bir araştırmada, farklı pazarlama teorileri kullanılarak, araştırma amacı ve soru kalıpları genişletilebilir.

KAYNAKLAR

Abeza, G., O'Reilly, N., & Reid, I. (2013). Relationship marketing and social media in sport. *International Journal of Sport Communication, 6*(2), 120-142.

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., & Algharabat, R. (2018). Examining factors influencing Jordanian customers' intentions and adoption of internet banking: Extending UTAUT2 with risk. *Journal of Retailing and Consumer Services, 40*, 125-138.

Balaji, M. S., Khong, K. W., Chong, A. Y. L. (2016). Determinants of negative Word-of-mouth communication using social networking sites. *International & Management*, *53*(4), 528-540.

Breazeale, M. (2009). Word of Mouse: An assessment of electronic word-of-mouth research. *International Journal of Market Research*, *50*(3), 297-318.

Büyüköztürk, Ş., Çakmak, E., Akgün, Ö., Karadeniz, Ş., & Demirel, F. (2014). *Bilimsel araştırma yöntemleri.* 17. Baskı. Ankara: Pagem Akademi, 194.

Chen, C. W., Lien, N. H. (2017). Social media and marketing effectiveness. *Asia Pacific Management Review*, *22*(1), 1.

Chen, C. Y., Lin, Y. H., Lee, C. Y., Lin, Y. K., Chuang, M. C., & Lee, K. N. (2019). Reflective or impulsive buying or both? Evidence from the sport merchandise consumption context. *Social Behavior and Personality: An international journal*, *47*(11), e8395

Costa, A. I. A, Dekker, M., & Jongen, W. M. F. (2004). An overview of means-end theory: Potential application in consumer-oriented food product design. *Trends in Food Science & Technology, 15*, 403–415.

Crespo-Hervas, J., Alguacil, M., & Núñez-Pomar, J. (2018). Gender comparison of the perception of brand image and purchasing preferences of users of a sports service. *Journal of Physical Education and Sport*, *18*, 1276-1284.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Do, H., Ko, E., & Woodside, A. G. (2015). Tiger Woods, Nike, and I are (not) best friends: how brand's sports sponsorship in social-media impacts brand consumer's congruity and relationship quality. *International Journal of Advertising, 34*(4), 658-677.

Drury, G. (2008). Opinion piece: Social media: Should marketers engage and how can it be done effectively? *Journal of Direct, Data and Digital Marketing Practice*, *9*(3), 274-277.

Dugalić, S., & Lazarević, S. (2016). The impact of celebrity athlete endorsement on purchasing habits. Facta Universitatis, *Series: Physical Education and Sport,* 435-446.

Erkan, İ., & Evans, C. (2018) Social media or shopping websites? The influence of eWOM on consumers' online purchase intentions, *Journal of MarketingCommunications*, *24*(6), 617-632, DOI: 10.1080/13527266.2016.1184706

Global Digital Report (2019). https://wearesocial.com/blog/2018/01/global-digital-report-2018

Global Online Consumer Report (2017). *The truth about online consumers.* https://assets.kpmg/content/dam/kpmg/xx/pdf/2017/01/the-truth-about-online-consumers.pdf

Global Web Index (2019). https://wearesocial-net.s3.amazonaws.com/wp-content/uploads/2018/01/DIGITAL-IN-2018-002-TIME-SPENT-ON-THE-INTERNET-V1.00.png

Gutman, J. (1982). A means-end chain model based on consumer categorization processes. *Journal of marketing, 46*(2), 60-72.

Gutman, J. (1984). Analyzing consumer orientations toward beverages through means–end chain analysis. *Psychology & Marketing*, *1*(3-4), 23-43.

Hussain, S., Guangju, W., Jafar, R. M. S., Ilyas, Z., Mustafa, G., Jianzhou, Y. (2018). Consumers' online information adoption behavior: Motives and antecedents of electronic Word of mouth communications. *Computers in Human Behaviour*, *80*, 22-32.

İşlek, M. S. (2012). *Sosyal medyanın tüketici davranışlarına etkileri Türkiye'deki sosyal medya kullanıcıları üzerine bir araştırma* (Master's thesis, Karamanoğlu Mehmetbey Üniversitesi Sosyal Bilimler Enstitüsü).

Jiang, S., Scott, N., & Ding, P. (2018). Motivations of experienced leisure travellers: A means-end chain study on the Chinese outbound market. *Journal of Vacation Marketing*, *25*(2), 225-238. https://doi.org/10.1177/1356766718763694

Karataş, Z. (2015). Sosyal bilimlerde nitel araştirma yöntemleri. *Manevi temelli sosyal hizmet araştırmaları dergisi*, *1*(1), 62-80.

Kim, A. J., Ko, E. (2012). Do social media marketing activities enhance customer equity? An empirical study of luxury fashion brand. *Journal of Business Research*, *65*(10), 1480–1486.

Li, E. Y., Chang, L. S., & Chang, L.F.K. (2016). Exploring consumer value of cross-border online shopping: An application of means-end chain theory and maslow's hierarchy of needs. *PACIS 2016 Proceedings*, 359.

Lim, J. S., Hwang, Y., Kim, S., & Biocca, F. A. (2015). How social media engagement leads to sports channel loyalty: Mediating roles of social presence and channel commitment. *Computers in Human Behavior, 46*, 158-167.

Lin, C. F., Fu, C. S., & Chen, Y. T. (2019). Exploring customer perceptions toward different service volumes: An integration of means–end chain and balance theories. *Food Quality and Preference, 73*, 86-96.

Mangold, WG., Faulds, DJ. (2009). Social media: The new hybrid element of the promotion mix. *ScienceDirect Business Horizons*, *52* (4), 357-365.

Maxham III, J. G. & Netemeyer, R. G. (2002). A longitudinal study of complaining customers' evaluations of multiple service failures and recovery efforts. *Journal of Marketing*, *66*(4), 57–71.

Nedra, B. A., Hadhri, W., & Merzani, M. (2019). Determinants of customers' intentions to use hedonic networks: The case of Instagram. *Journal of Retailing and Consumer Services*, *46*, 21-32.

Okazaki, S. (2009). The tactical use of mobile marketing: How adolescents' social networking can best shape brand extensions. *Journal of Advertising Research*, *49*(1), 12-26.

Parganas, P., Anagnostopoulos, C., & Chadwick, S. (2015). 'You'll never tweet alone': Managing sports brands through social media. *Journal of Brand Management*, *22*(7), 551-568.

Reynolds, T. J., & Gutman, J. (1988). Laddering theory, method, analysis and interpretation. *Journal of Advertising Research, 28*(1), 11-31.

Seggie N. F. ve Bayyurt Y. (2017). *Nitel Araştırma Yöntem, Teknik, Analiz ve Yaklaşımları*. (2.Baskı). Ankara: Anı Yayıncılık.

Shareef, M. A., Mukerji, B., Dwivedi, Y. K., Rana, N. P., & Islam, R. (2019). Social media marketing: Comparative effect of advertisement sources. *Journal of Retailing and Consumer Services*, *46*, 58-69.

Walliman, N. (2017). *Research methods: The basics*. Routledge Taylor & Francis Group.

Wang, X., Yu, C. & Wei, Y. (2012). Social media peer communication and impacts on purchase intentions: A consumer socialization framework. *Journal of Interactive Marketing*, *26*(4), 198-208.

Wang, Y., & Zhou, S. (2015). How do sports organizations use social media to build relationships? A content analysis of NBA clubs' Twitter use. *International Journal of Sport Communication*, *8*(2), 133-148.

Yıldırım, A., & Şimşek, H. (2008). *Nitel araştırma yöntemleri* (7. Baskı). Ankara: Seçkin Yayıncılık.

Yıldırım, A., & Şimşek, H. (2016). *Nitel araştırma yöntemleri* (10. Baskı). Ankara: Seçkin Yayıncılık.

Zhang, J. Q., Craciun, G., Shin, D. (2010). When does electronic word-of-mouth matter? A study of consumer product reviews. *Journal of Business Research*, *63*(12), 1336–1341.

CITATION OF THIS ARTICLE

Akoğlu, H.E. & Doğaner, S. (2020) The Effect of Using Social Media on Purchasing of Sports Products: A Qualitative Study on Faculty of Sport Sciences Academicians. *International Journal of Sport, Exercise & Training Sciences - IJSETS, 6(2), 45–56. DOI: 10.18826/useeabd.605334*

International Journal of Sport, Exercise & Training Sciences

e-ISSN 2149-8229 Vol 4, Issue 4, 57–64, (2020) Original Article

http://dergipark.gov.tr/useeabd

Balance board vs balance ball: which one is superior in enhancing static and dynamic balance abilities on healthy university students

Gülbin RUDARLI NALÇAKAN[1], Yeliz YOL[2]

Abstract

Aim: The purpose of this study was to compare the effects of two different unstable surfaces balance training on static and dynamic balance abilities.

Methods: The 52 healthy active university students were randomly divided into three groups: the training groups exercised on the firm (balance board) or soft ground (balance ball, BOSU®) for 16 min for 3 days per week for eight weeks, involving structured balance exercises. The control group did not perform the balance exercises in this process. All of the groups were tested static and dynamic balance tests by a computerized balance system before and after the training period. Tests were carried out using a single and double-leg stance either with the eyes open or closed.

Results: One-way and mixed-design analyses of variance tests indicated that significantly similar improvements were observed in the exercise groups' static (ellipse area and perimeter length) and dynamic (stability index and average track error) balance ($p < 0.05$). No significant changes were observed in the control group in any of the variables tested at any point ($p > 0.05$).

Conclusion: Finding shows that using balance board and balance ball as balance training intervention tools have similar effectiveness for static and dynamic balance enhancement in healthy active university students.

Keywords

Balance training,
Bosu,
Perimeter length
Unstable surface

Article Info

Received: 06.04.2020
Accepted: 29.05.2020
Online Published: 15.06.2020

DOI:10.18826/useeabd.715111

INTRODUCTION

Human postural demands and balance control during mobility and rotational motion are of primary interest for athletic performance and daily life and also for avoiding fractures and injuries caused by balance disorder in children and the elderly (Kibele, Granacher, Muehlbauer, & Behm, 2015; Ogaya, Ikezoe, Soda, & Ichihashi, 2011).

Balance is generally defined as the ability to maintain the body's center of gravity within its base of support (Hrysomallis, 2011). Postural control, on the other hand, involves controlling the body's position in space dually and is divided into two as static and dynamic control (Samuel, Solomon, & Mohan, 2015). Dynamic balance is the preservation of an upright body position throughout locomotion, whereas static balance is the process of maintaining the center of mass vertically over the base of support with minimal movement while maintaining specific poses for an extended period of time (Kilroy, Crabtree, Crosby, Parker, & Barfield, 2016). Balance is considered to be a critical component of common motor skills.

In recent years, studies on improving postural control and balance have gained gradual importance in rehabilitation and prevention of sports injuries and have focused particularly on knees and ankles. In the literature, it has been shown with strong evidence that training intended to improve balance can be performed on different grounds with different equipment; balance training on stable and unstable surfaces can develop dynamic balance ability as well as static balance ability and that it could reduce the risk of injury particularly in the lower extremity (Zech et al., 2010; Di Stefano, Clark, & Padua, 2009). Improvements occurring in proprioception and neuromuscular control are considered to be mainly responsible for this progress (Zech et al., 2010).

Since exercise on unstable surfaces requires the participants to make rapid and controlled changes in the center of pressure, it leads to difficulty in the control of the postural balance (Paillard & Noé, 2015). Studies on the unstable soft ground balance ball and unstable firm ground balance board which have maintained their popularity because of being easily portable, practical and cheap and not requiring a special setup have shown that this equipment improves balance ability; however, balance-performance differences that could come up due to the two different grounds have not been examined (Ogaya et al., 2011; Emery, Cassidy, Klassen, Rosychuk, & Rowe, 2005; Cug, Duncan, & Wikstrom, 2016; Cerrah et

The study designing; collecting, analyzing and interpretation data and manuscript preparation were undertaken by 1. and 2. author.

[1]**Corresponding author:** Ege University, Faculty of Sport Science, Department of Coaching Education, Izmir/Turkey gulbinrn@gmail.com ORCID ID:0000-0001-8914-7479
[2]Ege University, Institute of Health Sciences, Doctorate Program of Sport Health Sciences, Izmir, Turkey. yeliz.yol11@gmail.com ORCID ID:0000-0002-0859-6238

al., 2016; Balogun, Adesinasi, & Marzouk, 1992; Silva, Mrachacz-Kersting, Oliveira, & Kersting, 2018; Lubetzky-Vilnai, McCoy, Price, & Ciol, 2015).

Therefore, the aim of the present study was to compare the effect of the same balance training protocol performed on two different unstable surfaces (balance board and balance ball) on static and dynamic balance performance. We hypothesized that static and dynamic balance would improve as a result of the same exercise program with both types of equipment while no changes in the control group and that exercises on the balance board would be more effective compared to the balance ball in balance performance development as it is more difficult to preserve balance with this device.

METHOD

Participants

Eighty-seven university students completed a questionnaire providing information regarding their basic anthropometric data, injury history, physical activity level, and participation of balance training history. Sixty volunteers aged between 18-25 years met the inclusion criteria: not overweight or obese [body mass index (BMI) < 25], no serious injury in the lower extremity in the last six months, not participate any balance exercise program previously and not following an intense exercise program (with a weekly number of activities ≤ 3). Eight of the participants were excluded from the study because they could not attend the training program regularly.

Participants were randomly divided into three groups: the collected questionnaires were numbered sequentially, groups were formed as number 1 to group 1 (balance board group), number 2 to group 2 (balance ball group), and number 3 to group 3 (control group, CG). The exercise groups followed an 8-week training program of balance exercises on firm ground (balance board group) and soft ground (balance ball group), while the CG was not willing to participate in exercise training.

Prior to participation, all participants were fully informed of the purpose of the study, the experimental procedure, and the potential benefits and possible risks of being involved and were then asked to provide informed consent. The structure of the study was approved to be compliant with "the Declaration of Helsinki: Ethical Principles in Medical Research involving Human Subjects" by the Ege University Scientific Research Ethics Committee of the Faculty of Medicine (Approval number:18-10.2/44).

Height and Body Weight Measurement: They were measured using an electronic device (SECA® 767, USA) with standard methods (Lohman, Roche, & Martorell, 1991).

Static and Dynamic Balance Measurement: Static and dynamic balance performances of each group were evaluated using a computerized balance system (Prokin 252, Tecnobody, Bergamo-Italy); prior to and following the training program. The platform had a sensor in the center which perceived each angular movement and sent data to the computer directly. The software downloaded onto the computer makes it possible to monitor each angular movement perceived by the sensor and the loads on the platform on a computer screen and to record them into personal files. Angular movements of the system were forwards-backward (±15°) and left-right (±15°) and it has the opportunity of platform control at 50 different levels which can be controlled over the software.

Procedures

Before the tests, the participants practiced ski simulation game with two different difficulty levels on the balance platform for 2-3 minutes, to familiarize with the testing equipment. After that they started the tests following a 20-minute rest.

The static balance test was performed on the stable platform alternately using a single and double-leg stance, with eyes open (EO) and eyes closed (EC), and arms on sides of the body and standing position with no support. An approximately 30-sec rest was taken between each of six test measurement of 20 seconds. The positions of the feet were determined so as to stand at equal distances to the origin point with reference to the lines on X and Y axes and the participant was asked to look at a fixed point in front of him/her (Aksit & Cırık, 2017; Atilgan Erkut, 2013).

Dynamic balance on bipedal stance were tested for 60 second and the difficulty level was set as "20" point. The participants' barefoot was placed on the balance platform in a standardized position. The test compromises trying to move clockwise five times in a reference circle seen on the computer screen which provides continuous visual feedback to understand the difference between what he/she

was feeling on a kinesthetic level and what is actually happening at motor level. The test was repeated two times with a 10-min interval and the best result was recorded.

The tests evaluated the stability index (SI) indicating the angular distance during the test and the average track error (ATE) in the dynamic balance test. The ellipse area (EA) showing the area of the field departed away from the center and the perimeter length (P) indicating the distance taken during the test for the right and (R) left foot (L) with eyes open (EO) and closed (EC) in static balance (Aksit & Cırık, 2017; Atilgan Erkut, 2013).

The participants were warned not to change their usual physical activity levels during the study period, to be rested on measurement days and not to consume caffeine.

Training Program

Balance ball (Both Sides Up BOSU®, Fitness Quest, Canton, OH), is a piece of equipment shaped like an air-filled half-ball which is covered with a flat and firm platform at the bottom and rubber at the top. The ball, which can be used on both sides, makes it possible to do exercise intended for the development of general or branch-specific balance, proprioception and kinesthetic awareness (Yaggie & Champbell, 2006).

A balance board is a training tool that allows for a ~10º tilt in all directions with an inclined elevation of 4.5 cm at the bottom along with a hard surface of a circular platform that is 40 cm in diameter.

The program included exercises on BOSU®'s bladder side or balance board:

1) Full squats with eyes open and closed (20s -20s rest -20s) × 2 set
   20s rest
2) 2.Half squats with eyes open and closed (20s -20s rest -20s) × 2 set
   20s rest
3) 3.Swinging one leg (right) while standing on the other with eyes open and closed (20s -20s rest -20s) × 2 set
   20s rest
4) 4. Swinging one leg (left) while standing on the other with eyes open and closed (20s -20s rest -20s) × 2 set
   20s rest
5) 5.Standing in glider position (right) with eyes open and closed (20s -20s rest -20s) × 2 set
   20s rest
6) 6. Standing in glider position (left) with eyes open and closed (20s -20s rest -20s) × 2 set
   20s rest

They were repeated three times a week for eight weeks. Each exercise was maintained for 20 seconds and a 20-second rest was taken afterward on one session which lasted for a total of 16 minutes (Cerrah et al., 2016).

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) 25.0 (IBM Corp., Armonk, NY, USA) package program and $p \leq 0.05$ was accepted as the level of statistical significance. Descriptive statistics were reported as the mean ± SD. After the normality test (Shapiro-Wilk), descriptive characteristics of different groups were compared using a one-way variance analysis (ANOVA) test. To assess possible interaction between study groups and time, mixed-design ANOVA (3 × 2, Group × Time) for each investigated variable was used. The magnitude of performance changes (Δ) were compared using one-way ANOVA and post-hoc least significant difference (LSD) test. The effect size of the difference was evaluated using the classification of Cohen (< 0.2 trivial, $0.2 \leq d < 0.5$ small, $0.5 \leq d < 0.8$ moderate, $d \geq 0.8$ large effect size).

RESULTS

Five out of the 40 participants as the exercise groups that performed the training program and three out of the 20 participants as the CG failed to complete the study due to their busy school schedules. None of the participants experienced injuries or diseases during the program.

The physical characteristics of the exercise groups and the control group are presented in Table 1. The mean age, height, weight and BMI measured prior to training program were similar in all groups ($p > 0.05$).

Table 1. Physical characteristics of exercise and control groups

Characteristics	Balance Ball Group (n=18)	Balance Board Group (n=17)	Control Group (n=17)	p
Male/Female (n)	7/11	10/7	9/8	
Age (year)	22.2±1.62	21.6±2.03	22.0±1.65	0.631
Height (cm)	169±7.96	171±11.4	172±8.28	0.677
Weight (kg)	64.0±14.1	71.6±16.0	68.4±12.0	0.278
BMI (kg/m^2)	22.2±3.61	24.1±3.11	22.9±2.95	0.249

BMI: Body mass index

The 3 × 2 ANOVA results indicated that statistically significant interaction between group and time factors was found in EC-EA ($F [2,51] = 6.762$, $p = 0.002$, $\eta p^2 = 0.210$), in EC-P ($F = 3.339$, $p = 0.043$, $\eta p^2 = 0.116$), in R-EO-EA ($F = 4.153$, $p = 0.021$, $\eta p^2 = 0.140$), in R-EO-P ($F = 5.055$, $p = 0.010$, $\eta p^2 = 0.165$), in DIN-SI ($F = 3.790$, $p = 0.029$, $\eta p^2 = 0.129$). However, each group showed similar change patterns across the study from pre to post-test for the other parameters.

Descriptive statistics of static balance using double-leg stance pre- and post-test scores among groups, ANOVA test results of the percentage change between pre- and post-test scores and their post-hoc test results are shown in Table 2. Accordingly, Δ % of the static balance performance parameters (EA and P) measured with eyes open (EO) and closed (EC) separately on both legs were found statistically different between balance ball and control groups and between balance board and control groups, except EO-P ($p = 0.555$).

Table 2. Static balance test scores using double-leg stance of exercise and control groups

arameters		Balance Ball Group (1)	Balance Board Group (2)	Control Group (3)	¥ANOVA results	¥post-hoc p value	¥d value
EO-EA (mm^2)	Pre-test	160 ± 124	209 ± 143	190 ± 120	p = 0.003* F = 6.37	(1-2)=0.961	-0.378
	Post-test	99.1 ± 41.0	143 ± 85.8	175 ± 91.1		(1-3)=0.003*	-0.253
	Δ %	-25.6 ± 28.3	-26.0 ± 19.5	-1.50 ± 22.2		(2-3)=0.003*	0.148
EC-EA (mm^2)	Pre-test	278 ± 171	298 ± 181	325 ± 164	p < 0.001* F = 16.9	(1-2) 0.601	-0.117
	Post-test	182 ± 101	211 ± 136	313 ± 151		(1-3)<0.001*	-0.289
	Δ %	-31.0 ± 18.9	-28.1 ± 11.6	-2.42 ± 17.2		(2-3)<0.001*	-0.161
EO-P (mm)	Pre-test	216 ± 55.4	244 ± 83.3	213± 42.5	p = 0.555 F = 0.595	(1-2)=0.492	-0.410
	Post-test	181 ± 38.9	220 ± 61.9	204 ± 43.2		(1-3)=0.287	0.062
	Δ %	-12.1 ± 24.9	-7.00 ± 14.9	-4.18 ± 24.8		(2-3)=0.702	0.483
EC-P (mm)	Pre-test	318 ± 125	319 ± 81.4	333± 66.9	p = 0.051* F = 3.15	(1-2)=0.885	-0.010
	Post-test	266 ± 84.1	273± 78.5	328 ± 72.4		(1-3)=0.041*	-0.153
	Δ %	-13.2 ± 22.2	-14.0 ± 15.2	-1.19 ± 12.8		(2-3)=0.029*	-0.194

*p≤0.05; ¥ statistical comparison for Δ % values, d: Cohen's d (<0.2 trivial; 0.2≤d<0.5 small; 0.5≤d<0.8 moderate; d≥0.8 large effect size); EO: eyes open, EC: eyes closed, EA: ellipse area, P: perimeter length, Δ %: percentage change between pre and post test scores.

Descriptive statistics of static balance using a single-leg stance pre- and post-test scores among groups, ANOVA test results of the percentage change between pre- and post-test scores and their post-hoc test results are shown in Table 3. A statistical significant difference was found in the right leg (R) EO-EA (mm^2), EO-P (mm), EC-P, and the left leg (L) EO-EA.

Table 3. Static balance test scores using single-leg stance of exercise and control groups

Parameters		Balance Ball Group (1)	Balance Board Group (2)	Control Group (3)	¥ANOVA results	¥post-hoc p value	¥d value
R-EO-EA (mm^2)	Pre-test	447 ± 169	542 ± 214	541 ± 190	p = 0.002* F = 6.95	(1-2) = 0.967	-0.509
	Post-test	323 ±115	389 ±122	531 ± 180		(1-3) = 0.002*	-0.539
	Δ %	-24.0 ± 19.0	-24.3 ± 17.2	5.96 ± 41.1		(2-3) = 0.002*	0.005
R-EC-EA (mm^2)	Pre-test	3936 ± 4544	4033 ± 3033	6316 ±12917	p = 0.148 F = 1.98	(1-2) = 0.979	-0.026
	Post-test	2561 ± 1101	3100 ± 2283	5099 ± 6857		(1-3) = 0.093	-0.256
	Δ %	-2.04 ± 49.3	-2.81 ± 64.5	-47.8 ± 127.6		(2-3) = 0.088	-0.251
R-EO-P (mm)	Pre-test	661 ± 215	764 ± 253	687 ± 230	p = 0.001* F = 7.54	(1-2) = 0.042*	-0.453
	Post-test	601 ± 147	597 ± 154	715 ± 191		(1-3) = 0.079	-0.120
	Δ %	-4.33 ± 25.9	-18.5 ± 14.5	7.87 ± 19.2		(2-3) < 0.001*	0.328
R-EC-P (mm)	Pre-test	2158 ± 1173	2206 ± 993	2148 ± 1359	p = 0.043* F = 3.35	(1-2) = 0.923	-0.045
	Post-test	1609 ± 460	1754 ± 678	2149 ± 1284		(1-3) = 0.026*	0.008
	Δ %	-15.9 ± 26.3	-14.8 ± 28.9	10.2 ± 44.6		(2-3) = 0.033*	0.050
L-EO-EA (mm^2)	Pre-test	573 ± 390	504 ± 185	647 ± 389	p = 0.007* F = 5.51	(1-2) = 0.243	0.231
	Post-test	373 ± 168	408 ± 150	582 ± 221		(1-3) = 0.002*	-0.196
	Δ %	-28.3 ± 22.3	-15.9 ± 19.7	-6.17 ± 45.8		(2-3) = 0.041*	-0.484
L-EC-EA (mm^2)	Pre-test	4809 ± 7846	6480 ±11714	3822 ± 5469	p = 0.350 F = 1.07	(1-2) = 0.812	-0.174
	Post-test	2781 ± 1444	3680 ± 2762	4028 ± 4179		(1-3) = 0.263	0.150
	Δ %	12.6 ± 70.6	0.60 ± 75.4	69.1 ± 238.3		(2-3) = 0.177	0.300
L-EO-P (mm)	Pre-test	665 ± 254	718 ± 321	713 ± 344	p = 0.409 F = 0.91	(1-2) = 0.233	-0.189
	Post-test	618 ± 161	615 ± 227	649 ± 205		(1-3) = 0.934	-0.164
	Δ %	-2.63 ± 21.6	-11.5 ± 25.6	-3.25 ± 18.7		(2-3) = 0.266	0.015
L-EC-P (mm)	Pre-test	2303 ± 1616	2309 ± 1569	1867 ± 1033	p = 0.069 F = 2.82	(1-2) = 0.712	-0.004
	Post-test	1779 ± 732	1864 ± 741	2016 ± 867		(1-3) = 0.031*	0.329
	Δ %	-11.0 ± 29.8	-6.50 ± 38.5	16.0 ± 40.7		(2-3) = 0.071	0.343

* p ≤ 0.05; ¥ statistical comparison for Δ % values, d: Cohen's d (< 0.2 trivial; 0.2 ≤ d < 0.5 small; 0.5 ≤ d < 0.8 moderate; d ≥ 0.8 large effect size); R: right leg, L: left leg, EO: eyes open, EC: eyes closed, EA: ellipse area, P: perimeter length, Δ %: percentage change between pre and post test scores.

Descriptive statistics, ANOVA test results and their post-hoc test results of the dynamic balance performance parameters of the groups are given in Table 4. No statistically significant difference was found in percentage change between pre- and post-test scores of SI (°) and ATE (%), as the dynamic balance test parameters among the groups.

Table 4. Dynamic balance test scores of exercise and control groups

Parameters		Balance Ball Group (1)	Balance Board Group (2)	Control Group (3)	¥ANOVA results	¥post-hoc p value	¥d value
SI (°)	Pre-test	1.82±0.94	1.78±0.57	1.71±0.86	p = 0.079 F = 2.67	(1-2) = 0.852	0.053
	Post-test	1.23±0.40	1.41±0.58	1.66±0.68		(1-3) = 0.042*	-0.800
	Δ %	-19.4 ± 38.3	-17.5 ± 29.5	-0.83 ± 13.5		(2-3) = 0.063	0.099
ATE (%)	Pre-test	38.7±9.04	41.6±17.9	42.7±13.9	p = 0.368 F = 1.02	(1-2) = 0.172	-0.213
	Post-test	33.1±7.13	37.0±8.90	40.5±12.0		(1-3) = 0.324	-0.354
	Δ %	-13.5 ± 10.9	3.30 ± 57.9	-1.41 ± 22.5		(2-3) = 0.699	-0.071

*p ≤ 0.05; ¥ statistical comparison for Δ % values, d: Cohen's d (< 0.2 trivial; 0.2 ≤ d < 0.5 small; 0.5 ≤ d < 0.8 moderate; d ≥ 0.8 large effect size); SI: stability index, ATE: average track error, Δ %: percentage change between pre and post test scores.

DISCUSSION

The main findings of the present study were that balance exercise program on firm and soft unstable surfaces brings about significant improvement in healthy young participants' static balance parameters on both legs (EA and P with EO and EC) and single leg (R-EO-EA, L-EO-EA, R-EO-P, and R-EC-P); and dynamic balance parameters (SI and ATE) on both legs but no difference was found in percentage change for the dynamic balance test parameters among the groups. So balance ball and balance board have similar effects on balance improvement.

When the literature is examined, the use of different tests to evaluate the level of balance or its development and the results of these tests are evaluated with different parameters, which makes it difficult for us to discuss the results of our study. Even so, the literature includes strong evidence showing that balance training on stable and unstable surfaces can improve static as well as dynamic

balance ability. While dynamic and static balance ability can potentially be improved on an unstable surface; it is reported that individuals' initial values are important in terms of static balance on a stable surface; and that the ceiling effect appears to occur in the development of static balance ability on a stable surface particularly in elite athletes (Di Stefano et al., 2009). Zech et al. (2010) reviewed randomized controlled studies and non-randomized controlled studies including healthy and physically active participants aged up to 40 years. They concluded that balance training can be effective on the development of static postural sway, dynamic balance and neuromuscular control in athletes and non-athletes. Moreover, it was suggested that the changes occurring in proprioception and neuromuscular control were predominantly responsible for these effects. Proprioception is such an important component of joint function because it provides an extensive amount of afferent information on the joints' internal environment, for example, tension in ligaments, intra-articular pressure, mechanical stress, and joint velocity. Without this information, motor patterns that are created are not as effective and may result in the ankle being placed in an unstable situation, especially since other sources of afferent information are unable to adequately compensate for this loss (Kidgell, Horvath, Jackson, & Seymour, 2007).

The fact that it requires the maintenance of static stand in comparison with moving the surface during balancing unlike stable surfaces was considered to have been effective on the improvement obtained in static and dynamic balance with two unstable multi-axis equipment used during the 8-week training period in our study. Although it was not measured in the present study, the fact that proprioceptive exercise performed on unstable surfaces increases muscle electromyographic (EMG) activity in the lower leg particularly with eyes closed (Braun Ferreira et al., 2011), the decrease in leg and body velocity and the angular speed of supportive extremity on all platforms for ankle, knee and hip joints (Silva et al., 2018), the increase in the EMG activation of core muscles (Calatayud et al., 2015), that the hip and ankle muscles are enabled to integrate on a single leg (Gribble & Hertel, 2004) and the increase in the strength of lower extremity muscles (Granacher, Gollhofer & Kriemler, 2010) which is claimed to be a protective factor against sports injuries may have supported these results.

Despite being conducted on different groups, with different training programs and using different testing protocols, studies evaluating the effects of balance training with balance board or balance ball in the literature have demonstrated positive results (Ogaya et al., 2011; Emery et al., 2005; Cug et al., 2016; Cerrah et al., 2016; Balogun et al., 1992; Silva, Mrachacz-Kersting et al., 2018; Lubetzky-Vilnai et al., 2015). In a study, it was reported that balance exercise done by 66 adolescents on balance board at home for six weeks improved timed static and dynamic balance test results and reduced the incidence of sporting injuries in the following six months (Emery et al., 2005). In another study balance exercise done on balance ball by healthy young adults for four weeks improved selected static and dynamic postural control parameters (Cug et al., 2016). However, our study was designed considering that the determination of the superiority of these two still-popular pieces of equipment over one another as a result of balance training performed using them would provide useful information to be transferred into practice. To this end, the second hypothesis of our study was that the balance board which would require the participants to make faster and more controlled changes in their pressure centers and was considered to bear difficulties would be more effective in improving balance than the balance ball which have also unstable surfaces and are also known to be challenging for the neuromuscular system (Paillard & Noé, 2015).

Similar to the two studies planned in parallel with our study purposes, our measurements showed that balance ball and balance board were not superior to each other in the static and dynamic balance performances as a result of the training period (Kidgell et al., 2007; Braun Ferreira et al., 2011). Kidgell et al. (2007) measured the effects of a training performed by 20 participants (11 males, 9 females) aged between 22-35 years with ankle instability three days a week on a dura disk and mini trampoline due to their different mechanical features and the measurements were taken with postural sway performance while standing on single leg. At the end of six weeks, although significant improvement was observed in the center of pressure (COP) of both groups compared to the first measurements, this difference was found to be similar in the comparison of the groups (Kidgell et al., 2007). Eosin et al. (2010) used the star excursion balance test (SEBT) to evaluate the effects of balance training performed by college athletes from different branches on a multiple-axis dyna disk and a single-axis swinging platform 3 times a week as they were working on different axes, which included balancing a 1kg-ball during fast

catching on a single leg. At the end of four weeks, it was found that test parameters did not change significantly based on the equipment used. To reach similar results with these studies, it was thought that devices with similar mechanical properties used in these studies may have developed similar physiological mechanisms.

The sample size of the present study, not using blinding design in researchers, not designing with the increasing volume principle and the duration of the training period were the limitations of our study. Due to the methodological limitation of our study, neuromuscular mechanisms to explain the results obtained were unknown. Thus, it was not possible to explain whether physiologic adaptations or learning effects were responsible for the improved balance performance. However, depending on the findings of Taube et al. (2008), it could be asserted that spinal and supraspinal adaptations play a potential role in the improvement in postural control following balance training.

CONCLUSION

This study has demonstrated that 8-week of balance training on either a balance ball or a balance board have similar effects in improving static and dynamic balance among young healthy active people. It is recommended that future studies should examine the effects of different types of exercise and training equipment on static and dynamic balance performance.

ACKNOWLEDGEMENTS

The authors report no conflict of interest. A part of this study was presented at the 2th World Sports Sciences Research Congress (21-24 March 2019 – Manisa, Turkey) as oral presentation.

REFERENCES

Aksit, T. & Cırık, G. (2017). Comparison of static and dynamic balance parameters and some performance characteristics in rock climbers of different levels. *Turkish Journal of Sport and Exercise*, 19(1), 11-17.

Amico, A.P., Nisi, M., Covelli, I., Polito, A.M., Damiani, S., Ianieri, G., Megna, M., & Fiore, P. (2014). Efficacy of Proprioceptive Training with Prokin System in Balance Disorders from Multiple Sclerosis. *Multiple Sclerosis Journal*, 1, 110.

Atilgan Erkut, O. (2013). Effects of trampoline training on jump, leg strength, static and dynamic balance of boys. *Science of Gymnastics Journal*, 5(2), 15-25.

Balogun, J.A., Adesinasi, C.O., & Marzouk, D.K. (1992). The effects of a wobble board exercise training program on static balance performance and strength of lower extremity muscles. *Physiotherapy Canada*, 44(4), 23-30.

Braun Ferreira, L.A., Pereira, W.M., Rossi, L.P., Kerpers, I.I., Rodrigues de Paula, A. Jr, & Oliveira, C.S. (2011) Analysis of electromyographic activity of ankle muscles on stable and unstable surfaces with eyes open and closed. *Journal of Bodywork and Movement Therapies*, 15(4), 496-501.

Calatayud, J., Borreani, S., Martin, J., Martin, F., Flandez, J., & Colado, J.C. (2015). Core muscle activity in a series of balance exercises with different stability conditions. *Gait & Posture*, 42(2), 186-192.

Cerrah, A.O., Bayram, I., Yıldızer, G., Uğurlu, O., Şimşek, D., & Ertan, H. (2016). Effects of functional balance training on static and dynamic balance performance of adolescent soccer players. *International Journal of Sports, Exercise and Training Science*, 2(2), 73-81.

Cug, M., Duncan, A., & Wikstrom, E. (2016). Comparative effects of different balance-training–progression styles on postural control and ankle. Force production: a randomized controlled trial. *Journal of Athletic Training*, 51(2), 101-110.

Di Stefano, L.J., Clark, M.A., & Padua, D.A. (2009). Evidence supporting balance training in healthy individuals: a systemic review. *Journal of Strength Conditioning Research*, 23(9), 2718-2731.

Emery, C.A., Cassidy, J.D., Klassen, T.P., Rosychuk, R.J., & Rowe, B.H. (2005). Effectiveness of a home-based balance-training program in reducing sports-related injuries among healthy adolescents: a cluster randomized controlled trial. *CMAJ*, 172(6), 749-754.

Eosin, T.C., Danoff, J.V., Leone, J.E., & Miller, T.A. (2010). The effects of multiaxial and uniaxial unstable surface balance training in college athletes. *Journal of Strength Conditioning Research*, 24(7), 1740-1745.

Granacher, U., Gollhofer, A., & Kriemler, S. (2010). Effects of balance training on postural sway, leg extensor strength, and jumping height in adolescents. *Research Quarterly for Exercise and Sport*, 81(3), 245-251.

Gribble, P.A. & Hertel, J. (2004). Effect of hip and ankle muscle fatigue on unipedal postural control. *Journal of Electromyographic Kinesiology*, 14(6), 641-646.

Hrysomallis, C. (2011). Balance ability and athletic performance. *Sports Medicine*, 41(3), 221-232.

Kibele, A., Granacher, U., Muehlbauer, T., & Behm, D.G. (2015). Stable, unstable, and metastable states of equilibrium: definitions and applications to human movement. *Journal of Sports Science and Medicine*, 14(4), 885-887.

Kidgell, D.J., Horvath, D.M., Jackson, B.M., & Seymour, P.J. (2007). Effect of six weeks of dura disc and mini-trampoline balance training on postural sway in athletes with functional ankle instability. *Journal of Strength Conditioning Research*, 21(2), 466-469.

Kilroy, E.A., Crabtree, O.M., Crosby, B., Parker, A., & Barfield, W.R. (2016). The effect of single-leg stance on dancer and control group static balance. *International Journal of Exercise Science,* 9(2), 110-20.

Lohman, T.G., Roche, A.F., & Martorell, R. (1991). *Anthropometric standardization reference manual.* Champaign, USA: Human Kinetics.

Lubetzky-Vilnai, A., McCoy, S.W., Price, R., & Ciol, M.A. (2015). Young adults largely depend on vision for postural control when standing on a bosu ball but not on foam. *Journal of Strength Conditioning Research*, 29(10), 2907-2918.

Ogaya, S., Ikezoe, T., Soda, N., & Ichihashi, N. (2011). Effects of balance training using wobble boards in the elderly. *Journal of Strength Conditioning Research*, 25(9), 2616-2622.

Paillard, T. & Noé, F. (2015). Techniques and methods for testing the postural function in healthy and pathological subjects. *BioMed Research International*, 891390.

Samuel, A.J., Solomon, J., & Mohan, D. (2015). A critical review on the normal postural control. *Physiotherapy and Occupational Therapy Journal*, 8(2), 71-75.

Silva, P.B., Mrachacz-Kersting, N., Oliveira, A.S., & Kersting, U.G. (2018). Effect of wobble board training on movement strategies to maintain equilibrium on unstable surfaces. *Human Movement Science*, 58(1), 231-238.

Taube, W., Gruber, M., & Gollhofer, A. (2008). Spinal and supraspinal adaptations associated with balance training and their functional relevance. *Acta Physiologica (Oxf)*, 193(2), 101-116.

Yaggie, J.A. & Champbell, B.M. (2006). Effects of balance training on selected skills. *Journal of Strength Conditioning Research*, 20(2), 422-428.

Zech, A., Hübscher, M., Vogt, L., Banzer, W., Hänsel, F., & Pfeifer, K. (2010). Balance training for neuromuscular control and performance enhancement: a systematic review, *Journal of Athletic Training*, 45(4), 392-403.

CITATION OF THIS ARTICLE

Nalçakan, G.R. & Yol, Y. (2019) Balance Board vs Balance Ball: Which One is Superior in Enhancing Static and Dynamic Balance Abilities on Healthy University Students. *International Journal of Sport, Exercise & Training Sciences - IJSETS, 6(2), 57–64. DOI: 10.18826/useeabd.175111*

International Journal of Sport, Exercise & Training Sciences

e-ISSN 2149-8229 Vol 6, Issue 2, 65–72, (2020) Original Article

http://dergipark.gov.tr/useeabd

Kinematical variables analysis of shot-put activity in para athletics (Class F32/33) and their relationships with digital level achievement.

Guebli ABDELKADER[1], Reguieg MADANI[2], Sba BOUABDELLAH[3]

Abstract

Aim: The primary purpose of this part of was to Kinematical variables analysis of shot-put activity in Para-Athletics (Class F32/33) and their relationships with digital level achievement. **Methods:** International Paralympic athlete "Kerdjana Kamel" participated voluntarily in this study. He's the gold medalist and the record holder in this class F32/33 (Age: 37 years, Height: 1.76 m, Weight: 82 kg, Type of Impairment: cerebral palsy, origin of impairment: congenital, club: GSP Alger, Best Digital level: 12.24 m). The analysis of the present study was doing with the software Kinovea software 0.8.15 for the kinematical analysis, we used two cameras (AEE. 120ips, 1280*720, 720p) for record the Kinematic performance during the first and second phase (Start and Finish Pushing) in the Shot-Put. sites of this cameras (Cam; X0.5m, Y1.5m. Cam; X6m, Y5.5m). Shot-Put tries were applied for our sample (the international Paralympic athlete) in eight tries, we choose the best six tries for analysis. The data were analyzed in SPSS program, descriptive statistics (mean±Sd, Std.E) and Pearson test for the correlations between variables.

Results: As a result of the statistical analysis, there was a positive significant correlations of the Digital level with Distance of shot from the armrest (0.04*), and with The wrist Angle of the shooting hand (0.015*) in the first phase (start pushing), and in the second phase (finish pushing) there was a negative significant correlations of the Digital level with Pushing angle (-0.013*) , and Positive significant correlations with Shot height (0.006**).

Conclusion: Based on the kinetic Performance results analysis of Paralympic elite (the Shot-Put Activity, Class 32/33) in practice; we confirm: 1) The increase in the variables values of Distance shot from the armrest, and the wrist Angle of the shooting hand in first phase of pushing (start) are affects the digital level achievement, Also the Shot height variable in the second phase of pushing, 2) The decrease in the value of Pushing angle variable in second phase of pushing (finish) is affect the digital level achievement.

Keywords

Kinematical variables,
Para athletics,
Shot-put,
Digital level,

Article Info

Received: 09.04.2020
Accepted: 20.06.2020
Online Published: 21.06.2020

DOI:10.18826/useeabd.709944

INTRODUCTION

Biomechanics is the main field of objective research into the technical rules and methods of various kinetic skills (Guebli, Regiueg, et al., 2018). This is affected through precise measurements that are processed quantitatively by the laws of physics (R. Bartlett, 2007; Zerf Mohammed et al., 2015). There is no doubt that the objective study of any skill contributes to the development of the scientific foundations of the participant in terms of their ability to innovate and reach the best performance level possible (Elbadry et al., 2019). Biomechanical Knowledge is a "Must" for Coaching. All movements of Athletes are determined by the laws of mechanics. It is the first task of science (but only the first) to understand movements of athletes; therefore, it is an indispensable base for understand the basics of Performance kinetic in different activity and for coaching. In the throwing events the factors influencing the performance are classified into: 1. the physical laws of the flight phases of the implement and; 2. the biomechanical laws of the movement of the system 'thrower and implement' before release (SUGUMAR.C, 2012). Video analysis is a great system that films one's performance and reconstructs a model of one. Athletes can then compare one's technique on a good day and a bad day, athlete can compare one's technique with an expert (if one are not already), and much, much more (Franks & Goodman, 1986).

Paralympic Games is a multi-sport event for athletes with physical, mental and sensorial disabilities. This includes mobility disabilities, amputees, visual disabilities and those with cerebral

The role and contributions of each authors as in the section of IJSETS Writing Rules "**Criteria for Authorship**" is reported that: **1. Author:** Contributions to the conception or design of the paper, data collection, writing of the paper and final approval of the version to be published paper; **2. Author:** Data collection, preparation of the paper according to rules of the journal, final approval of the version to be published paper; **3. Author:** Statistical analysis, interpretation of the data and final approval of the version to be published paper.

[1]**Corresponding Author:** Laboratory APS, Society, Education and Health, Faculty of Physical Education and Sport, Hassiba Benbouali University, Chlef/Algeria, abdelkader85@windowslive.com. **ORCID ID:** 0000-0001-5314-4903.

[2]SMAH Laboratory, Faculty of Physical Education and Sport, Abdelhamid Ibn Badiss University, Mostaganem/Algeria, mad_eps@yahoo.fr **ORCID ID:** 0000-0002-8090-0257

[3]Laboratory APS, Society, Education and Health, Faculty of Physical Education and Sport, Hassiba Benbouali University, Chlef/Algeria, b.sba@univ-chlef.dz **ORCID ID:** 0000-0001-9733-6990

palsy (Brittain, 2016). The Paralympic Games are held every four years, following the Olympic Games, and are governed by the International Paralympic Committee IPC (International Paralympic Committee 2018). The Paralympic Games is the highest obtainable level for all athletes. Evidence based classification in Paralympic Sport requires evidence for the impact of the underlying impairment on sport specific performance (Webborn, 2009). During Rio 2016 Paralympic Games, 4350 athletes from more than 160 countries participated in these games for 528 males from different sports (Van Biesen et al., 2018). In para athletics open to athletes in various disability groups, based on a functional classification system, which is coordinated by world para athletics sports technical committee (van Dijk et al., 2017). Algeria achieved new Gold medals in the male competitions for elite throwers with impairment of cerebral palsy (Class F32/33). The level of competition was of high quality, where Performing well in shot-put consists of simply throwing the shot as far as possible (Landolsi et al., 2018).

Kinematic analyses of the throwing techniques of elite stationary shot-putters are commonly conducted in routine observations and sport research (Ariel et al., 2005). Some of these analyses focused on parameters underlining either the sequence of actions taken by the athlete leading to the release of the shot (e.g. spatial and temporal characteristics of backward and forward thrust, range of motion, linear and angular momentum of each segment) or the shot's trajectory at the instant of release (e.g. position, speed and angle of shot) (John W. Chow et al., 2000; O'Riordan & Frossard, 2006). To the best of our knowledge, most research has focused on biomechanical variables of the para-athletics and studied the effects, comparative and correlation of kinetic and kinematics variables with digital level (Guebli, Bessenouci, et al., 2018), in athletics disciplines such as the Shot-Put throw (Abdelkader et al., 2018a; Błażkiewicz et al., 2019; Gilberto, n.d.; Hubbard et al., 2001; Landolsi et al., 2018; Lee et al., 2015; Willwacher et al., 2011), Discus Throw (Abdelkader et al., 2018a; R. M. Bartlett, 1992; Błażkiewicz et al., 2019; J. W. Chow & Mindock, 1999; Delgado, 2012; Hay & Yu, 1995; Leigh et al., 2010; Maroński, 1991; Shestakov, 2005). Some of these analyses focused on parameters underlining either the sequence of actions taken by the athlete leading to the release of the throw (e.g. spatial and temporal characteristics of backward and forward thrust, range of motion, linear and angular momentum of each segment) or the throw's trajectory at the instant of release (e.g. position, speed and angle of throw) (L. Frossard et al., 2007).

These studies contributed to improvement of training programs of stationary throwers as they provided coaches and athletes with a better understanding of throwing technique as well as strength and fitness requirements (O'Riordan & Frossard, 2006), along with the long-term development of very complex skills, and the abil-ity to perform these complex and precisely timed movements at high velocity in a confined space (i.e. technique) (Marcos Gutiérrez-Davila et al., 2009; SUGUMAR.C, 2012), Where G. Davila reported that the shot-put technique is individual; each thrower uses his or her own individual temporal sequence and rhythm. Apart from the body composition and strength of the thrower, also the degree of automation of the individual temporal sequence determines the optimal individual technique (John W. Chow et al., 2000; Marcos Gutiérrez-Davila et al., 2009). however, it remains currently unknown whether the observed differences in performance are due to: intrinsic factors of the throwers (e.g. body composition, strength), external factors (e.g. training volume, quality of the coaches), their underlying cognitive impairment, or a combination of multiple factors (L. Frossard et al., 2007) or the characteristics of kinetic performance in Shot Put Activity in Paralympic Athletcs.

Thus, the present study aimed at Continue the work initiated by Guebli et al, 2017 by reporting the parameters of the shot's trajectory for male gold medal during world-class events, and analyzing the kinetic performance in different Para-athletics class in this activity. Also, to provide the magnitude of differences in these parameters across classes and genders. Therefore, the primary purpose of this part of was to Kinematical variables analysis of shot-put activity in para-athletics (Class F32/33) and their relationships with the digital level achievement.

METHOD

Participants

International paralympic athlet "Kerdjana Kamel" participated voluntarily in this study. The participant is the gold medalist and the record holder in this class F32/33. Kerdjana Kamel (Age: 37 years, Height:

1.76 m, Weight: 82 kg, Type of Impairment: celebral pallsy, origin of impairment: congenital, club: GSP Alger, Best Digital level: 12.24 m).

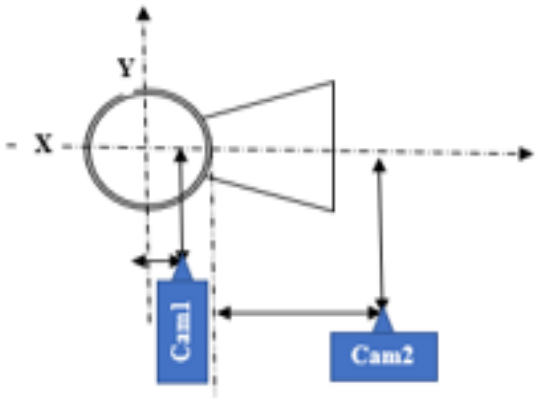
Ethics Committee approval of this study was obtained from Laboratory APS, Society, Education and Health, Faculty of Physical Education and Sports, Hassiba Benboualy University of Chlef, doctorat project Committee (2016/ biomechanics of Physical Activities and Sport).

Research Design: For the purposes of analysis, we have calculated the distance of the Shot-Put in two-dimensional. The analysis of the present study was with the software Kinovea, the capture and measured distance of each phase of Shot-Put as Fig.1. Sites of the two cameras that depicting the distance Shot-put These cameras (AEE MagicCam, 170° view, MOV Format Video, 720p Video Resolution, 120 ips NTFS, Screen Resolution 1280*720 16:9).

Were placed at distances of X0.5 m and X6 m from the midline of shot-Put circle, with their optical axes at right angles to this line. The first camera was placed Y1.5 m forward (or on the circle side) from the axis of the circle and was used to record the Kinematic performance during the first and second phase (Start and Finish Pushing) of the Shot-Put.

The second camera was placed Y5.5 m forward of the front edge of the board and was used to record performance during the second phase in Shot-Put. To measure the real distance, a series of markers was placed in carefully measured locations along the inside. These markers served as reference measurement. Shot-Put tries were applied for our sample (the international paralympic athlete) in eight tries, we choos the best six tries for analysis.

Fig 1. The method chosen to Capture Video of the variables in Shot-Put Performance.



Kinematic Variables: Based in the similar studies, we choose the kinematic variables for analysing the performance kinematic of athlete in shot-put activity class F32/33 in two phase, the first phase of start pushing (variables; The number of swings, Standby time, Time of push, Distance of shot from the armrest, Trunk angle, Cubitus Angle of the shooting hand, Shoulder angle of the shooting hand, The wrist Angle of the shooting hand, Cubitus Angle of the Support hand, Shoulder angle of the Support hand, Distance of shot from the neck), and in the second phase of finish pushing (variables; Digital level, Trunk angle, Cubitus Angle of the shooting hand, Shoulder angle of the shooting hand, The wrist Angle of the shooting hand, Pushing angle, Shot height, Max height of shot, Time of Throwing, Total Performance Time).

We used kinovea softwore 0.8.15 for the kinematical analysis, it's a video player for sport analysis. It provides a set of tools to capture, slow down, study, compare, annotate and measure technical performances.

Data Collection

Our cameras were attached to our laptops to record directly into folders prepare in advance for each attempt chosen for analysis. The distances of the analysis's tests are shown in Table 1 for the athlete of Algerian Paralympic elite. With the software Kinovea, the films obtained for each try were phase analysis for each variable and try.

Statistical analysis

The data analysis procedures used in this study consisted of the computation of the means, standard deviations (SD), standard deviation Error (Std.E) as descriptive statistics, and the Pearson test for the correlations between all variables identified in based of similar studies. Statistical results were analyzed at ($p<0.05$) and ($p<0.01$) significance levels.

We used SPSS (SPSS for Windows, version 22.0, SPSS Inc. Chicago, Illinois, USA) statistical program for that statistical analysis of the data obtained.

RESULTS

Table 1. Description Results of the Algerian world Champion of Shot-Put Class F32/33 "Kerdjana Kamel" in the kinematic analysis of his Performance.

Variables	Mean±Sd	Std. E	Min/Max	Mean±Sd	Std. E	Min/Max
		Stage I			Stage II	
Digital level (m).	10.423±0.015	0.006	09.40/10.44	10.423±0.015	0.006	09.40/10.44
The number of swings	3.166±0.408	0.166	3.00/4.00			
Standby time (s)	2.285±0.015	0.006	2.27/2.31		----	
Time of push (s)	0.305±0.005	0.002	0.30/0.31			
Distance of shot from the armrest(cm)	51.253±0.017	0.007	51.23/51.28			
Trunk angle (°)	62.333±0.816	0.333	61.00/63.00	86.166±0.408	0.166	86.00/87.00
Cubitus Angle of the shooting hand(°)	16.333±0.816	0.333	15.00/17.00	154.666±0.816	0.333	154.00/156.00
Shoulder angle of the shooting hand (°)	24.000±0.894	0.365	23.00/25.00	160.833±1.834	0.749	159.00/163.00
The wrist Angle of the shooting hand(°)	108.166±1.329	0.542	106.00/109.00	155.166±0.983	0.401	154.00/156.00
Cubitus Angle of the Support hand (°)	116.500±1.048	0.428	115.00/118.00			
Shoulder angle of the Support hand (°)	56.000±2.00	0.816	54.00/59.000		----	
Distance of shot from the neck (cm)	12.096±0.030	0.012	12.05/12.130			
Pushing angle (°)				50.500±1.048	0.428	49.00/52.00
Shot height (cm)				202.785±.815	0.333	201.12/203.16
Max height of shot(cm)		----		399.468±1.480	0.604	397.66/401.26
Time of Throwing (s)				1.658±.018	0.007	1.64/1.68
Total Performance Time (s)				4.248±0.027	0.011	4.22/4.28

Table 1 shows the description results of performance kinematic Analysis for our sample "Kerajaan Kamel" (the Algerian world Champion, Class F32/33) in Shot-Put activity during the first and second stage of performance (start & finish pushing), the results explaine the values of mean±Sd, Std.Error, Minimal and maximal Values of variables.

Table 2. The connectivity relationships between variables in order to study in stages of performance (I and II).

The Variables correlated Stage I		Sig. p	The Variables correlated Stage II		Sig. p
Digital level	Distance of shot from the armrest	0.832* 0.040	Digital level	Pushing angle	-0.907* 0.013
	The wrist Angle of the shooting hand	0.898* 0.015		Shot height	0.935** 0.006
Time of push	Distance of shot from the armrest	-0.891* 0.017	Shot height	Pushing angle	-0.813* 0.049
	Shoulder angle of the Support hand	-0.905* 0.013	Max height of shot	Cubitus angle of the shooting hand	0.845* 0.034
Shoulder angle of the Support hand	Distance of shot from the armrest	0.985** 0.000	The wrist Angle of the shooting hand	Shoulder angle of the shooting hand	0.953** 0.003
Distance of shot from the neck	Trunk angle	-0.820* 0.046	Total Performance Time	Time of Throwing	0.818* 0.047
The Variables correlated between Stage I & Stage II					
Pushing angle	Time of push	0.905* .0130	Cubitus Angle of the shooting hand II	Cubitus Angle of the shooting hand I	-0.850* 0.032
	Distance of shot from the armrest	-0.985** .0000		Shoulder angle of the shooting hand I	0.839* 0.037
	Shoulder angle of the Support hand	-0.955** .0030		Cubitus Angle of the Support hand	0.953** 0.003
Shot height	The wrist angle of the shooting hand	0.826* 0.043	Time of Throwing	Standby time	0.818* 0.047
The wrist Angle of the shooting hand II	Shoulder angle of the shooting hand I	0.904* 0.013	Max height of shot	Cubitus angle of the shooting hand I	-0.939** 0.005

(*p<0.05*)* Correlation is significant at the 0.05 level.
(*p<0.01*)** Correlation is significant at the 0.01 level (*1-tailed*).

Table 2; shows the correlation results between kinematic variables for our sample in the first stage of Shot-put (start pushing), in the second stage (finish pushing), also between kinematic variables of first and second stage in shot-put. The significant correlation was observed at the 0.01 & 0.05 level (1-tailed) and degrees of freedom (n-1) between the values of kinetic performance in the first stage (start pushing), the correlations are positive significant in; the Digital level with Distance of shot from the armrest (0.040*), and with the wrist Angle of the shooting hand (0.015*) at the 0.05 level. Also, between the Shoulder angle of the Support hand with Distance of shot from the armrest (0.000**) at the 0.01 level. The correlations are negative significant in; Time of push with Distance of shot from the armrest (-0.017*), and with Shoulder angle of the Support hand (-0.013*), also between Distance of shot from the neck and Trunk angle (-0.046*) at the 0.05 level.

The significant correlation was observed at the 0.01 & 0.05 level (1-tailed) and degrees of freedom (n-1) between the values of kinetic performance in the second stage (finish pushing), the correlations are positive significant in; Max height of shot with the Cubitus angle of the shooting hand (0.034*), and Total Performance Time with the Time of Throwing (0.047*) at the 0.05 level. Also, between the Digital level with Shot height (0.006**), and between the wrist Angle of the shooting hand with the Shoulder angle of the shooting hand (0.003**) at the 0.01 level. The correlations are negative significant in the Digital level with Pushing angle (-0.013*) at the 0.05 level, and Positive significant with Shot height (0.006**) at the 0.01 level.

The significant correlation was observed at the 0.01 & 0.05 level (1-tailed) and degrees of freedom (n-1) between the values of kinetic performance in the first and second stage (start and finish pushing), the correlations are positive significant in; Pushing angle with Time of push (0.013*), and Shot height with The wrist angle of the shooting hand (0.043*), and The wrist Angle of the shooting hand Π with Shoulder angle of the shooting hand I (0.013*), and the Cubitus Angle of the shooting hand Π with Shoulder angle of the shooting hand I (0.037*), and the Time of Throwing with Standby time (0.047*) at the 0.05 level, and between the Cubitus Angle of the shooting hand Π with Cubitus Angle of the Support hand (0.003**) at the 0.01 level. The correlations are negative significant in; Cubitus Angle of the shooting hand Π with Cubitus Angle of the shooting hand I (-0.032*) at the 0.05 level, also, between the Max height of shot with Cubitus angle of the shooting hand I (-0.005**), and Pushing angle with Distance of shot from the armrest (-0.000**) and with Shoulder angle of the Support hand (-0.003**) at the 0.01 level.

DISCUSSION

The goal of this study was to the Kinematical variables' analysis of shot-put activity in Para-Athletics (Class F32/33) and their relationships with digital level achievement. The results indicated that the correlation values of Variables; Distance of shot from the armrest, the wrist Angle of the shooting hand (start pushing), and the Shot height, pushing angle (finish pushing) were significant with the digital level achievement. from that, also we can see the significant correlation values of Variables; Distance of shot from the armrest with the Shoulder angle of the Support hand, and the Pushing angle. also, the wrist Angle of the shooting hand with the Shoulder angle of the shooting hand, and Shot height. also, the Pushing angle with Shot height with Time of push, and Distance of shot from the armrest, and with the Shoulder angle of the Support hand. These kinematic variables in the performance of our sample, were important for effective and supportive for basics variables correlated to digital level achievement.

According to Biomechanical & Performance researches, a most basic kinematic variables effective in shot putting techniques of disability male athletes, with a result in reduction of the acceleration path of the shot resulting in a lower speed of the shot at release (Abdelkader et al., 2018b). the digital level and pushing angle are inversely related. As one parameter increases, the other decreases. Pushing angle can be manipulated depending on the throwers strength and anthropometrics (Cooper & Luigi, 2014). Projectiles obey constant acceleration, making them easier to describe and understand (Galileo's equations). Three factors deter -mine trajectory, including horizontal displacement, of a projectile: speed of release, angle of release, height of release (Maroński, 1991). The goal is to determine the pushing angle that optimizes the total distance for the release velocity attained for the thrower. For the shot put, the optimum angle of release is between 31° and 36° (SUGUMAR.C, 2012), Positive height of release, optimal angle should be slightly lower than 45°. Theoretically optimal angle is about 40-41°. Skilled

shot-putters use angles of 35-37° (Judge et al., 2016). The mathematically calculated optimal release angle αopt ranges from 40° to 43° and is calculated by the following formula (Milan coh et al., 2008):

$$\alpha_{opt} = \frac{1}{2}\arccos\left(\frac{1}{1+\frac{v_R^2}{gh_R}}\right)$$

but in the present study indicates that the shot-putter has achieve distance of 10.423 ±0.015 meters. Shot-putter use angles of Push are 49°-52°. All athletes have their own specific optimum Pushing angle because of individual differences in the rate of force generation and apply and the Disability classification (Keogh & Burkett, 2013). where, the study results may depend upon the factors related to shot put performance, Lowest and highest shot-put performance depends upon the angle of release. To achieve good performances, it is not necessary to throw at very close to the optimum release angle. Throwing with a high release speed is more important to performance than throwing at the optimum release angle (L. A. Frossard et al., 2005; Perrin et al., 2000).

As expected, these results confirm the findings of previous studies focusing two predominant factors, The velocity and angle to the performance of gold medalists (Abdelkader et al., 2018b). The lack of strong relationship with the position at release might be explained by the difference in Shot height was since all the throwing frames have the same height of 75cm, corresponding to the maximum height allowed by the IPC's rule (L. Frossard et al., 2007). The main mechanisms explained for that performance analysis are the Technique acquisition might be one major factor which is restricted by a cerebral palsy disability (Kohe & Peters, 2016).

However, it is likely that the performance relied more importantly on the throwing technique and functional outcome as they are both directly related to velocity and angle of release. Shot-putting requires great explosive strength, together with the ability to perform precisely timed movements in a confined space(Landolsi et al., 2018). The athlete's objective is to project the shot as far as possible, but competition regulations restrict the technique that may be used. The shot must be thrown from the shoulder using one hand and it must be held near to the chin throughout any preliminary movements (Błażkiewicz et al., 2016).

In the end, sport scientists, coaches, athletes and classifiers can only rely partially on data provided in the literature for a sound understanding of the current performance of medalist stationary shot-putters (L. A. Frossard et al., 2005). As pointed out by Chow 2000, "More quantitative data, especially those collected during major competitions, are needed for the development of a data base on performance characteristics" (John W. Chow et al., 2000). Anyone with a serious interest in the performance of top-level athletes should appreciate the importance of the smallest worthwhile change in performance, the change that makes a meaningful difference to an athlete's chances of winning. Also, knowledge of this change is needed when assessing athletes with a performance test either to make decisions about meaningful changes in an individual or to re-search strategies that might affect performance.

CONCLUSION

As a results of kinetic Performance analysis of Paralympic elite (the Shot-Put Activity, Class 32/33) in practice; we confirm: 1) The increase in the variables values of Distance shot from the armrest, and the wrist Angle of the shooting hand in first phase of pushing (start) are affects the digital level achievement, Also the Shot height variable in the second phase of pushing, 2) The decrease in the value of Pushing angle variable in second phase of pushing (finish) is affect the digital level achievement.

PRACTICAL APPLICATION

The kinematical analysis of performance is very importenet for achinement the the digital level, for that, we need to focus on applying biomechanical principles to during kinetic performance, Also Ensure that the required mechanical position is taken at every stage of performance and in line with the kinetic

performance requirements. Especially for the Paralympic athletes due to their physical and kinetical characteristics, depending on the nature and classification of their disability.

REFERENCES

Abdelkader, G., Madani, R., Adel, B., & Bouabdellah, S. (2018a). Sporting events among the disabled between excellence and ideal in motor performance. *International Journal of Physical Education, Fitness and Sports*, *7*(3), 66–71. https://doi.org/10.26524/ijpefs1837

Abdelkader, G., Madani, R., Adel, B., & Bouabdellah, S. (2018b). Sporting events among the disabled between excellence and ideal in motor performance. *International Journal of Physical Education, Fitness and Sports*, *7*(3), 66–71. https://doi.org/10.26524/ijpefs1837

Ariel, G., Penny, A., Probe, J., & Finch, A. (2005). *Biomechanical analysis of the shot·put event at the 2004 Athens Olympic games*. 4.

Bartlett, R. (2007). *Introduction to Sports Biomechanics,* (2nd ed.).

Bartlett, R. M. (1992). The biomechanics of the discus throw: A review. *Journal of Sports Sciences*, *10*(5), 467–510. https://doi.org/10.1080/02640419208729944

Błażkiewicz, M., Łysoń, B., Chmielewski, A., & Wit, A. (2016). Transfer of mechanical energy during the shot put. *Journal of Human Kinetics*, *52*, 139–146. https://doi.org/10.1515/hukin-2016-0001

Błażkiewicz, M., Łysoń, B., & Wit, A. (2019). Mechanical energy flows between body segments in ballistic track-and-field movements (shot put, discus, javelin) as a performance evaluation method. *Acta of Bioengineering and Biomechanics*, *21*(1), 31–36.

Brittain, I. (2016). *The Paralympic Games Explained* (Second Edition). Routledge.

Chow, J. W., & Mindock, L. A. (1999). Discus throwing performances and medical classification of wheelchair athletes. *Medicine and Science in Sports and Exercise*, *31*(9), 1272–1279. https://doi.org/10.1097/00005768-199909000-00007

Chow, John W., Chae, W.-S., & Crawford, M. J. (2000). Kinematic analysis of shot-putting performed by wheelchair athletes of different medical classes. *Journal of Sports Sciences*, *18*(5), 321–330. https://doi.org/10.1080/026404100402386

Cooper, R. A., & Luigi, A. J. D. (2014). Adaptive Sports Technology and Biomechanics: Wheelchairs. *PM&R*, *6*, S31–S39. https://doi.org/10.1016/j.pmrj.2014.05.020

Delgado, C. (2012). The Biomechanical Analysis of the Discus Throw: Stages and Suggested Training Techniques. *The International Journal of Sport and Society*, *2*(4), 1–10. https://doi.org/10.18848/2152-7857/CGP/v02i04/53881

Elbadry, N., Hamza, A., Pietraszewski, P., Alexe, D. I., & Lupu, G. (2019). Effect of the French Contrast Method on Explosive Strength and Kinematic Parameters of the Triple Jump Among Female College Athletes. *Journal of Human Kinetics*, *69*(1), 225–230. https://doi.org/10.2478/hukin-2019-0047

Franks, I. M., & Goodman, D. (1986). A systematic approach to analysing sports performance. *Journal of Sports Sciences*, *4*(1), 49–59. https://doi.org/10.1080/02640418608732098

Frossard, L. A., O'Riordan, A., & Goodman, S. (2005). Applied biomechanics for evidence-based training of Australian elite seated throwers. *International Council of Sport Science and Physical Education Perspectives Series*. https://eprints.qut.edu.au/2713/

Frossard, L., Smeathers, J., O'Riordan, A., & Goodman, S. (2007). Shot Trajectory Parameters in Gold Medal Stationary Shot-Putters during World-Class Competition. *Adapted Physical Activity Quarterly*, *24*(4), 317–331. https://doi.org/10.1123/apaq.24.4.317

Gilberto, M. F. (n.d.). *Shot Put Regulations Changes and Implications in Physically Challenged Athletes Performance*.

Guebli, A., Bessenouci, H. A. I., & Regiueg, M. (2018). The Compounds of Some Variables Kinematics in the Phases of Triple Jump and Their Relationships with the Finale Results-An analytical study of the elements of the Algerian elite team-. *journal of physical activity and sport, society, education and health*, *1*(1), 25–31. https://www.asjp.cerist.dz/en/article/67719

Guebli, A., Regiueg, M., & Sbaa, B. (2018). The Value of Dynamic Priorities in Motor Learning between Some Basic Skills in Beginner's Basketball, U14 Years. *Sport Management and Sport Marketing*, *12*, 1. https://doi.org/dai.waset.org/1307-6892/92495

Hay, J. G., & Yu, B. (1995). Critical characteristics of technique in throwing the discus. *Journal of Sports Sciences*, *13*(2), 125–140. https://doi.org/10.1080/02640419508732220

Hubbard, M., de Mestre, N. J., & Scott, J. (2001). Dependence of release variables in the shot put. *Journal of Biomechanics*, *34*(4), 449–456. https://doi.org/10.1016/s0021-9290(00)00228-1

Judge, L. W., Bellar, D. M., Craig, B. W., Gilreath, E. L., Cappos, S. A., & Thrasher, A. B. (2016). Influence of Postactivation Potentiation on Shot Put Performance of Collegiate Throwers. *Journal of Strength and Conditioning Research*, *30*(2), 438–445. https://doi.org/10.1097/JSC.0000000000000202

Keogh, J., & Burkett, B. (2013, December 4). *Kinematics of shot-put, discus and javelin throwing in Paralympic athletes*. Routledge Handbook of Ergonomics in Sport and Exercise; Routledge. https://doi.org/10.4324/9780203123355-61

Kohe, G. Z., & Peters, D. M. (2016). *High Performance Disability Sport Coaching*. Taylor & Francis.

Landolsi, M., Labiadh, L., Zarrouk, F., Maaref, K., Ghannouchi, S., Tabka, Z., & Lacouture, P. (2018). Kinematic analysis of the shot-put: A method of assessing the mechanical work of the hand action force. *European Journal of Sport Science*, *18*(9), 1208–1216. https://doi.org/10.1080/17461391.2018.1478449

Lee, S., Davis, R., Judge, L. W., Kwon, Y.-H., Han, K., Kim, J., Kim, J., & Kim, J. (2015). Gender-Based Correlation Profiles Among the Release Factors and Distance Thrown in Paralympic Seated Shot Put. *Adapted Physical Activity Quarterly*, *32*(4), 318–330. https://doi.org/10.1123/APAQ.2014-0148

Leigh, S., Liu, H., Hubbard, M., & Yu, B. (2010). Individualized optimal release angles in discus throwing. *Journal of Biomechanics*, *43*(3), 540–545. https://doi.org/10.1016/j.jbiomech.2009.09.037

Marcos Gutiérrez-Davila, Javier Rojas, José Campos, Javier Gámez, & Alberto Encarnación. (2009). *Biomechanical analysis of the shot put at the 12th IAAF World Indoor Championships| News*. https://www.worldathletics.org/news/news/biomechanical-analysis-of-the-shot-put-at-the-1

Maroński, R. (1991). Optimal distance from the implement to the axis of rotation in hammer and discus throws. *Journal of Biomechanics*, *24*(11), 999–1005. https://doi.org/10.1016/0021-9290(91)90017-h

Milan coh, Stanko stuhec, & Matej Supej. (2008). *Comparative biomechanical analysis of the rotational shot put technique | Matej Supej et Stanko Stuhec—Academia.edu*. *32*(1), 249–256.

O'Riordan, A., & Frossard, L. A. (2006). Seated Shot Put – What's it all about? *Modern Athlete and Coach*, *44*(2), 2–8.

Perrin, P., Perrot, C., Deviterne, D., Ragaru, B., & Kingma, H. (2000). Dizziness in discus throwers is related to motion sickness generated while spinning. *Acta Oto-Laryngologica*, *120*(3), 390–395. https://doi.org/10.1080/000164800750000621

Shestakov, M. P. (2005). Modelling of technical training of discus throwers in the period of significant changes of their mass-inertia characteristics. *Journal of Physiological Anthropology and Applied Human Science*, *24*(4), 367–370. https://doi.org/10.2114/jpa.24.367

Sugumar, C. (2012). A Biomechanical Analysis of the Shot Put Performance. *Global Journal for Research Analysis*, *3*(5), 118–119. https://doi.org/10.15373/22778160/MAY2014/44

Van Biesen, D., McCulloch, K., & Vanlandewijck, Y. C. (2018). Comparison of shot-put release parameters and consistency in performance between elite throwers with and without intellectual impairment. *International Journal of Sports Science & Coaching*, *13*(1), 86–94. https://doi.org/10.1177/1747954117707483

van Dijk, A., Daďová, K., & Martínková, I. (2017). Intellectual disability sport and Paralympic classification. *AUC Kinanthropologica*, *53*(1), 21–34. https://doi.org/10.14712/23366052.2017.2

Webborn, A. D. J. (2009). *Paralympic Sports*. https://doi.org/10.1002/9781444316872.ch30

Willwacher, S., Potthast, W., & Müller, R. (2011). *Shot Put Kinematics Of World Class Athletes With An Intellectual Disability*. 4.

Zerf Mohammed, Mokkedes Moulay Idriss, Bengoua Ali, Bendahmane Med Nasreddin, & Guebli Abd-el-Kader. (2015). The Impact of the Techniques and Tactics Appropriate by the Athletes in Phase Triple Jump and Their Relationships with the Finale Results. *Journal of Sports Science*, *3*(4). https://doi.org/10.17265/2332-7839/2015.04.004

CITATION OF THIS ARTICLE

Abdelkader, G., & Madani, R. & Bouabdellah, S. (2020) Kinematical variables analysis of shot-put activity in para athletics (class F32/33) and their relationships with digital level achievement. *International Journal of Sport, Exercise & Training Sciences–IJSETS, 6(2), 65–72.* DOI: 10.18826/useeabd.709944

International Journal of Sport, Exercise & Training Sciences

e-ISSN 2149-8229 Vol 6, Issue 2, 73–79, (2020) Original Article

http://dergipark.gov.tr/useeabd

The kinematical analysis of blocking skill in volleyball and their relationships with the explosive force of lower limbs

Hicham BENELGUEMAR[1], Sba BOUABDELLAH[2], Farid MOUISSI[3]

Abstract

Aim: The study aims to conduct a kinematical analysis of blocking skill in volleyball and their relationships with the explosive force of lower limbs, for the athletes from the elite Algerian team.

Methods: A total of 06 male Volleyball Players from the elite Algerian team as volunteers (Age: 25.66+3.32 yr, Length:198.00+3.68 cm, Weight: 86.66+6.62 kg). We used for kinematical analysis the software Dartfish9. For video capturing, we used three cameras (AEE Magic Cam) for record the performance during an Experimental competition, two $CAM^{I\&II}$(^{X}1m, ^{Y,Z}1.5m) were placed in the sides of volleyball Court, and CAM^{III}(^{X}4.5m,^{Y}1m, ^{Z}1.5m) behind the elite Algerian team. Also, two force Explosive tests were executed; Squat Jump (SJ) and Counter Movement Jump (CMJ). The data were analyzed in SPSS 22.0 program. Descriptive statistics (mean±SD) and P test for the correlations between variables studied.

Results: Through the statistical analysis, there were significant correlations between values of CMJ test with both of the ^{D}Height$_{BCG}$ ($p<0.01$), & ^{D}Max height ($p<0.01$), and between variable ^{D}Max height with each of the $^{\circ}$Trunk ($p<0.01$), & $^{\circ}$Knee ($p<0.01$), and ^{D}Low$_{BCG}$ ($p<0.01$), and ^{D}Height$_{BCG}$ ($p<0.01$) respectively, at the 0.05 level. Also, between ^{D}Low$_{BCG}$ with $^{\circ}$Trunk ($p<0.01$), and with $^{\circ}$Knee ($p<0.01$).

Conclusion: This study was able to produce results that are helpful to coaches when deciding when they are considering vertical jump heights during the performance of blocking skill in volleyball, through: developing the technical aspect of the blocking skill by training players to improve the kinematical properties of a certain degree; especially, the angles of the lower limbs of the body, such as the angles of the trunk, knee, and ankle.

Keywords
Kinematical Analysis,
Volleyball,
Blocking Skill,
Explosive Force,

Article Info
Received: 04.05.2020
Accepted: 28.06.2020
Online Published: 30.06.2020

DOI:10.18826/useeabd.731462

INTRODUCTION

Volleyball is one of the most popular team sports games in the world. Pass, set up, attack, block, etc., can be mentioned as examples of individual basic skills creating the game. All of them utilize various motor skills and abilities as jumps, swings or different ways of locomotion as well as power, agility, flexibility and speed of reaction (Lehnert et al. 2017), The spike, block and serve are the three most important skills to score points in volleyball (R. Lobietti, Michele, and Merni 2006), In volleyball, the skill of blocking, in which a player or players jump and extend their hands above and over the net (without touching the net) to block an attack (spike) by the opponent, is crucial to team success (Ficklin, Lund, and Schipper 2014), Blocking in volleyball is a very important skill, this is particularly true at the more advanced and competitive levels, Blocking has been associated with a team's winning percentage, Next to spiking, the team with the best blocking will most likely win (Farokhmanesh and McGown 1988). According to Lobietti (2009), a successful defense in the game of volleyball starts with a well-trained and disciplined block, blocking in volleyball is one of the key components to a team's success. As volleyball has evolved and spiking has become more powerful, the skill of blocking has become a crucial aspect of the game and is highly correlated with team success (Lobietti 2009).

The vertical jump is a fundamental part of the spike, block, and the topspin and floating serves (Borràs et al. 2011). Successful performance in volleyball often depends on the ability of the individuals to perform high enough high jumps (Milosevic et al. 2000). Vertical jumping is probably the most important manifestation of explosive strength in volleyball (Borràs et al. 2011). Jump height achieved in countermovement jumping is also correlated to the height achieved in spike jumping for the attacker

The role and contributions of each authors as in the section of IJSETS Writing Rules "**Criteria for Authorship**" is reported that: **1. Author:** Contributions to the conception or design of the paper, data collection, writing of the paper and final approval of the version to be published paper; **2. Author:** Data collection, preparation of the paper according to rules of the journal, final approval of the version to be published paper; **3. Author:** Statistical analysis, interpretation of the data and final approval of the version to be published paper;

[1]Laboratory of Physical and Sports activity, Society, Education and Health, Physical and Sports Education Institute, Hassiba Benbouali University, Chlef/Algeria, h.benelguemar@univ-chlef.dz **ORCID ID:**0000-0003-3306-9154

[2]Laboratory of Physical and Sports activity, Society, Education and Health, Physical and Sports Education Institute, Hassiba Benbouali University, Chlef/Algeria, b.sba@univ-chlef.dz **ORCID ID:**0000-0001-9733-6990

[3]Laboratory of Physical and Sports activity, Society, Education and Health, Physical and Sports Education Institute, Hassiba Benbouali University, Chlef/Algeria, f.mouissi@univ-chlef.dz **ORCID ID:** 0000-0003-0562-3939

(Wagner et al. 2009). The use of strength during the play is determined by the fact that the usage of maximum strength lasts from 0.5 to 0.7 seconds; however, most of the explosive moments take substantially less time. For this reason, the optimal usage and transformation of the gained maximum muscle strength into the "explosivity" of the main muscle group of the lower limbs, which take part in the takeoff, require special power training (Lehnert, Lamrová, and Elfmark 2009). Specific jumping can be measured in different ways (Lidor and Ziv 2010). Most frequently used nonspecific tests for assessing jumping are squat jump, countermovement jump without arm swing and countermovement jump with arm swing (Glatthorn et al. 2011).

Biomechanics has been defined as the study of the mechanical laws relating to the movement or structure of the living organism, an analysis of the biomechanics of the specific skills that are performed by volleyball athletes permit optimal sports performance while minimizing the injury (Reeser and Bahr 2017). Examples of well-known athletes easily display the importance of biomechanical technology in improving performance (Zahálka et al. 2017). Kinematics is the study of bodies in motion without regard to the causes of the motion. It is concerned with describing and quantifying both the linear and angular positions of the bodies and their time derivatives (Harpreet S et al. 2017). The assessment of relevant biomechanical factors of performance is essential for appropriate training progression, especially at high skill levels (Fuchs et al. 2019). As the biomechanical analysis of sports performance provides an objective method of determining the performance of any particular sporting technique (Abdelkader et al. 2018), because it is a science concerned with studying kinetic technology and movement performance in order to make the skill work well and this requires various elements of physical fitness from speed, flexibility, agility, and great muscles force. Therefore, this study was aimed to the kinematical analysis of blocking skill in volleyball and their relationships with the explosive force of lower limbs, for the athletes from the elite Algerian team. In order to determine the kinetic transfer mechanism by transferring muscular force to give a better model of mechanical blocking skill.

METHOD

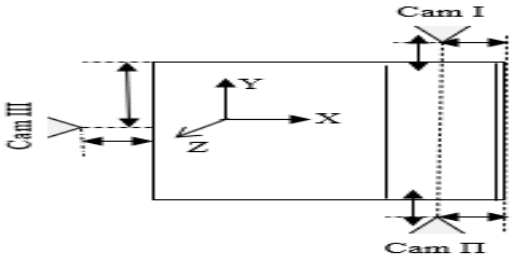
Participants

The Ethics committee protocol was approved by the institute of physical and sport education, laboratory of physical and sports activity, society, education, and health in Hassiba Benbouali University of Chlef Algeria on 31.07.2016 with 935 number. A total of six healthy male Volleyball Players from the elite Algerian team provided their informed consent to participate in the study as volunteers. They averaged 25.66±3.32 years of age, 14.33±4.27 years for experience, 1.98±0.36 m in height, and 86.66±6.62kg in mass. Four athletes were right-hand dominant and two were left-hand dominant. To ensure the athlete's eligibility for the study, we collected a brief medical history from each athlete. None reported a history surgery and none complained of pain at the time of the testing.

Research Design and Data Collection: In this study, we have analyzed the kinematic variables of volleyball blocking skill in two-dimensional. The analysis of the present study was with the software Dartfish 9 (release 5-9.0.11219.0), the video capture of volleyball blocking skill with three cameras (AEE Magic Cam, 170° view, MOV Format Video, 720p Video Resolution, 120 ips NTFS, Screen Resolution 1280*720 16:9). Sites of the three cameras depicting the blocking skill in volleyball as Fig.1.two $CAM^{I\ \&\ II}$ were placed in the sides of the volleyball Court from the right and left (^{X} 1m, ^{Y,Z} 1.5m), and the third CAM^{III} was behind the elite Algerian team (^{X}4.5m, ^{Y}1m, ^{Z}1.5m). Also, two force Explosive tests were executed; Squat Jump (SJ) and Counter Movement Jump (CMJ).

Each athlete was required to wear tight-fitting clothing (i.e. spandex shorts and a sleeveless shirt). The tape Reflective markers were bilaterally attached on the surface of the skin over the following Joints; the neck, wrist, hip, knee, and ankle. Reflective markers on all volunteers were attached by one investigator. Also, all athletes were encouraged to warm up according to the normal routine to ensure optimal performance. Once warmed up, the athletes performed a Friendly Experimental competition with a team from the first division in Volleyball (CRBC Team), the data were collected from the best blocking skill in volleyball of our sample (the athletes of Algerian National Elite). Data collection occurred in Harcha Hacen multisport hall, Algiers by the researchers (APAAS Laboratory, Chlef, Algeria).

Fig.1. Distance sites of the three cameras used for capture video



Kinematic Variables: Based on similar studies, we were choosing the following kinematical variables for the analysis; Times ([T]Absorption, [T]Pushing, [T]Takeoff/Flight, [T]Height **BCG**), angles ([°]Trunk, [°]Knee, [°]Ankle), Distance ([D]Low **BCG**, [D]Height **BCG**, [D]Max height), and Velocity of Body's center of gravity (Velocity **BCG**).

Statistical analysis

The data analysis procedures used in this study consisted of the computation of the means, standard deviations (SD), variance as descriptive statistics, and the Pearson Test for the correlations between all variables identified in based on similar studies. Statistical results were analyzed at ($p<0.05$) and ($p<0.01$) significance levels. We used SPSS (SPSS for Windows, version 22.0, SPSS Inc. Chicago, Illinois, USA) statistical program for that analysis of the data obtained.

RESULTS

Table 1. Description results of the analysis of the kinematical variable of blocking in volleyball

Variables			Mean ± SD	Variance	Min Value	Max Value
Kinematics	Time (s)	[T]Absorption	0.032±0.006	0.000	0.023	0.043
		[T]Pushing	0.026±0.004	0.000	0.020	0.033
		[T]Takeoff/Flight	0.060±0.006	0.000	0.047	0.067
		[T]Height BCG	0.056±0.006	0.000	0.050	0.067
	Angle (°)	[°]Trunk	27.250±5.972	35.659	18.000	36.000
		[°]Knee	84.000±9.155	83.818	70.000	98.000
		[°]Ankle	75.833±5.781	33.424	69.000	89.000
	Distance (m)	[D]Low BCG	0.833±0.072	0.005	0.690	0.930
		[D]Height BCG	1.660±0.033	0.001	1.600	1.710
		[D]Max height	2.858±0.038	0.001	2.790	2.920
	Velocity BCG(m/s²)		30.550±2.884	8.316	25.870	34.890
Explosive Force	Squat Jump SJ(m)		0.960±0.084	0.007	0.840	1.060
	Counter Movement JumpCMJ(m)		0.788±0.062	0.004	0.713	0.860

Table 1. shows the description results of the analysis of the kinematical variables during the performance kinetic of blocking skill in volleyball, the results explain the values of mean±SD, variance, minimal and maximal values of variables.

Table 2. The connectivity relationships between kinematic variables and SJ, CMJ tests.

Variables	SJ		CMJ	
	Correlation Coefficient	Sig. p	Statistic	Sig. p
[T]Absorption	-0.459	0.067	-0.475	0.059
[T]Pushing	-0.311	0.162	-0.327	0.150
[T] Takeoff/Flight	0.104	0.374	0.206	0.260
[T]Height BCG	-0.420	0.087	-0.543	0.034*
[°] Trunk	0.258	0.209	0.677	0.016*
[°] Knee	-0.533	0.037*	-0.610	0.018*
[°]Ankle	0.287	0.183	0.352	0.131
[D]Low BCG	-0.225	0.241	-0.775	0.030*
[D]Height BCG	0.521	0.041*	0.815	0.001**
[D]Max height	0.776	0.030*	0.816	0.000**
VelocityBCG	0.257	0.210	0.358	0.127

p<0.05 **Correlation is significant at the 0.05 level.** ***p<0.01*** **Correlation is significant at the 0.01 level.**

Table 2; shows the correlation results between kinematic values analysis for our sample in the performance of blocking skill in volleyball and the explosive force tests squat jump (SJ) and countermovement jump (CMJ). Positive significant correlations were observed between values of the countermovement jump test with the angle of the trunk (P<0.05), and values of squat jump test with the distance of height BCG (P<0.05), and with the distance of max height (P<0.05); also, between values of countermovement jump test with the distance of height BCG (P<0.01), and with the distance of max height (P<0.01).

Table 3. The connectivity relationships between kinematics variables of study during the performance**.**

Variables	Time (s)				Angle (°)			Distance (m)		
	Absorption	Pushing	Takeoff/Flight	Height$_{BCG}$	Trunk	Knee	Ankle	Low$_{BCG}$	Height$_{BCG}$	Max height
^{T}Pushing (s)	0.295 0.176					-				
^{T}Takeoff/Flight	-0.245 0.222	0.065 0.420				-				
^{T}Height$_{BCG}$	0.089 0.391	-0.019 0.477	-0.228 0.238				-			
$^{\circ}$Trunk	0.179 0.289	0.386 0.108	-0.338 0.141	-0.003 0.496				-		
$^{\circ}$Knee	-0.062 0.424	-0.069 0.415	0.378 0.113	-0.220 0.246	-0.753** 0.002				-	
$^{\circ}$Ankle	-0.456 0.068	-0.326 0.150	0.403 0.097	-0.521* 0.041	-0.543* 0.034	0.424 0.085				-
^{D}Low$_{BCG}$	-0.202 0.264	-0.176 0.292	0.321 0.155	-0.341 0.139	-0.828** 0.000	0.865** 0.000	0.312 0.162		-	
^{D}Height$_{BCG}$	-0.264 0.204	-0.120 0.355	0.062 0.425	0.166 0.303	0.622* 0.015	-0.623* 0.015	0.151 0.320	-0.769** 0.002	-	
^{D}Max height	0.030 0.463	0.121 0.354	-0.284 0.185	-0.093 0.386	0.833** 0.000	-0.727** 0.004	0.065 0.421	-0.845** 0.000	0.810** 0.001	-
Velocity$_{BCG}$	-0.421 0.087	-0.158 0.312	0.457 0.068	-0.560* 0.029	-0.281 0.188	0.504* 0.047	0.534* 0.037	0.532* 0.037	-0.070 0.414	-0.121 0.354

p<0.05 Correlation is significant at the 0.05 level. **p<0.01**** Correlation is significant at the 0.01 level.**

Table 3; shows the correlation results between kinematic variables for our sample in the performance of blocking skill in volleyball. The significant correlation was observed at the 0.01&0.05 level (1-tailed) and degrees of freedom (n-1) between the values of kinetic. The correlations are positive significant between variables; the distance of Low BCG with the angle of the knee (P<0.01), and between the distance of Max height with the distance of Height BCG (P<0.01). Also, between the distance of Height BCG with angle of Trunk (P<0.05), and between Velocity BCG with angle of Knee (P<0.05), and with the angle of Ankle (P<0.05), and with the distance of Low BCG (P<0.05).

The correlations are negative significant between variables; angle of Knee with the angle of Trunk (P<0.01), and between the distance of Low BCG with angle of Trunk (P<0.01), and between the distance of Height BCG with the distance of Low BCG (P<0.01), and between the distance of Max height with angle of Trunk (P<0.01), and with the angle of Knee (P<0.01), and with the distance of Low BCG (P<0.01); also between variables of the angle of Ankle with time of Height BCG (P<0.05), and with the angle of Trunk (P<0.05), and between the distance of Height BCG with angle of Knee (P<0.05), and between Velocity BCG with the time of Height BCG (P<0.05).

DISCUSSION

The results of correlation between variables in our study (Ankle angle with each of the Time of Height BCG & and the Trunk angle) confirmed the previous findings of Lobietti et al 2006; that the legs bent (knee angle around 110°) and feet wider suggest that the starting position is an automatic choice by the players in order to be ready to go to block all types of opponent sets (Roberto Lobietti, Fantozzi, and Merni 2006). Athletes should employ more strength training of lower limb extension, engaging small joint angles (full squats) (Hartmann et al. 2012).

The player during blocking without approach steps has a stable equilibrium and the BCG is located at a point lower than the spin axis where the player benefits from it. Therefore, he gets more height (Hicham, Bouabdellah, and Yacine 2018). Here, the characteristic of the movement, although with higher knee flexion angles (mean value of 113°), can be considered similar to a squat jump (90°) (Roberto Lobietti et al. 2006); whereas strength and power undoubtedly contribute to jump performance (Sheppard et al. 2008). As volleyball has evolved and hitting has become more powerful and offensive, the skill of blocking became a more crucial aspect of the game, which requires volleyball players to create a more rigid kinetic chain to impart force to the ball during blocking (Linebach 2014).

The study also revealed the results of the relationship between Knee angle with each of the SJ & CMJ tests, that can be explained through countermovement which permitted higher jumps, by the eccentrically preloading of the hip extensors and the knee flexors (Gollhofer and Bruhn 2008); i.e. the low angle of the knee causes the distance of the BCG to decrease. Also, the best blocking performance is achieved when the jump is at its maximum height, approximately around 50 % of the flight time (Donà et al. 2006). Meaning, wherever the explosive force for lower limbs increases, the vertical jump will increase where the vertical distance is equal to the sum of the vertical distances of the steps that preceded it. Thus, it will increase the explosive force to push the body up (Linebach 2014). Nevertheless, the explosive force of lower limbs depends on the degree of the knees flexion which we determined on (5°) in our study, confirming the previous findings of Gollhofer et al 2008; elaborating that the elastic muscular strength is much more effective when the knees are flexed around (6°), whereas going to the higher countermovement requires a greater concentric muscular activation during the push-off phase of the jump due to the greater flexion (Gollhofer and Bruhn 2008). As observed by Komi, the countermovement jump allows the athletes to perform a higher jump with respect to the squat jump (Komi 1983).

When looking at the CMJ as a whole, it is a combination of muscles lengthening and shortening in order to produce a goal (i.e. the jump), The research shows that the CMJ yields a jump height that is greater than its squat jump (SJ) counterpart. Typically, a 20-30% increase above the SJ height, although this may not always be the case (Bosco et al. 1987); where a very strong athlete with poor ability to effectively transfer energy may yield an SJ that is higher than the CMJ (Dias et al. 2011), and this is the athlete that spends a lot of time working on absolute strength and fails to incorporate any plyometric movement in their training (Klavora 2000). This suggests that performances in the CMJ are linked with maximal speed, maximal strength, and explosive-strength. When the CMJ is performed using the arm-swing, performances can be ≥10% higher than when they include no arm-swing (Feltner, Fraschetti, and Crisp 1999).

Ultimately, this study was able to produce results that are helpful to coaches when deciding to consider vertical jump heights. Key points for the effectiveness of the block are anticipation, decision-making, movement speed, and jumping ability (Lobietti 2009), where kinematical analysis is useful and permits to analyze volleyball blocking movement in order to identify differences in kinematics parameters (Roberto Lobietti et al. 2006). The data could be evaluated with coaches alongside strength and conditioning coaches to design effective training modules, specific to (Plyometric) to enhance overall lower extremity strength and explosiveness off the floor (Sato and Mokha 2007).

CONCLUSION

The kinematical analysis of any technical skill in volleyball includes dividing the movement that we want to analyze in its overlapping sections and knowing the nature of each part of the movement for the purpose of applying the foundations and mechanical and anatomical laws appropriate to the ideal movement technically. A vertical jump begins with a preparatory phase, which involves eccentric muscle activity with gravity providing the driving force and certain degree of flexion at the trunk and knee joints (knee angle around 110°). Since the kinetic transfer from the limbs to the trunk comes from giving the limbs of the body an additional force, it moves from the lower limbs to the top to perform the skill well.

PRACTICAL APPLICATION

Based on the findings and conclusions of this study for thus we confirm the working on developing the technical aspect of the blocking skill, by training players to improve the kinematical properties of a

certain degree; especially, the angles of the lower limbs of the body, such as the angles of the trunk, the knee, and ankle. Moreover, during the movement of blocking skill, core muscles play a very important role in transferring the force from the lower to the upper body. This is particularly emphasized during swift transitions from a pushing into a block jump. The authors suggest further research of explosive force structure for volleyball players. There is especially a lack of longitudinal studies which would analyze the structure of this important motor ability in the period from the start of practicing volleyball up until the peak of the sports career.

Essentially, placing subjects under competitive conditions, subjects may respond with maximal effort. It is recommended that future investigators attempt to use a portable force platform that can be placed on a volleyball court during a game-like or actual competition situation.

REFERENCES

Abdelkader G, Reguieg M, Belkadi A, and Sbaa B. 2018. 'Sporting Events among the Disabled between Excellence and Ideal in Motor Performance'. *International Journal of Physical Education, Fitness and Sports* 7(3):66–71.

Borràs, Xantal, Xavier B, Franchek D, and Piero G. 2011. 'Vertical Jump Assessment on Volleyball: A Follow-Up of Three Seasons of a High-Level Volleyball Team'. *The Journal of Strength & Conditioning Research* 25(6):1686–1694.

Bosco, C., G. Montanari, R. Ribacchi, P. Giovenali, F. Latteri, G. Iachelli, M. Faina, R. Colli, A. Dal Monte, and M. La Rosa. 1987. 'Relationship between the Efficiency of Muscular Work during Jumping and the Energetics of Running'. *European Journal of Applied Physiology and Occupational Physiology* 56(2):138–43.

Dias, Jonathan A, Juliano D P, Diogo C. Reis, Lucas B, Saray G. Santos, Antônio R. P. Moro, and Noé G. Borges. 2011. 'Validity of Two Methods for Estimation of Vertical Jump Height'. *Journal of Strength and Conditioning Research* 25(7):2034–39.

Donà, Giulia, Elena Z, Nicola P, Zimi S, and Claudio C. 2006. 'Biomechanical analysis of three different blocking footwork tchniques in volleyball: A pilot study. ISBS- *Conference Proceedings Archive*.

Farokhmanesh, Mashallah, and C. McGown. 1988. 'A Comparison of Blocking Footwork Patterns'. *Coaching Volleyball* 1(2):20–22.

Feltner, M. E., D. J. Fraschetti, and R. J. Crisp. 1999. 'Upper Extremity Augmentation of Lower Extremity Kinetics during Countermovement Vertical Jumps'. *Journal of Sports Sciences* 17(6):449–66.

Ficklin, Travis, Robin L, and Megan S. 2014. 'A Comparison of Jump Height, Takeoff Velocities, and Blocking Coverage in the Swing and Traditional Volleyball Blocking Techniques'. *Journal of Sports Science & Medicine* 13(1):78–83.

Fuchs, Philip X., Hans-J K Menzel, Flavia G, Jeffrey B, Serge P. von Duvillard, and Herbert W. 2019. 'Spike Jump Biomechanics in Male versus Female Elite Volleyball Players'. *Journal of Sports Sciences* 37(21):2411–19.

Glatthorn, Julia F., Sylvain G, Silvio Nussbaumer, Simone S, Franco M. Impellizzeri, and Nicola A. Maffiuletti. 2011. 'Validity and Reliability of Optojump Photoelectric Cells for Estimating Vertical Jump Height'. *The Journal of Strength & Conditioning Research* 25(2):556–560.

Gollhofer, Albert, and Sven Bruhn. 2008. 'The Biomechanics of Jumping'. Pp. 18–28 in *Handbook of Sports Medicine and Science: Volleyball*. John Wiley & Sons, Ltd.

Hartmann, Hagen, Klaus W, Markus K, Josip D, Claus M, and Dietmar S. 2012. 'Influence of Squatting Depth on Jumping Performance'. *The Journal of Strength & Conditioning Research* 26(12):3243–3261.

Hicham, B, Sbaa B, and Benchohra y. 2018. 'An analytical analysis of some biomechanical variables of blocking skill among volleyball players'. *journal of physical activity and sport, society, education and healt* 1(1):20–24.

Klavora, P. 2000. 'Vertical-Jump Tests: A Critical Review'. *Strength & Conditioning Journal* 22(5):70.

Komi, P. V. 1983. 'Elastic Potentiation of Muscle and Its Influence on Sport Performance'. *Biomechanics and Performance in Sport, Schorndorf, Germany, Hofmann* 6.

Lehnert, M, M. Sigmund, P. Lipinska, R. Vařeková, M. Hroch, Z. Xaverová, P. Stastny, P. Háp, and P. Zmijewski. 2017. 'Training-Induced Changes in Physical Performance Can Be Achieved without

Body Mass Reduction after Eight Week of Strength and Injury Prevention Oriented Programme in Volleyball Female Players'. *Biology of Sport* 34(2):205–13.
Lehnert, Michal, Ivona L, and Milan E. 2009. 'Changes in Speed and Strength in Female Volleyball Players during and after a Plyometric Training Program'. 39(1):8.
Lidor, Ronnie, and Gal Ziv. 2010. 'Physical and Physiological Attributes of Female Volleyball Players-A Review'. *The Journal of Strength & Conditioning Research* 24(7):1963–1973.
Linebach T. 2014. 'A Comparative Analysis between Traditional and Swing Blocking among Division II Female Volleyball Players'. Citeseer.
Lobietti, R., R. Michele, and F. Merni. 2006. 'Relationships between Performance Parameters and Final Ranking in Professional Volleyball'. *Proceedings of WCPAS7* 474–83.
Lobietti R. 2009. 'A Review of Blocking in Volleyball: From the Notational Analysis to Biomechanics'. *Journal of Human Sport and Exercise* 4(2):93–99.
Lobietti R, Silvia F, and Franco M. 2006. 'Blocking the quick attack in volleyball: A 3D Kinematic analysis'. *ISBS - Conference Proceedings Archive*.
Milosevic, M., M. Blagojevic, S. Pilipovic, and B. Tosic. 2000. 'The behaviour of muscles in external instantaneous force fields'. *ISBS - Conference Proceedings Archive*.
Reeser, Jonathan C., and Roald B. 2017. *Handbook of Sports Medicine and Science, Volleyball*. John Wiley & Sons.
Sato, Kimitake, and Monique M. 2007. 'Vertical jump performance during video simulated blocking and maximal effort jumping in female collegiate volleyball players'. *ISBS - Conference Proceedings Archive*.
Sheppard, Jeremy M., John B. Cronin, Tim J. Gabbett, Michael R. McGuigan, Naroa Etxebarria, and Robert U. Newton. 2008. 'Relative Importance of Strength, Power, and Anthropometric Measures to Jump Performance of Elite Volleyball Players'. *The Journal of Strength & Conditioning Research* 22(3):758–765.
Wagner, H., M. Tilp, S. P. von Duvillard, and E. Mueller. 2009. 'Kinematic Analysis of Volleyball Spike Jump'. *International Journal of Sports Medicine* 30(10):760–65.
Zahálka, František, Tomáš M, Lucia M, Miloslav E, and Marek Z. 2017. 'Kinematic Analysis of Volleyball Attack in the Net Center with Various Types of Take-Off'. *Journal of Human Kinetics* 58(1):261–71.

CITATION OF THIS ARTICLE

Benelguemar, H., Sba, B., & Mouissi, F. (2020) The Kinematical Analysis of Blocking Skill in Volleyball and Their Relationships with the Explosive Force of Lower Limbs. *International Journal of Sport, Exercise & Training Sciences – IJSETS, 6(2), 73–79.* DOI: 10.18826/useeabd.731462