ATATURK UNIVERSITY PUBLICATIONS

Research in Sport Education and Sciences

Formerly:
Journal of Physical Education and Sport Sciences Official journal of Atatürk University Faculty of Sport Sciences
Volume 26 • Issue 4 • December 2024

EISSN 2822-3527
https://dergipark.org.tr/en/pub/rses

Research in Sport Education and Sciences

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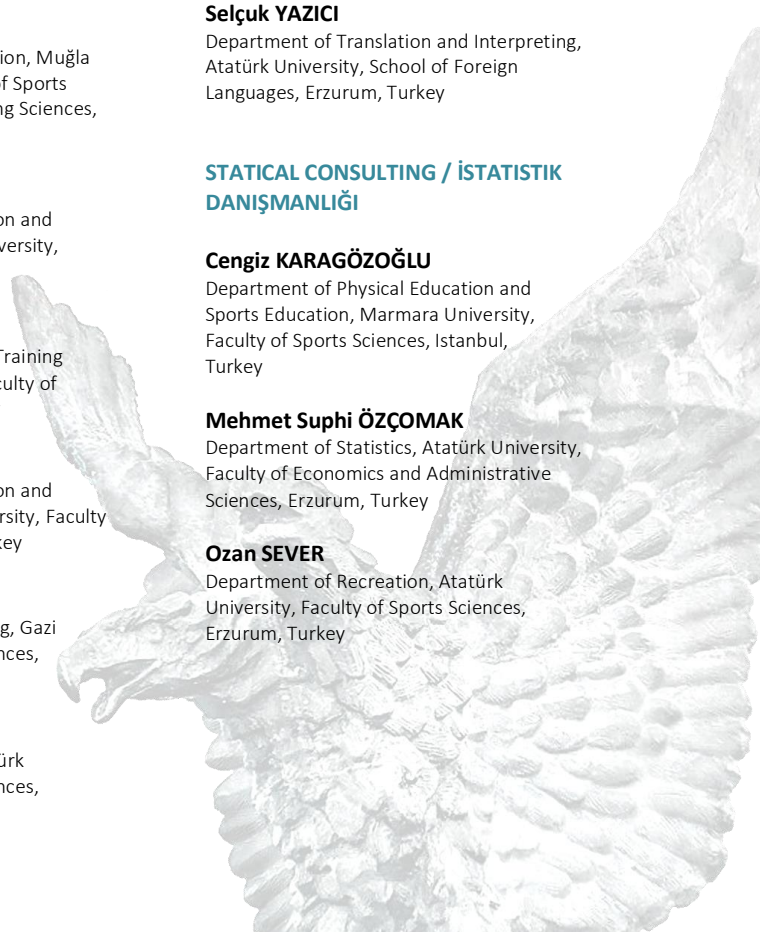

Research in Sport Education and Sciences

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Research in Sport Education and Sciences is a peer reviewed, open access, online-only journal published by the Atatürk University.

Research in Sport Education and Sciences is a quarterly journal published in English and Turkish in March, June, September, and December.

Journal History

As of 2022, the journal has changed its title to Research in Sport Education and Sciences.

Previous Title (1999-2021)

Atatürk Üniversitesi Beden Eğitimi Spor ve Yüksekokulu Dergisi/Journal of Physical Education and Sport Sciences
ISSN: 1302-2040

Current Title (2022-...)

Research in Sport Education and Sciences
EISSN: 2822-3527

Abstracting and Indexing

Research in Sport Education and Sciences is covered in the following abstracting and indexing database;

- Emerging Sources Citation Index (ESCI)
- Scopus
- DOAJ
- EBSCO
- CNKI
- ERIH Plus
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You can find the current version of the Instructions to Authors at https://dergipark.org.tr/en/pub/rses.

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Publisher: Atatürk University
Address: Atatürk University, Yakutiye, Erzurum, Turkey
E-mail: ataunijournals@atauni.edu.tr

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ATATÜRK ÜNİVERSİTESİ YAYINLARI
ATATURK UNIVERSITY PUBLICATIONS

Research Article *Araştırma Makalesi* DOI: 10.62425/rses.1495571

The Effect of Combined Blood Flow Restriction TheraBand Training on Functional Capacity and Quality of Life

Kombine Uygulanan Kan Akışı Kısıtlama Terabant Antrenmanının Fonksiyonel Kapasite ve Yaşam Kalitesine Etkisi

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ABSTRACT

This study aims to examine the effects of 4-week combined blood flow restriction-TheraBand training on functional capacity and quality of life in healthy individuals aged 55-65 years. A total of 24 women aged 55-65 participated in the study voluntarily. Participants were divided into three groups consisting of 8 people: TheraBand group (TG), blood flow restriction+TheraBand group (BFR+TG), and control group (CG). Participants were administered a 30-second sit-to-stand chair test, a 6-minute walk test (6MWT), and Modified Borg Scale (MBS) for quality of life. In intra-group comparisons, both the Borg scale and 6MWT showed statistically significant improvements favouring the final test in TG and BFR+TG groups (p= .05). Inter-group comparisons revealed that the BFR+TG group exhibited higher improvement compared to the other groups. Significant differences favouring the final test were also observed in the intra-group comparison of the 30-second sit-to-stand test in TG and BFR+TG groups (p= .05), with the BFR+TG group showing higher improvement compared to the CG in inter-group comparisons. Moreover, no statistically significant differences were found in intra-group and inter-group comparisons of quality of life (p= .05). In conclusion, it can be recommended that lower-intensity strength training with TheraBands, combined with BFR where possible, be applied to elderly individuals instead of high-intensity strength training and, if possible, use the BFR method in these training.

Keywords: Blood flow restriction, quality of life, functional capacity

ÖZ

Yapılan çalışmanın amacı sağlıklı bireylere 4 haftalık kombine olarak uygulanan kan akışı kısıtlama-terabant antrenmanlarının yaşam kalitesi ve fonksiyonel kapasite üzerine olan etkisinin incelenmesidir. Çalışmaya 55-65 yaş arası toplam 24 kadın gönüllü olarak katılmıştır. Katılımcılar 8 kişiden oluşan terabant grubu (TG), kan akışı kısıtlama+terabant grubu (KAK+TG) ve kontrol grubu (KG) olarak üç gruba ayrılmıştır. Katılımcılara 30 sn sandalyeye otur kalk testi, 6 dakika yürüme testi (6DYT) ve modifiye borg skalası (MBS) ölçümü ile yaşam kalite ölçeği uygulanmıştır. Çalışma sonucunda hem MBS hem de 6DYT yürüme testlerinin grup içi karşılaştırılmasında TG ve KAK+TG gruplarında son test lehine istatistiksel olarak anlamlı bir fark bulunurken (p= ,05), bu parametrelerin gruplar arası karşılaştırılmasında ise KAK+TG grubunun diğer gruplara göre daha yüksek bir gelişim sağladığı belirlenmiştir. 30 sn otur-kalk testinin grup içi karşılaştırılmasında TG ve KAK+TG grubunda son test lehine anlamlı fark bulunurken (p= ,05), bu parametrelerin gruplar arası karşılaştırılmasında KAK+TG grubunun KG'ye göre daha yüksek bir gelişim sağladığı tespit edilmiştir. Ayrıca yaşam kalitesinin grup içi ve gruplar arası karşılaştırılmasında istatiksel olarak anlamlı fark belirlenmemiştir (p= ,05). Sonuç olarak, yaşlı bireylere yüksek şiddetli kuvvet antrenmanları yerine terabantlar ile daha düşük şiddetli kuvvet antrenmanlarının uygulanması ve imkân varsa bu antrenmanlarda KAK yönteminin kullanılması önerilebilir.

Anahtar Kelimeler: Kan akışı kısıtlama, yaşam kalitesi, fonksiyonel kapasite

Geliş Tarihi/Received 04.06.2024
Kabul Tarihi/Accepted 05.11.2024
Yayın Tarihi/Publication Date 25.12.2024

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Cite this article: Aktuğ, Z.B., Selçuk, Ç., Yavuz, G., & Pişkin, N.E. (2024). The effect of combined blood flow restriction theraband training on functional capacity and quality of life. *Research in Sport Education and Sciences, 26*(4), 150-158.

Introduction

After the age of 30, muscle mass decreases by 3-8% every decade (English & Paddon-Jones, 2010), leading to an increased risk of muscle atrophy, physical decline, and sarcopenia in older individuals (Centner et al., 2019). Consequently, this condition not only limits an individual's active lifestyle (Aghamolaei et al., 2011) but also results in difficulty performing simple daily movements such as dressing or reaching for a box on the top shelf, along with an increased risk of falls. These challenges escalate with advancing age, consequently reducing the quality of life (Brach & VanSwearingen, 2002). To mitigate these adverse outcomes, prevent chronic diseases, and improve the quality of life, strength training plays a crucial role (Paproski et al., 2019). Strength training aims to prevent muscle atrophy while effectively enhancing muscle strength and power (Garber et al., 2011).

Research indicate that traditional strength training has been said to involve training at intensities greater than 70% of your one repetition maximum (1RM) to promote gains in muscular strength (American College of Sports Medicine Position Stand, 2009). However, the elderly and rehabilitated patients may face challenges with high-intensity strength training due to the high mechanical stress placed on the joints, which can potentially lead to injuries that compromise overall health (Loenneke & Pujol, 2009). Considering the difficulty elderly individuals may have in performing high-intensity strength training, there is a need for alternative methods. One of the most significant alternatives is blood flow restriction (BFR) training, which can be applied at lower intensities (Centner et al., 2019).

In the BFR method, the overall training intensity is kept low to target the improvement of older adults' musculoskeletal systems (Loenneke & Pujol, 2009). BFR involves the use of a specialized pressure cuff wrapped around the proximal portion of the limb, which restricts blood flow while not completely occluding arterial circulation. This reduction in blood flow aims to decrease oxygen delivery to the muscles and induce venous pooling, thereby promoting muscle development (Loenneke & Pujol, 2009; Fitschen et al., 2014; Loenneke et al., 2011; Patterson et al., 2019). The specific mechanisms underlying the development induced by BFR training are still under investigation. It is noted that various interconnected concepts such as muscle protein synthesis and breakdown mechanisms, satellite cell regulation, energy systems, increased motor unit recruitment, hormonal effects, increase in cellular fluid, metabolic stress, mtTOR signalling pathway, and heat shock proteins play roles in the development observed with BFR training (de Castro et al., 2017). The BFR method can be combined with different training modalities (weight machines, TheraBands, vibration devices, EMS, cycling, gymnastics, yoga, walking, running, plyometric and nordic hamstring exercises) (de Queiros et al., 2021; Yasuda et al, 2017; Loenneke et al., 2012; Pişkin et al., 2022; Razeke et al., 2020; Pişkin et al., 2024). Although there are studies on BFR+TheraBand training combinations in the literature, research evaluating both quality of life and functional capacity simultaneously in the elderly population is limited.

Thus, the hypothesis of the present study is formulated as "combining TheraBand training with BFR method enhances both quality of life and functional capacity to a greater extent".

Methods

Participants

The sample of the study consisted of a total of 24 female volunteers aged between 55 and 65 years without any health problems (Table 1). While the participants were included in the study, the necessary health reports were obtained, and it was confirmed that no motor dysfunction would prevent them from performing the exercises. For the study, an ethics committee approval report dated 29/08/2023 and decision number 2023/45 was received from Niğde Ömer Halisdemir University Non-Interventional Clinical Research Ethics Committee. This study was conducted in accordance with the Principles of the Declaration of Helsinki. Verbal consent was obtained from all the participants.

Research Design

Before commencing the training protocols, participants underwent the following assessments in sequence: the 30-second sit-to-stand test, the 6-minute walk test (6MWT), and the quality-of-life scale. Additionally, the Borg scale was used to assess fatigue and pain levels immediately after the 6MWT. Prior to the training period, participants were divided into three groups: the TheraBand group (TG) (n=8) performing only TheraBand exercises, the BFR+ TheraBand group (BFR+TG) (n=8) performing TheraBand exercises combined with blood flow restriction (BFR), and the control group (CG) (n=8) not engaging in any exercises.

Subsequently, participants followed their respective training programs for four weeks, after which the final assessments were conducted. It has been stated that the increase in strength that occurs in the first weeks (4 weeks) of strength training is due to neural adaptation (Baechle and Earle, 2008; Günay et al., 2017). Therefore, although muscle hypertrophy is not expected before 4 weeks, it has been stated that muscle hypertrophy occurs in less than 4 weeks in strength training performed with the BFR method. This situation shows that the muscle hypertrophy mechanism that occurs after early strength gain due to neural adaptation is reversed after training with the BFR method (Loenneke et al., 2012).

Applied Tests

30-Second Sit-to-Stand Test

The 30-second sit-to-stand test was administered twice in total: at the beginning of the study and at the end of the fourth week. This test evaluates individuals' sit-to-stand activity, lower extremity strength and dynamic balance. For the test, a chair with a seat height of approximately 44 cm and a backrest was used, along with a stopwatch. The chair was secured to prevent movement during the sit-to-stand activity, and care was taken to ensure that the participant's feet were in contact with the floor when seated. The test involved the participant sitting comfortably on the chair with full contact for 30 seconds, then transitioning to a standing position, and finally returning to a seated position on the chair. The stopwatch was started at the moment of the first rise, and the number of sit-to-stand repetitions performed by the individual within 30 seconds was recorded (Jones et al., 1999).

6-Minute Walk Test (6MWT)

The 6-minute walk test (6MWT) was conducted twice in total: at the beginning of the study and at the end of the fourth week. The 6-MWT, which reflects functional capacity, required participants to walk as fast as possible for 6 minutes without running or jumping over 30 meters. Participants were instructed not to speak during the test, and the test began with the participant's initiation of walking. Additionally, time-related information was provided to the participants every 60 seconds. Participants were informed that they could stop the test if they experienced any health problems. At the end of the allotted time, the total distance covered by the participants was recorded in meters (American Thoracic Society, [ATS] 2002).

Modified Borg Scale

Immediately after the 6-MWT, the Modified Borg Scale (MBS) was used to assess the severity of pain and fatigue. Participants rated their level of fatigue and pain experienced during the test on a scale ranging from nothing (6) to exhaustion (20), with descriptors including very, very light (7-8), very light (9-10), quite light (11-12), somewhat hard (13-14), hard (15-16), very hard (17-18), and extremely hard (19) (Borg, 1982).

Quality of Life Scale (SF-36 Short Form)

The SF-36 Short Form Quality of Life Scale was administered twice in total, at the beginning and at the end of the fourth week of the study. The scale consists of eight subscales assessing physical functioning, physical role limitations, emotional role limitations, energy/fatigue/vitality, mental health, social functioning, pain, and general health perception. Each subscale is scored separately, ranging from 0 to 100, with higher scores indicating better health status. There is no total score for the scale (Ware et al., 1993).

Training Protocol

TG Training Protocol

The difficulty level of therabands is classified into different levels according to the resistance they create as they are extended. These are indicated by colors representing eight different difficulty levels. The colors are listed from easy to more difficult, including skin color, yellow, red, green, blue, black, gray and golden yellow (Baltacı et al., 2003; Thera-Band, 2006). Since the study sample consisted of sedentary individuals, the applied squat banded, leg extension, and band curl in prone movements were performed with a light tension intensity using yellow-coloured TheraBand. The training sessions were conducted 3 days a week, with 3 sets, and a repetition scheme of 30-15-15, with rest intervals of 30-45 seconds between sets. A rest period of 2 minutes was applied during transitions to new exercises.

BFR+TG Training Protocol

To restrict blood flow, elastic bands with a width of 76 mm were used in the lower extremities as an alternative to

pneumatic cuffs for the participants. The elastic band was applied proximally to both legs during the training session, removed between sets and exercises, and re-applied during movements. When adjusting the pressure on the lower extremities, assistance was sought from the numbers on the band, and the pressure was evaluated based on a numerical value ranging from 1 to 10. A value of 10 represented maximum pressure, while 0 represented no pressure sensation at all. Studies have been conducted in the literature to ensure the safer and more reliable use of these bands and recommended pressure adjustment up to zones 7-8 (Lowery et al., 2014; Wilson et al., 2013). Therefore, in our study, pressure sensation was adjusted to be between 7-8, and squat banded, leg extension, and band curl in prone training movements were performed using yellow-coloured TheraBand. The training sessions were conducted as 3 days a week, with 3 sets, and a repetition scheme of 30-15-15, with rest intervals of 30-45 seconds between sets. A rest period of 2 minutes was applied during transitions to new exercises.

Statistical Analysis

In this study, the assumption of normal distribution for quantitative variables was examined visually (histograms and probability plots) and analytical methods (Shapiro-Wilk Test). Since the quantitative variables exhibited normal distribution, they were expressed as mean and standard deviation. To examine the results of different protocols (BFR+TG, TG, CG), pre-test and post-test measurements, and the protocol*time interaction effect, a Repeated Measures two-way ANOVA test was utilized. Mauchly's sphericity test was employed to test the homogeneity of variances, and Greenhouse-Geisser correction was applied when necessary. Partial eta squared (ηp2) values were calculated to determine the effect size between groups, and a significance level of p=0.05 was considered in the study.

Results

Table 1.
Demographic variables of the participants

	Theraband+BFR	Theraband	Control Group	
	M±SD	M±SD	M±SD	*p*
Age (years)	59.50±6.52	61.62±6.82	61.22±7.10	.13
Height (cm)	161.75±9.48	153.75±6.84	158.33±4.41	.10
Body weight (kg)	79.62±9.57	75.37±12.44	79.55±7.95	.62
BMI (kg/m^2)	30.50±3.33	31.71±3.20	31.73±2.80	.66

Tablo 1 shows demographic variables of the participants. No difference was determined between the groups in age, height, body weight and BMI parameters.

Table 2.
Comparison of intra-group and inter-group functional capacity and Borg scale parameters

n=24	Pre	Post	%	Two-way Repeated ANOVA			
Variable	M±SD	M±SD	T_B-T_{end}	Time	Group	Time*Group	Tukey
30-Second Sit-to-Stand Test							
Theraband	10.50±2.97	12.00±2.72*	14.28	F = 27.75	F = 1.80	F = 11.55	BFR+TG >CG
Theraband+BFR	9.87±2.41	12.50±1.30*	26.64	*p* < .001	*p* < .188	*p* < .001	
Control	9.44±2.35	9.22±2.63	-2.33	η_p^2 = 0.55	η_p^2 = 0.14	η_p^2 = 0.51	
6-Minute Walk Test (m)							
Theraband	249.00±63.4	279.00±55.82*	12.04	F = 34.81	F =8.72	F =8.98	BFR+TG >TG/CG
Theraband+BFR	307.50±60.8	358.50±45.09*	16.58	*p* < .001	*p* < .002	*p* < .001	
Control	226.66±46.2	229.33±48.90	1.17	η_p^2 = 0.61	η_p^2 = 0.44	η_p^2 = 0.45	
Modified Borg Scale							
Theraband	13.50±1.69	12.75±1.48*	5.55	F = 23.67	F = 8.11	F = 7.63	BFR+TG >TG/CG
Theraband+BFR	11.25±2.16	9.25±2.71*	17.77	*p* < .001	*p* < .002	*p* < .003	
Control	13.55±1.33	13.44±1.66	0.81	η_p^2 = 0.51	η_p^2 = 0.42	η_p^2 = 0.41	

Pre= Preintervention; Post= Postintervention; ηp2: Partial eta squared; Bold values denote statistical significance at the p = 0.05 level.
* There is a significant difference between the pre-test and post-test.

Tablo 2 shows comparison of intra-group and inter-group functional capacity and Borg scale parameters. In the 30-second

sit-to-stand test, statistically significant differences were found from pre-test to post-test in BFR+TG and TG (F=27.75; *p*=.000, ηp^2=0.55). In inter-group comparison, it was determined that BFR+TG showed higher improvement compared to CG (F=1.80; *p*=.1888; ηp^2=0.14). Considering the improvement levels in percentage (%), the highest improvement was observed in BFR+TG. In the 6-minute walk test (F=34.81; *p*=.000, ηp^2=0.61) and modified Borg scale parameter (F=23.67; *p*=.000, ηp^2=0.51), statistically significant differences were found from pre-test to post-test in BFR+TG and TG. In inter-group comparison, it was determined that BFR+TG showed higher improvement compared to TG and CG in the 6-minute walk test (F=8.72; *p*=.002, ηp^2=0.44) and modified Borg scale parameter (F=8.11; *p*=.002, ηp^2=0.42). Looking at the improvement levels in percentage (%), the highest improvement was observed in BFR+TG.

Table 3.
Comparison of intra-group and inter-group assessment of quality-of-life scale

n=24	Pre	Post	%	Two-way Repeated ANOVA		
Variable	M±SD	M±SD	T_B-T_{end}	Time	Group	Time*Group
			Physical function			
Theraband	71.25±9.16	71.87±14.12	0.87	F = 0.18	F = 0.12	F = 0.00
Theraband+BFR	73.75±12.74	74.37±11.78	-0.84	*p* < .001	*p* < .888	*p* < 1.000
Control	71.87±9.61	72.50±8.86	0.87	η_p^2 = 0.00	η_p^2 = 0.11	η_p^2 = 0.00
			Physical role difficulty			
Theraband	25.00±26.72	21.87±28.14	-12.52	F = 0.03	F= 1.42	F = 0.59
Theraband+BFR	40.62±46.17	37.50±44.32	-7.68	*p* < .849	*p* < .264	*p* < .562
Control	9.37±18.60	18.75±22.16	100.10	η_p^2 = 0.02	η_p^2 = 0.11	η_p^2 = 0.05
			Emotional role difficulty			
Theraband	45.83±39.59	25.00±34.50	-48.80	F = 1.11	F = 0.34	F = 1.24
Theraband+BFR	20.83±35.35	25.00±23.57	20.01	*p* < .303	*p* < .714	*p* < .307
Control	33.33±30.86	29.16±41.54	-11.63	η_p^2 = 0.05	η_p^2 = 0.03	η_p^2 = 0.10
			Energy / dynamics / vitality			
Theraband	22.50±24.64	24.37±13.47	8.31	F = 0.01	F = 1.74	F = 0.43
Theraband+BFR	39.37±16.13	35.00±17.32	-11.09	*p* < .912	*p* < .200	*p* < .654
Control	33.12±19.07	36.87±17.10	11.32	η_p^2 = 0.01	η_p^2 = 0.14	η_p^2 = 0.04
			Mental health			
Theraband	44.50±21.32	40.00±17.10	-10.11	F = 0.09	F = 1.86	F = 0.80
Theraband+BFR	57.00±26.42	62.50±17.09	9.64	*p* < .763	*p* < .180	*p* < .461
Control	53.50±16.82	55.50±21.10	3.73	η_p^2 = 0.00	η_p^2 = 0.15	η_p^2 = 0.07
			Social functioning			
Theraband	64.06±25.38	53.12±24.77	-17.07	F = 0.03	F = 0.47	F = 1.31
Theraband+BFR	62.50±14.94	68.75±11.57	10,00	*p* < .844	*p* < .629	*p* < .291
Control	63.12±29.02	70.93±24.60	12,37	η_p^2 = 0.00	η_p^2 = 0.04	η_p^2 = 0.11
			Pain			
Theraband	43.12±19.16	42.18±21.85	-2,17	F = 0.38	F = 1.90	F = 2.00
Theraband+BFR	46.87±9.97	57.18±18.39	21,99	*p* < .543	*p* < .174	*p* < .159
Control	37.56±19.41	33.81±19.21	-9,98	η_p^2 = 0.18	η_p^2 = 0.15	η_p^2 = 0.16
			General health perception			
Theraband	48.75±22.79	50.62±22.10	3.83	F = 2.14	F = 0.72	F = 0.28
Theraband+BFR	56.25±17.06	61.87±16.02	9.99	*p* < .158	*p* < .495	*p* < .753
Control	53.75±23.10	62.50±12.81	16.27	η_p^2 = 0.09	η_p^2 = 0.06	η_p^2 = 0.02

Pre= Preintervention; Post= Postintervention; ηp2: Partial eta squared; Bold values denote statistical significance at the p = 0.05 level.
* There is a significant difference between the pre-test and post-test.

Tablo 3 shows comparison of intra-group and inter-group assessment of quality-of-life scale. There were no statisticilay significant differences in both pre-post test and group*time interaction for physical function (F=0.18; *p*=.000, ηp^2=0.00), physical role difficulty (F=0.03; p=0.849, ηp^2=0.02), emotional role difficulty (F=1.11; *p*=.303, ηp^2=0.05), energy / dynamics / vitality (F=0.01; *p*=.912, ηp^2=0.01), mental health (F=0.09; *p*=.763, ηp^2=0.00), social functioning (F=0.03; *p*=.844, ηp^2=0.00), pain (F=0.38; *p*=.18, ηp^2=0.55) and general health perception (F=2.14; *p*=.158, ηp^2=0.09). Additionally, no significant difference was determined in inter-group comparison.

Discussion

Strength training that can be done at home with TheraBands is widely used for the elderly and individuals with low activity levels (Rogers et al., 2002; Zion et al., 2003; Colado & Triplett, 2008; Colado et al., 2010). Studies in the literature have shown positive effects of TheraBand training combined with the BFR method on muscle strength in elderly and clinical populations (Yasuda et al., 2014; Kjeldsen et al., 2019). However, while previous studies in the literature have focused solely on strength development using the BFR method, there are limited studies that simultaneously assess strength development, functional capacity, and quality of life. The aim of this study, conducted to fill this gap in the literature, is to investigate the effects of TheraBand training combined with the BFR method on quality of life and functional capacity in elderly individuals.

Functional Capacity

Upon examining Table 2, after four weeks of training, improvement was observed in both TG and BFR+TG groups in the 6-minute walk test (6MWT), modified borg scale (MBS), and 30-second sit-to-stand test. This improvement was higher in the BFR+TG and TG groups compared to the CG group in the 30-second sit-to-stand test, while in the 6MWT and MBS tests, it was higher in the BFR+TG group compared to both TG and CG groups. Clarkson et al. (2017) conducted a study on elderly adults to examine the effects of low-intensity walks combined with the BFR method on the scores of the 30-second sit-to-stand test, 6MWT, time up to go test, and Queen's College step test. The results of this study indicated that for populations unable to perform high-intensity exercises, low-intensity walks combined with the BFR method would be effective in improving functional capacity. Other studies conducted on the elderly have also found that strength training using the BFR method is effective in increasing muscle strength and functional capacity (Karabulut et al., 2010; Vechin et al., 2015). Shimizu et al. (2016) divided participants into two groups: those performing strength training with the BFR method and those performing strength training without the BFR method, in a study conducted on a healthy elderly population. Both groups were subjected to two movements involving the lower and upper extremities, and it was determined that strength development was higher in the BFR group.

The sample groups and study designs of the studies mentioned above are similar to our study, and positive effects were observed on strength (30-second sit-to-stand test) and aerobic capacity (6-minute walk test) parameters. In our study, intra-group differences were observed in the 30-second sit-to-stand test associated with lower extremity strength in both BFR+TG and TG groups, while inter-group differences were only observed with the KG group. However, when the percentage increase rate between BFR+TG and TG was examined, it was determined that the effect level was higher in BFR+TG (BFR+TG 26.64% increase - TG 14.28% increase). Another parameter in which BFR+TG showed significant improvement compared to both TG and CG, and had the lowest score, is the MBS. The difference in favour of BFR+TG in the MBS parameter is thought to be associated with the perceived level of effort reduction due to the higher level of strength development observed in this group.

Another parameter in which BFR+TG shows a significant increase compared to TG and CG is the 6MWT. 6MWT is widely used as a measure of functional capacity, more commonly associated with aerobic capacity (Enright et al, 2003; ATS, 2002). The combination of the BFR method with low-intensity resistance training has been frequently proven in the literature to have a positive effect on strength development (Vanwye et al., 2017). However, research on aerobic capacity is still ongoing, and conflicting results are being presented in both young and elderly populations (Castilla-López et al., 2022). It has been assumed that the BFR method primarily stimulates peripheral adaptations in the elderly population. Since deteriorations in the peripheral system with increasing age are not typically observed in young individuals, it is suggested that training performed with the BFR method is more likely to provide central cardiovascular adaptations in the elderly population (Bennett & Slattery, 2019). When the 6MWT results in our study are examined, it is thought that the significant increase in BFR+TG compared to both TG and CG may be related to this situation.

Quality of Life

The acquisition and maintenance of moderate muscle strength (such as lifting weights, climbing stairs, and getting up from a chair) help minimize the negative effects of aging, enabling individuals to perform daily activities and contributing to an

increase in quality of life (Vale et al., 2006). As the aging process tends to decrease muscle strength in the elderly, strength training with or without BFR aims to maintain the quality of life, reduce the risk of falls, and improve the essential strength needed to perform daily activities in this population (Carvalho & Soares, 2004). In a study by Ruaro et al. (2019), it was stated that a 14-week strength program combined with the BFR method and a strength program without the BFR method significantly improved the quality of life in the elderly population. In another study, the direct impact of the BFR method on variables such as pain, functionality, and quality of life was analysed. As a result of the study, it was concluded that this method reduced pain and improved daily life activities (Centner & Lauber, 2020). In a systematic review conducted by Reina-Ruiz et al. (2023), it was determined that 12 weeks of aerobic exercise with and without BFR improved the quality of life. They stated that the improvement was similar in both groups. Additionally, the lack of difference in quality of life between the groups was attributed to the pressure applied in the BFR group being below the average (Reina-Ruiz et al., 2023; Castilla-López, 2022). A common characteristic of the studies mentioned above is that they all had long-term training programs. Literature includes studies where statistically significant differences in the quality of life have been observed in training sessions with BFR. The most important common feature of these studies is the determination of individualized pressure ranges and the use of pneumatic cuff types, along with the training duration being longer than 4 weeks (Reina-Ruiz et al., 2023; Hughes et al., 2019; Tennent et al., 2017). Therefore, the lack of difference in quality of life between the TheraBand training groups with and without BFR method may be attributed to the limited duration of the training program being only 4 weeks. It is thought that the increase in strength and aerobic capacity over the 4-week period may have been insufficient to provide adequate stimulus for parameters related to quality of life. Therefore, extending the duration of the training may further enhance the development of strength in participants, which could result in improvements in quality of life.

Conclusion and Recommendations

When considering the elderly and individuals with low activity levels, the fact that BFR+TheraBand exercises provide a short-term development in strength provides an advantage for this population. However, a longer-term training program is needed to provide sufficient stimulation in quality of life parameters. In conclusion, it can be recommended that lower-intensity strength training with TheraBands, combined with BFR where possible, be applied to elderly individuals instead of high-intensity strength training and, if possible, use the BFR method in these training.

Literature reveals studies that show both similarities and differences in the effectiveness of the BFR method compared to our study findings. One reason for the variability among studies is the absence of a standardized methodology in all studies involving the BFR method (such as cuff type, cuff width, pressure range, determination of limb occlusion pressure, training intensity, training duration, etc.). Therefore, there is a need for further studies with BFR method particularly in the elderly population.

Etik Komite Onayı: Bu çalışma için etik komite onayı Niğde Ömer Halisdemir Üniversitesi'nden (Tarih: 29 Ağustos 2023, Karar No: 2023/45) ile alınmıştır..
Katılımcı Onamı: Çalışmaya katılan tüm katılımcılardan sözlü onam alınmıştır.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları: Fikir; Z.B.A; Tasarım; Z.B.A., G.Y; Denetleme; N.E.P., G.Y.; Kaynaklar; Ç.S., G.Y.; Veri Toplanması ve/veya İşlemesi; Ç.S., N.E.P.,; Analiz ve/ veya Yorum; Z.B.A.; Literatür Taraması; N.E.P., G.Y.; Yazıyı Yazan; Z.B.A., G.Y., N.E.P.,; Eleştirel İnceleme; Z.B.A.
Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmiştir.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Niğde Ömer Halisdemir University (Date: 29 August, 2023, Decision Number: 2023/45
Informed Consent: Verbal consent was obtained from all the participants.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept-Z.B.A.; Design-Z.B.A., G.Y.; Supervision-N.E.P., G.Y.; Resources-Ç.S., G.Y.; Data Collection and/or Processing-Ç.S., N.E.P.; Analysis and/or Interpretation-Z.B.A.; Literature Search-N.E.P., G.Y.; Writing Manuscript-Z.B.A., G.Y., N.E.P.; Critical Review-Z.B.A.
Conflict of Interest: The authors have no conflicts of interest to declare.
Financial Disclosure: The authors declared that this study has received no financial support.

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Research Article *Araştırma Makalesi* DOI: 10.62425/rses.1499914

Bibliometric Analysis of Sport Entrepreneurship Literature: The Case of Web of Science

Spor Girişimciliği Literatürünün Bibliyometrik Analizi: Web of Science Örneği

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ABSTRACT

Sport entrepreneurship is the sport dimension of entrepreneurship and research on the concept has increased in recent years. The aim of this research is to provide a general perspective on sports entrepreneurship, to draw attention to the importance of the subject and to generate ideas for further research. For this purpose, bibliometric analysis technique was used in the research. In this context, 494 publications on sport entrepreneurship in the WoS database were examined under 7 headings (advanced search, cited references, co-author analysis, common word analysis, citation analysis, bibliometric matching analysis, co-citation analysis). These titles were analyzed in a total of 32 parameters and analyzed bibliometrically with Sankey diagram, VOSviewer, MapChart and Wordclouds programs. When the researches on sports entrepreneurship were examined, it was determined that the most publications were made in 2020 and the most citations were made in 2021, and the title, keyword, abstract, research area and WoS categories specified in the publications were related to each other. In this context, it has been seen that the basis of the structure in the relevant literature is sports, entrepreneurship, management, business and innovation. Although bibliometric studies have been conducted in the field of entrepreneurship in national literature, bibliometric analysis of sports entrepreneurship has not been carried out in a comprehensive manner, the number of studies in the international literature is low, and the use of more parameters and more data in this research than the studies conducted in the international literature reveals the importance and originality of the research.

Keywords: Sport, Entrepreneurship, Sport Entrepreneurship, Bibliometric Analysis, WoS

ÖZ

Spor girişimciliği, girişimciliğin spor boyutu olup, kavram ile ilgili araştırmaların son yıllarda artış gösterdiği görülmektedir. Bu araştırmanın amacı, spor girişimciliğine genel bir bakış açısı kazandırmak, konunun önemine dikkati çekmek ve daha sonraki araştırmalar için fikir üretmektir. Bu amaç doğrultusunda araştırmada bibliyometrik analiz tekniği kullanılmıştır. Bu kapsamda WoS veri tabanında spor girişimciliğini ele alan 494 yayın 7 başlık (gelişmiş arama, alıntılanan referanslar, ortak yazar analizi, ortak kelime analizi, atıf analizi, bibliyometrik eşleştirme analizi, ortak atıf analizi) altında incelenmiştir. Bu başlıklar toplam 32 parametrede incelenerek Sankey diyagramı, VOSviewer, MapChart ve Wordclouds programları ile bibliyometrik açıdan çözümlenmiştir. Spor girişimciliği ile ilgili araştırmalar incelendiğinde en fazla yayının 2020 yılında en fazla atıfın ise 2021 yılında yapıldığı, yayınlarda belirtilen başlık, anahtar kelime, özet, araştırma alanına ve WoS kategorilerinin birbirleriyle ilişkili durumda oldukları belirlenmiştir. Bu kapsamda ilgili literatürdeki yapının temelini spor, girişimcilik, yönetim, işletme ve inovasyon oluşturduğu görülmüştür. Ulusal literatürde girişimcilik alanında bibliyometrik araştırmaların yapılmasına rağmen spor girişimciliğinin geniş kapsamlı olarak bibliyometrik analizinin gerçekleştirilmemesi, uluslararası literatürde araştırma sayısının az olması ve bu araştırmada uluslararası alanda yapılan araştırmalardan daha fazla parametre ve daha fazla verinin kullanılması araştırmanın önemini ve özgünlüğünü ortaya koymaktadır.

Anahtar Kelimeler: Spor, Girişimcilik, Spor Girişimciliği, Bibliyometrik Analiz, WoS

Geliş Tarihi/Received 12.06.2024
Kabul Tarihi/Accepted 11.12.2024
Yayın Tarihi/Publication Date 25.12.2024

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Cite this article: Esmer, Y., & Dertli, Ş. (2024). Bibliometric analysis of sport entrepreneurship literature: The case of web of science. *Research in Sport Education and Sciences*, 26(4), 159-176.

Introduction

Sport entrepreneurship, which is a new and rapidly developing interdisciplinary research field today, is a very important phenomenon that should be supported in all countries, and it is also one of the current themes that attracts the attention of researchers (Şeşen & Basım, 2012, p. 21; Sánchez Franco et al., 2023, p. 648). While sport, which affects individuals directly or indirectly, is a social phenomenon that can always sustain the society, entrepreneurship is the process of recognising and evaluating an opportunity and taking action to benefit from the opportunity. Therefore, it can be said that sport is a phenomenon that has always managed to attract the attention of society on how entrepreneurship is experienced. In this context, sport entrepreneurship is a type of entrepreneurship that enables more researchers to understand how entrepreneurship is seen and perceived in organisations, enhancing the entrepreneurship literature and offering a promising economic development strategy (Dağlı Ekmekçi & İrmiş, 2013, p. 636-638). Hammerschmidt et al. (2022, p. 7) defined sport entrepreneurship as *"the identification and exploitation of opportunities to create new value through sport".* According to Ratten (2010, p. 560) a sport entrepreneur is a person who manages and organises a sport venture and accepts risk in the venture process. Hammerschmidt et al. (2023, p. 11) analysed the development of sport entrepreneurship in three sub-periods. The first is the time period 2000-2011, which is the beginning of the field of sport entrepreneurship and innovation, and the main theme of this period is entrepreneurship. The second is the 2012-2020 time period, which is the development and evolution of the research field, and the themes of this period are primarily innovation, technology, sports entrepreneurship, entrepreneurial orientation and social entrepreneurship. The third is the 2021-2022 time period, when the sports entrepreneurship literature started to gain conceptual clarity, and the themes of this period are innovation, sports entrepreneurship, COVID-19 and economic performance, especially entrepreneurship. These themes indicate key areas for new research. Based on this inference, a research is planned to examine the literature on sports entrepreneurship, and in this research, it is aimed to provide an overview of sports entrepreneurship with bibliometric analysis technique, to draw attention to the importance of the subject and to generate ideas for further research. In this context, although studies such as Şeşen and Basım (2012), Karabulut and Doğan (2019), Tükel et al. (2020), Şahin et al. (2021), Öner et al. (2023) have been conducted in the field of entrepreneurship in sports in the national literature, it has been determined that there is no comprehensive bibliometric analysis research focused on the concept of sports entrepreneurship in the national literature. On the other hand, there are few studies on entrepreneurship in sport in the international literature, including, Escamilla-Fajardo et al. (2020), González-Serrano et al. (2020b), González-Serrano et al. (2020a), Pellegrini et al. (2020), Cardella et al. (2021), Lara-Bocanegra et al. (2022), Hammerschmidt et al. (2023), Sánchez Franco et al. (2023). This result shows that the number of studies in the international literature is limited. Therefore, this research, which aims to provide a general perspective on sports entrepreneurship, is considered to be important in terms of revealing its difference and originality from the national and international literature both by not limiting the scans such as language, genre, theme, Web of Science (WoS) category, unlike the existing literature, and by analysing the data obtained in terms of bibliometric analysis in 7 titles and 32 parameters, including advanced search, cited references, co-author analysis, common word analysis, citation analysis, bibliometric matching analysis, and co-citation analysis.

Methods

It was deemed appropriate to use the bibliometric analysis technique as a method to determine the bibliometric profile of the researches published by examining the sport entrepreneurship literature in the WoS database. According to De Bellis (2009), bibliometric analysis is a scientific as well as computer-aided analysis technique that can identify the underlying research or authors and their relationships, covering all publications related to a particular topic or field (Han et al., 2020, p. 2). In this context, TS= Topic and SO= Publication titles options were preferred in the advanced search section. On 04.03.2024, 494 publications were reached in each query by making an online query to the publications containing the expression of sports entrepreneurship in the title, abstract and author keywords and SO=Publication titles as described below without any time restriction.

- TS=(«sport* and entrepreneurship» or «entrepreneurship in sport*» or «sport* entrepreneurship» or «entrepreneurship and «sport*»),

- TS=(sport* and entrepreneurship or entrepreneurship in sport* or sport* entrepreneurship)

- (((((TS=(sport*)) and TS=(entrepreneurship)) or TS=(entrepreneurship in sport*)) or TS=(sport* entrepreneurship)) or TS=(entrepreneurship)) and TS=(Sport*)
- TS=(«sport* and entrepreneurship» or «entrepreneurship in sport*» or «sport* entrepreneurship» or «entrepreneurship» and «Sport*») or SO =(«sport* and entrepreneurship» or «entrepreneurship in sport*» or «sport* entrepreneurship» or «entrepreneurship» and «Sport*»)
- TS= (entrepreneurship in sport* or sport* entrepreneurship) or SO=(sport* and entrepreneurship)
- TS= (entrepreneurship in sport* or sport* entrepreneurship)
- TS=(sport* entrepreneurship)
- TS=(sport* and entrepreneurship)

Graphics, Sankey diagram, VOSviewer, MapChart and Wordclouds programs were used to visualise a total of 494 publications obtained after screening. Figure 1 shows the 7 headings and 32 patrameters for which answers were sought in the research

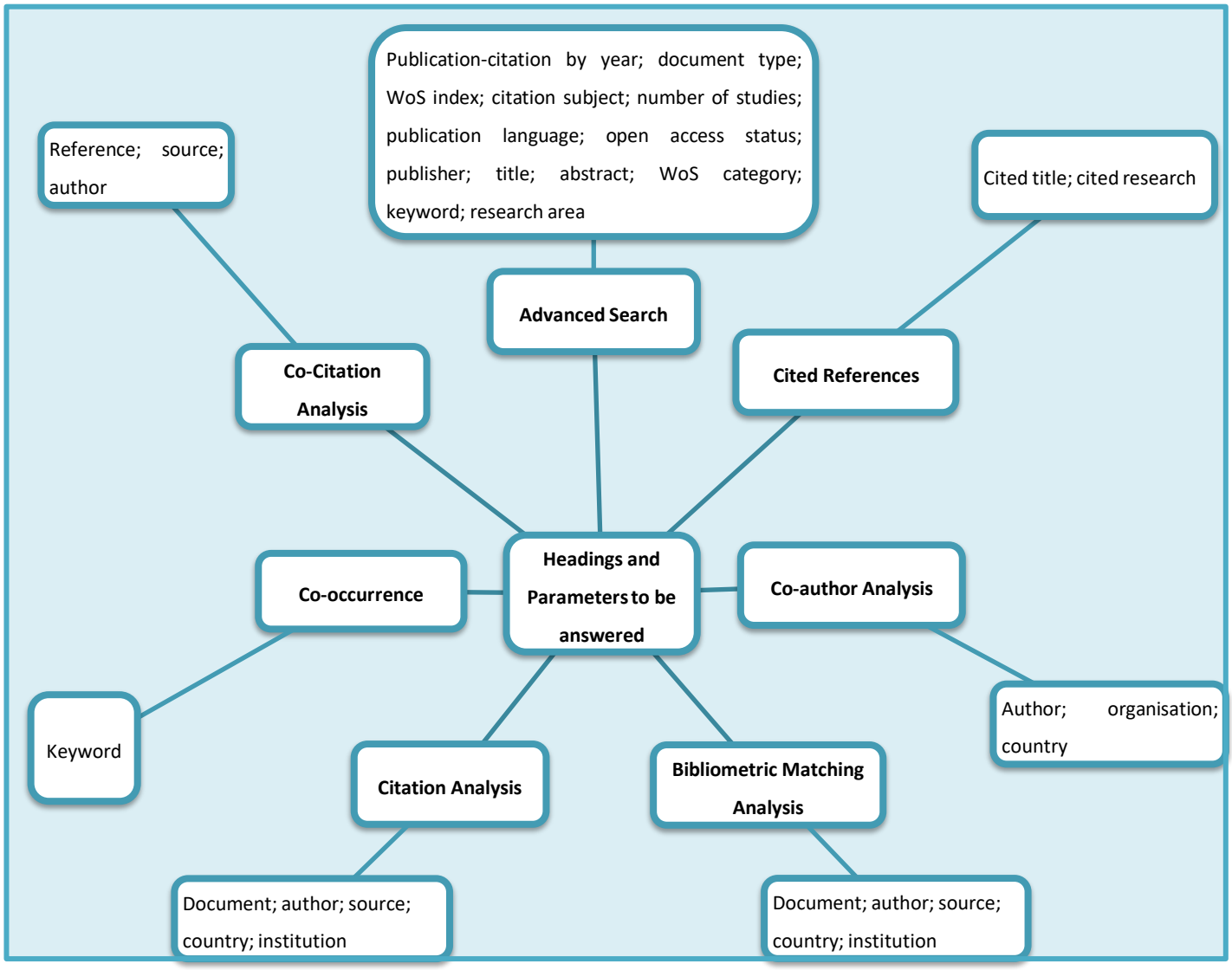


Figure 1. *Topics and Parameters to be Answered in the Research*

Results

This section presents the results from advanced search, cited references, co-author analysis, common word analysis, citation analysis, bibliometric matching analysis and co-citation analysis.

Results from the advenced search

The title, keyword, abstract, research area and WoS category of the publications related to sports entrepreneurship in the WoS database are visualised in the word cloud and their distribution according to publication-citations, document types, WoS index, citation topics, science network categories, publication language, open access status and publishers are given in Figure 2 and Figure 3.

Figure 2. *Distribution of Sport Entrepreneurship Research by Number and Word Clouds*

When the word cloud in Figure 2 is analyzed, it is seen that the words “sports”, “entrepreneurship”, “management”, “business”, “innovation”, “education”, “social”, “development”, “society”, “economy” and “technology” are mostly used in the studies. It can be said that these results are in line with the results of Hammerschmidt et al. (2023). This result shows that sport entrepreneurship research titles in the WoS database are in parallel with keywords, abstract, research area and WoS category.

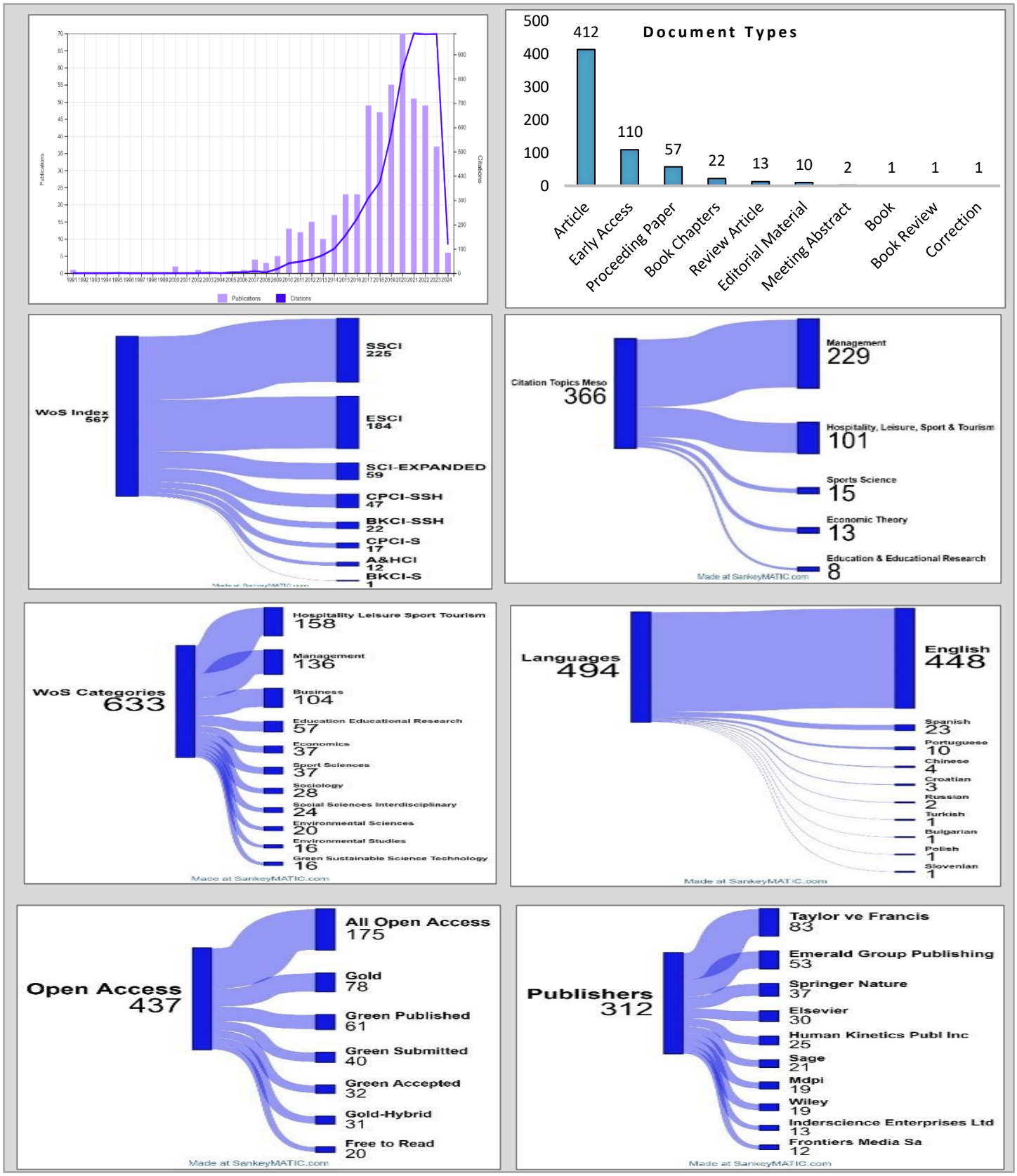


Figure 3. *Distribution of Sports Entrepreneurship Research by Key Variables*

When the publication-citation distribution by years is examined in the data in Figure 3; it is seen that the highest number of publications was made in 2020 (70 publications), followed by 2019 (55 publications), 2021 (51 publications), 2017 (49 publications), 2022 (49 publications), 2018 (47 publications) and 2023 (37 publications), respectively. It is noteworthy that

the highest number of citations was made in 2021 (986 citations), followed by 2023 (984 citations), 2022 (983 citations), 2020 (837 citations), 2019 (573 citations), 2018 (374 citations) and 2017 (310 citations). Although the first research on sports entrepreneurship was conducted in 1991 (1 publication-0 citations), the most publications were made in 2020 (70 publications-837 citations) and the most citations were made in 2021 (51 publications-986 citations). However, it is noteworthy that although there were no research and citations on sports entrepreneurship in 1992-1999, 2001 and 2004, there were no research and citations in 2003 (0 publications-2 citations) and 2005 (0 publications-5 citations). This means that researches conducted in 1991, 2000 and 2002 were cited in 2003 and 2005. When the distribution of the researches according to document types is analyzed; it is seen that most of the researches are published in the type of "article (410 publications)" followed by "early access (110 publications)", "proceeding paper (57 publications)" and "book chapters (22 publications)" respectively. When the studies were analyzed according to WoS index, it was determined that the highest number of studies were published in SSCI (225 publications), followed by ESCI (184 publications), SCI-EXPANDED (59 publications), CPCI-SSH (47 publications). A total of 494 studies were indexed in 567 indexes. This reveals that the studies were indexed in more than 1 index. Examples of citation topics in the order of most to least are as follows; "management (229 publications)", "hospitality, leisure, sport & tourism (101 publications)", "sports science (13 publications)", "economic theory (13 publications)", "education & educational research (8 publications)". When the categories of science networks are analyzed, it is seen that the highest number of studies were published in "hospitality leisure sport tourism (158 publications)" followed by "management (136 publications)" and "business (104 publications)". It was revealed that the publications in which a total of 494 studies were published were prepared in more than 1 science network categories. This result reveals that the topics of sport entrepreneurship citations in the WoS database are in line with the science network categories and that sport entrepreneurship is researched in the interdisciplinary field. When the studies are analyzed according to the language of publication; it is seen that the most studies were published in English (448 publications), followed by Spanish (23 publications) and Portuguese (10 publications), respectively. It can be said that this result is in parallel with the fact that the publication language of WoS is English. It was determined that the open access status was All Open Access with 175 publications, followed by Gold with 78 publications and Green Published with 61 publications. When the publishers of the researches are analyzed, it is seen that the highest number of research publishers is Taylor&Francis (83 publications), followed by Emerald Group Publishing (53 publications); Springer Nature (37 publications); Elsevier (30 publications).

Results from the cited references section

The results (cited title and cited work) of the top 10 cited research titles related to sport entrepreneurship in the WoS database are given in Table 1.

Table 1
Top 10 Cited Titles and Cited Works on Sports Entrepreneurship

	Cited Author	Cited Work	Title	Year	Citing Articles
Cited Title	**Hall, C. M.**	The Sociological Review	Urban entrepreneurship, corporate interests and sports mega-events: The thin policies of competitiveness within the hard outcomes of neoliberalism	2006	254
	Ratten, V.	International Entrepreneurship and Management Journal	Sport-based entrepreneurship: towards a new theory of entrepreneurship and sport management	2011	139
	Hayhurst, L. M. C.	Gender, Place & Culture	The 'Girl Effect'and martial arts: Social entrepreneurship and sport, gender and development in Uganda	2014	94
	Ratten, V.	International Journal of Entrepreneurial Behavior & Research	Coronavirus disease (COVID-19) and sport entrepreneurship	2020	74
	Ratten, V.	Journal of Management & Organization	Developing a theory of sport-based entrepreneurship	2010	70
	González-Serrano, Jones, P.; Llanos-Contrera, O.	Sport İn Society	An overview of sport entrepreneurship field: a bibliometric analysis of the articles published in the Web of Science	2019	67

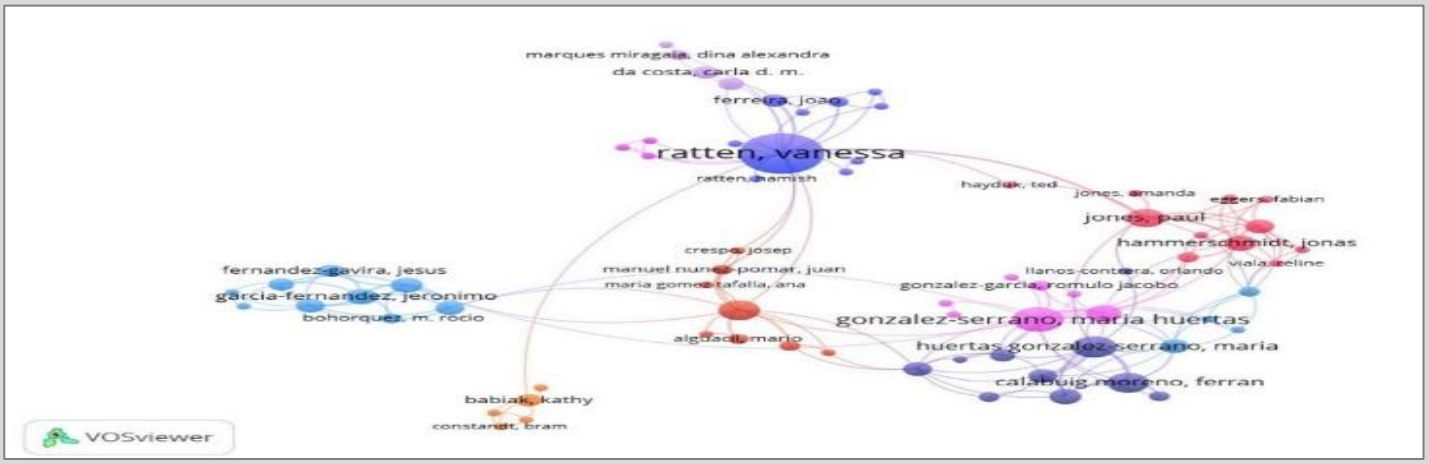
	Ratten, V.	International Journal of Entrepreneurial Venturing	Sport entrepreneurship: challenges and directions for future research	2012	55
	Bjärsholm, D.	Journal Of Sport Management	Sport and social entrepreneurship: A review of a concept in progress	2017	50
	Hammerschmidt, J.; Durst, S.; Kraus, S.; Puumalainen, K.	Technological Forecasting and Social Change	Professional football clubs and empirical evidence from the COVID-19 crisis: Time for sport entrepreneurship?	2021	47
	Miragaia, D.A.M.; Ferreira, J.; Ratten, V.	International Journal of Sport Policy And Politics	Corporate social responsibility and social entrepreneurship: drivers of sports sponsorship policy	2017	45
Cited Work	**Ratten, V.**	Sport Entrepreneursh	The future for sport entrepreneurship	2018	5
	Ratten, V.	Sport Entrepreneurship: An Economic, Social and Sustainability Perspective	Sport data analytics and social media: A process of digital transformation	2020	2
	Ratten, V.	Sport Startups: New Advances İn Entrepreneurship	Digital Transformation in Sport and Social Media	2020	2
	Ratten, V.	Sport Entrepreneurship	Sport entrepreneurship education and policy	2018	2
	Porter, Dilwyn	Sport And Entrepreneurship	Opportunistic, parasitic, strategic, symbiotic: Entrepreneurship and the business of sport	2020	1
	Ratten, V.; Nanere, M.	Sport Entrepreneursh	Sport Entrepreneurship and Entrepreneurial Ecosystems	2020	1
	Ratten, V.; Thukral, E.	Sport Entrepreneursh	Sport entrepreneurship education	2020	1
	Ratten, V.; Thukral, E.	Sport Entrepreneursh	Sport entrepreneurship education	2020	1
	Ratten, V.	Sport Startups: New Advances İn Entrepreneurship	Accelerators as knowledge providers	2020	1
	Ratten, V.	Sport Startups: New Advances İn Entrepreneurship	Football ecosystems and innovation	2020	1

When Table 1 is examined, it is seen that the most cited author is Hall, C.M. and Ratten, V., and when the cited research is examined, it is seen that the most cited author is Ratten, V. again.

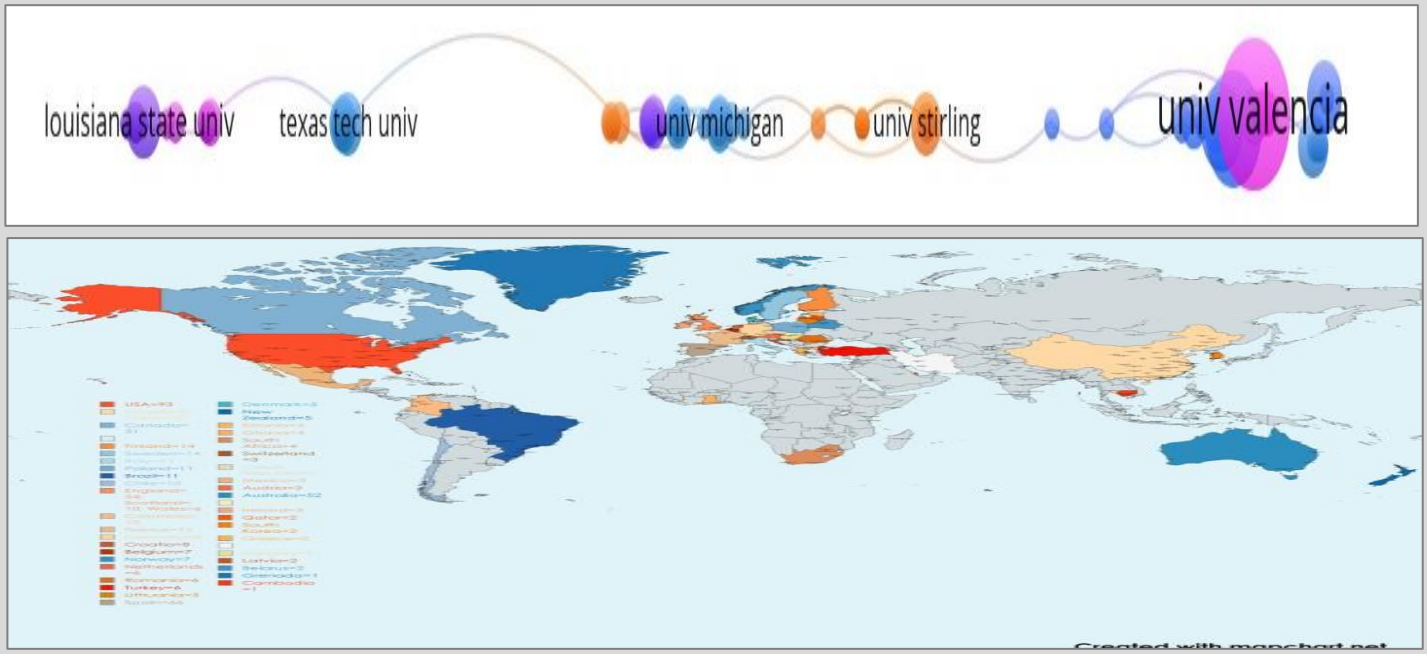
Co-author analysis

In this section, a co-author network map was created according to authors, institutions and countries as shown in Figure 4.

Co-authorship/Authors



Co-authorship/Organizations



Co-authorship/Countries

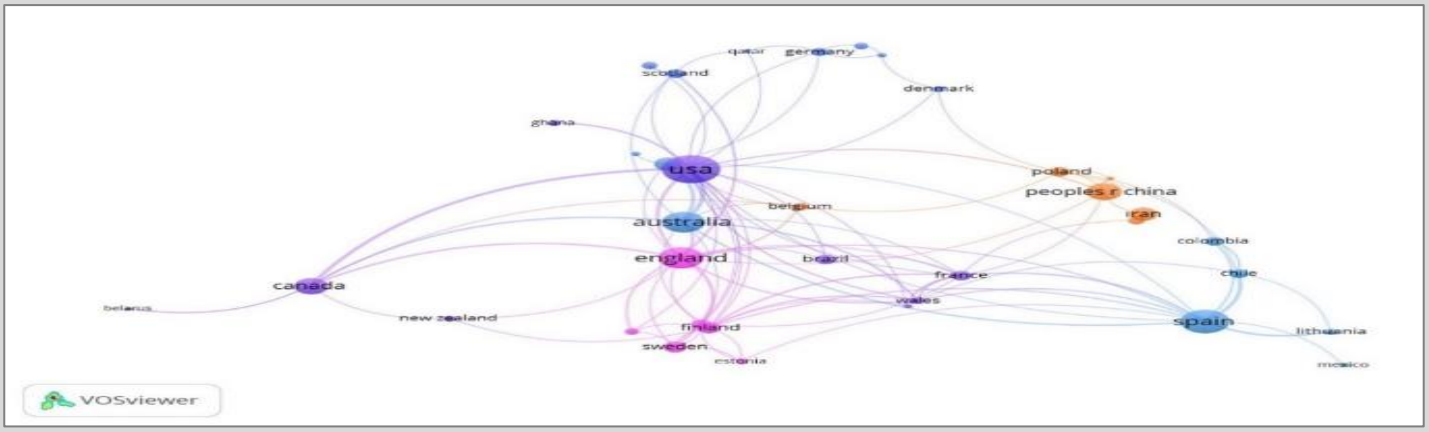


Figure 4. *Coauthor Network Map of Sports Entrepreneurship*

In order to create a map of the co-author network in the field of sports entrepreneurship as shown in Figure 4, the minimum number of articles was determined as 1 and the minimum number of citations as 5 based on Gürel (2022) research. This helped both to eliminate authors with few citations and to identify the social connections of authors who work together and are pioneers in their field. In this context, the co-author network map consists of 71 nodes, 10 clusters, 172 links and 228 total link strengths. According to the total link strength values, the most influential author collaboration is Ratten V. (33 publications-852 citations-26 total link strength), followed by Gonzalez-Serrano M. H. (a) (12 publications-78 citations-26 total link strength), Gonzalez-Serrano M. H. (b) (9 publications-128 citations-18 total link strength), Grimaldi-Puyana, M. (5 publications-21 citations-17 total link strength), Jones P. (7 publications-225 citations-16 total link strength). Ratten V. (33 publications-852 citations) was the co-author who conducted the most research, followed by Gonzalez-Serrano M.H.a (12 publications-78 citations); Gonzalez-Serrano M. H.(b) (9 publications-128 citations), Escamilla-Fajardo P. (8 publications- 69 citations), Calabuing Moreno F. (8 publications- 64 citations).

In order to create a map of the co-author network according to the institutions to which sport entrepreneurship authors are affiliated, the minimum number of articles was determined as 2 based on Koç (2023) research. In this context, the co-author network map according to institutions consists of 73 nodes, 12 clusters, 112 links and 148 total link strengths. According to the total link strength values, the most effective institutional co-author collaboration is Univ Valencia (40 publications-371 citations-332 total link strength), followed by La Trobe Univ (24 publications-433 citations-11 total link strength), Louisiana State Univ (9 publications-223 citations-10 total link strength), Swansea Univ (5 publications-153 citations-9 total link strength), Texas Tech Univ (7 publications-105 citations-9 total link strength), Univ Catolica Santisima Concepcion (6 publications- 83 citations-9 total link strength), Univ Stirling (7 publications-105 citations-9 total link strength). Univ Valencia (40 publications-371 citations), followed by La Trobe Univ (24 publications-433 citations), Univ Beira Interior (14 publications-260 citations), Louisiana State Univ (9 publications-223 citations), Univ Seville (9 publications-35 citations).

Using the MaPChart program, a map of the distribution of sports entrepreneurship research by country was created. In this context, it is seen that the countries with the highest number of researches are USA (93 publications), followed by Spain (66 publications), England (54 publications), Australia (52 publications). In order to create a map of the co-author network according to the countries where sport entrepreneurship authors are affiliated, the minimum number of articles was determined as 1 and the minimum number of citations as 5 based on Gürel (2022) research, which helped to identify the countries and country collaborations that play an active role in sport entrepreneurship. In this context, the co-author network map by country consists of 37 nodes, 8 clusters, 99 links and 171 total link strengths. According to the total linking power values, the most effective country co-author collaboration is USA (93 publications-1423 citations- 39 total linking power), followed by England (54 publications-686 citations-34 total linking power), Australia (52 publications-919 citations-32 total linking power), Spain (66 publications- 496 citations-30 total linking power), Finland (14 publications-410 citations-20 total linking power), France (11 publications- 556 citations-18 total linking power), Canada (31 publications-815 citations-17 total linking power). It was determined that USA (93 publications- 1423 citations) was the country with the highest number of co-authored studies, followed by Spain (66 publications- 496 citations), England (54 publications- 686 citations), Australia (52 publications- 919 citations), China (33 publications-78 citations), Canada (31 publications- 815 citations), Iran (22 publications-30 citations). All these results show a close parallelism with the total link strength values.

Co-occurrence keyword analysis

In this section, a keyword network map of sport entrepreneurship research was created as in Figure 5.

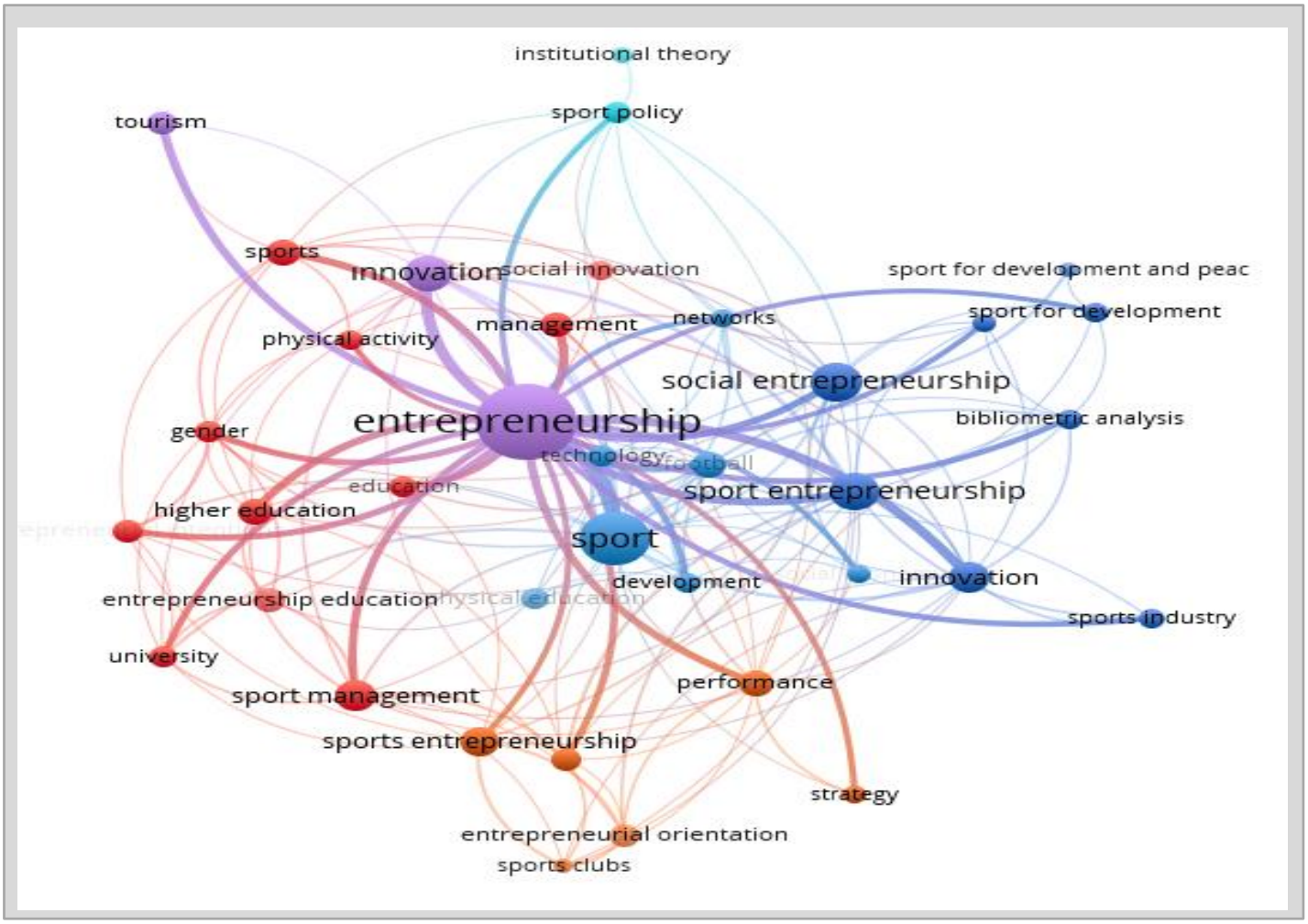


Figure 5. *Keyword Network Map of Sports Entrepreneurship*

In order to create a map of the keyword network of sport entrepreneurship research in Figure 5, the minimum number of words was determined as 5 based on Gürel (2022) research, which helped to determine the relationship status of the words in sport entrepreneurship with each other and to identify the links of frequently used keywords. In this context, the keyword network map consists of 37 nodes, 6 clusters, 172 links and 339 total link strengths. According to the total link strength values, it was seen that the most frequently used keyword was "entrepreneurship (116 publications-121 total link strength)". It is seen that the most related keywords related to sport entrepreneurship are "entrepreneurship (116 publications)", "sport (66 publications)", "sport entrepreneurship (42 publications)" and "social entrepreneurship (29 publications)" respectively. This is in close parallel with the total link strength values.

Citation analysis

In this section, a citation network map of document, author, source, country and institution was created as shown in Figure 6.

In this context, in order to create a map of the author, source, country and institution citation network of sport entrepreneurship researches, the minimum number of articles was determined as 1 and the minimum number of citations as 5 based on Gürel (2022) research, and the minimum number of citations was determined as 2 to create a map of the document citation network.

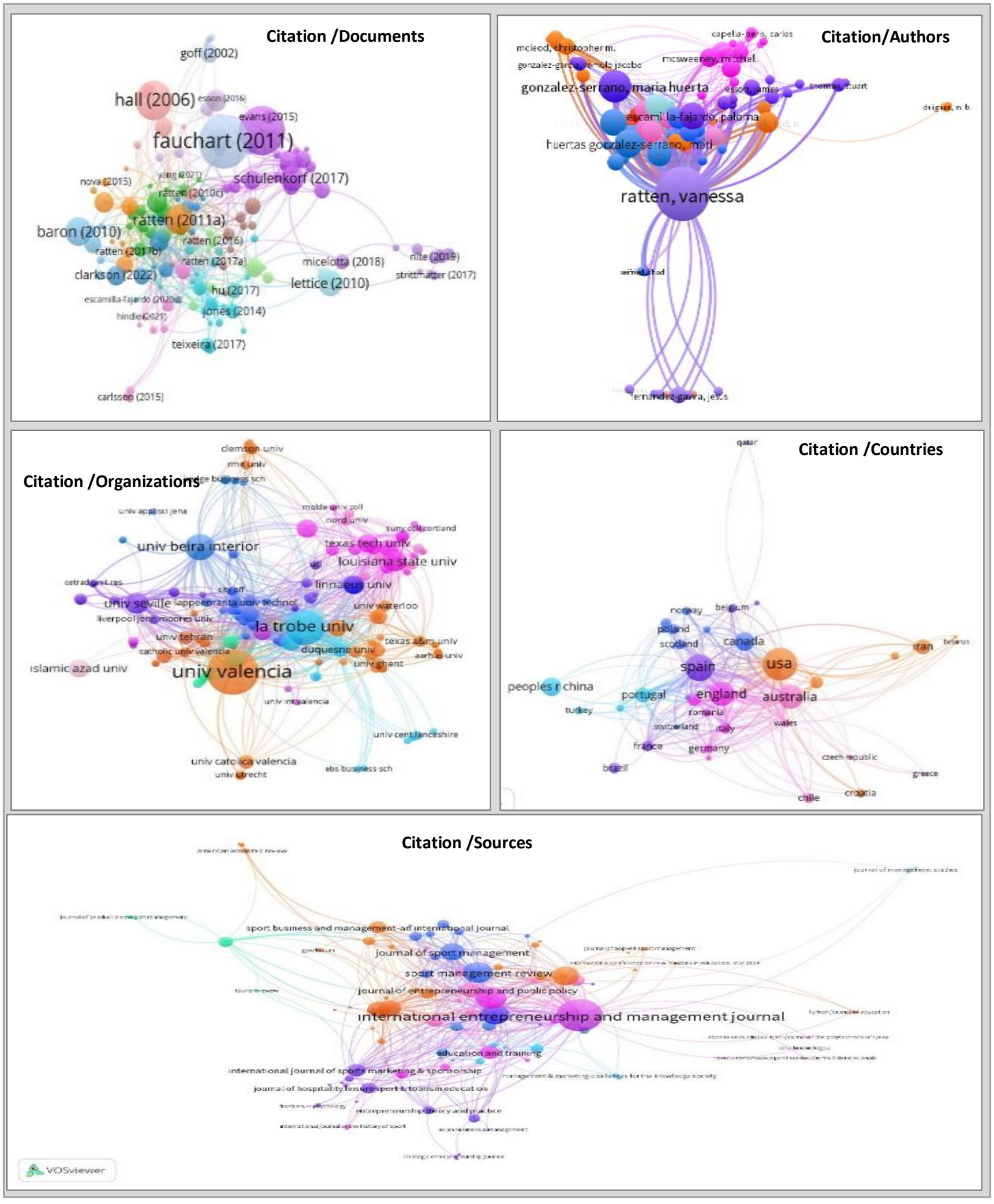


Figure 6. *Citation Analysis Network Map of Sport Entrepreneurship*

The document citation network map of sport entrepreneurship research in Figure 6 consists of 147 nodes, 15 clusters and 501 links. It is seen that the most document citation network related to sport entrepreneurship is realized by Fauchart-2011 (466 citations-1 link), followed by Kidd -2008 (392 citations-11 links), Hall-2006 (255 citations-9 links), Ratten-2011a (139 citations-55 links).

The author citation network map of sport entrepreneurship research consists of 271 nodes, 22 clusters, 2242 links and 4011 total link strength. It is also understood that the most influential authors in the field are Ratten, V. with 852 citations, followed by Fauchart, E. and Gruber, M. with 466 citations each. The institutional attribution network map of sport entrepreneurship research consists of 180 nodes, 18 clusters, 1230 links and 2254 total link strengths. According to the number of publications related to sports entrepreneurship, it was observed that the highest institutional citation network was realized by Univ Valencia (40 publications-371 citations-385 total link strength), followed by La Trobe Univ (24 publications-433 citations-342 total link strength) and Univ Beira Interior (14 publications-260 citations-141 total link strength).

This result is in close parallelism with the total link strength values. It was observed that the highest number of institutional citation networks related to sport entrepreneurship was realized by Conservatoire Natl Arts&Metiers; Ecole Polytech Fed Lausanne; Sch Business (466 citations-1 publication-3 total link strength each), followed by La Trobe Univ (433 citations-24 publications-342 total link strength) and Univ Toronto (392 citations-1 publication-20 total link strength).

The resource attribution network map of sport entrepreneurship research consists of 73 nodes, 16 clusters, 364 links and 764 total link strengths. According to the number of publications related to sports entrepreneurship, it is seen that the highest source citation network is realized by “Sport in Society (17 publications-545 citations-63 total link strength)”, followed by “Sustainability (16 publications-142 citations-63 total link strength)” and “International Entrepreneurship and Management Journal (16 publications-460 citations-232 total link strength)”.

It is seen that “Sport in Society (545 citations-17 publications-63 total link strength)” has the highest number of source citation network related to sport entrepreneurship, followed by “Academy of Management Journal (468 citations-2 publications-2 total link strength)” and International “Entrepreneurship and Management Journal (460 citations-16 publications-209 total link strength)”.

The country citation network map of sport entrepreneurship research consists of 39 nodes, 9 clusters, 257 links and 1643 total link strength. However, it is seen that the most effective country collaboration is USA with 1423 citations, followed by Australia with 916 citations and Canada with 815 citations. In this context, it has been determined that all these results show a close parallelism according to the total link strength values and help to identify original researchers and publications in the field of sports entrepreneurship.

Bibliographic coupling analysis

In this section, a density map was created according to bibliometric mapping of documents, sources, authors, institutions and countries as in Figure 7.

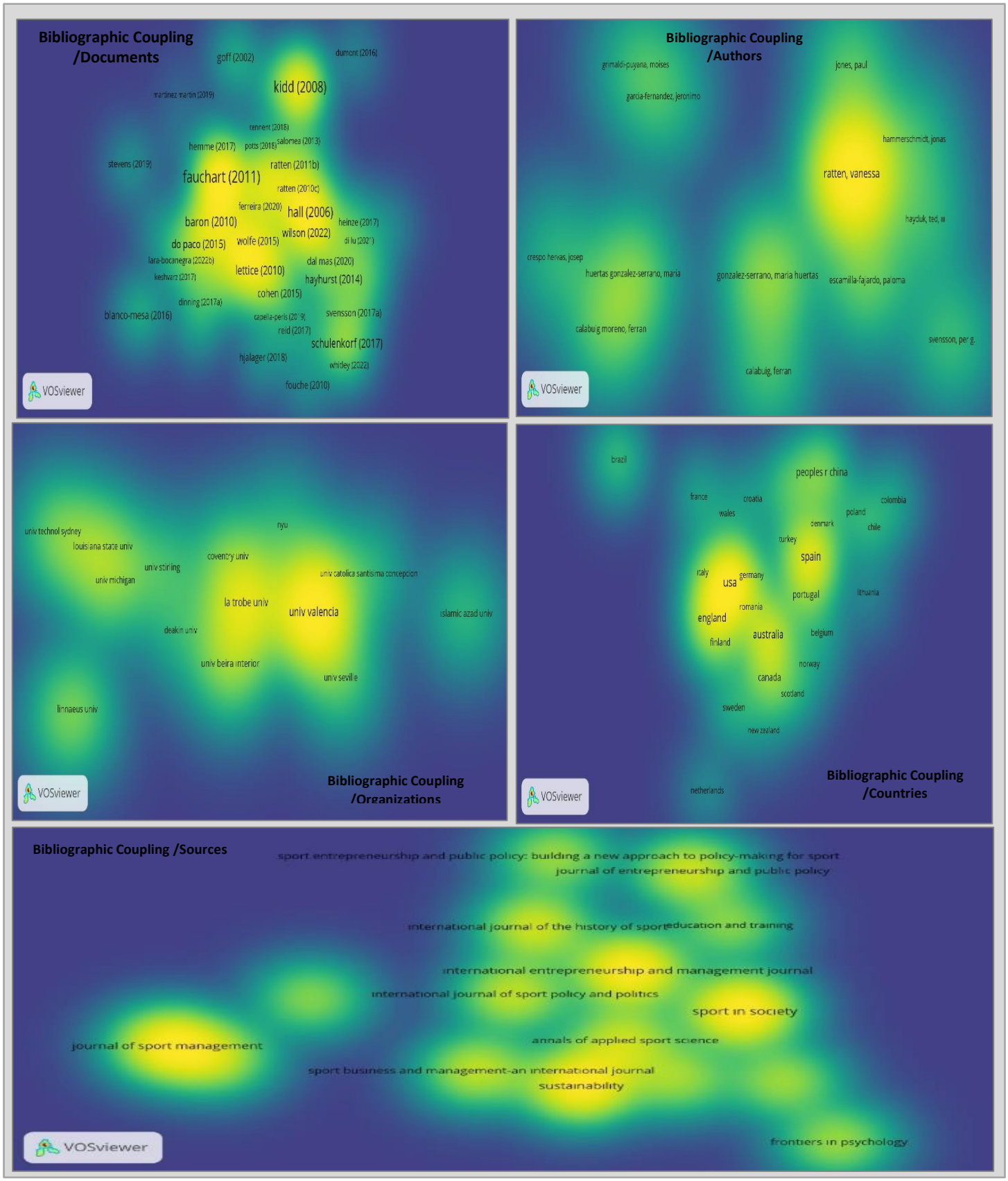


Figure 7. *Density Map of Sport Entrepreneurship According to Bibliometric Coupling*

In order to create a density map according to the bibliometric matching of the documents related to sports entrepreneurship in Figure 7, the minimum number of citations was set as 5 based on Arslan (2022) research, and the minimum number of articles was set as 5 and the minimum number of citations was set as 1 as in Bozdemir and Çivi (2019) research to create a density map according to the bibliometric matching of authors, sources, countries and institutions. In this context, in the research on sports entrepreneurship, Fauchart-2011, Kidd-2008, Hall-2006, Ratten -2011a, Baron-2010, Lettice-2010 and Schulenkorf-2017 documents on the basis of documents, Ratten V., Gonzalez- Serrano M. H., Calabuing-Moreno F. and Escamilla-Fajardo, P. as authors, Univ Valencia, La Trobe Univ, Univ Seville and Louisiana State Univ as institutions, USA, Spain, England, Australia, China and Canada as countries, and "Sport in Society" and "International Entrepreneurship and Management Journal, Sustainability" as sources.

Co-citation analysis

In this section, a co-citation network map of the cited references, sources and authors was created as shown in Figure 8.

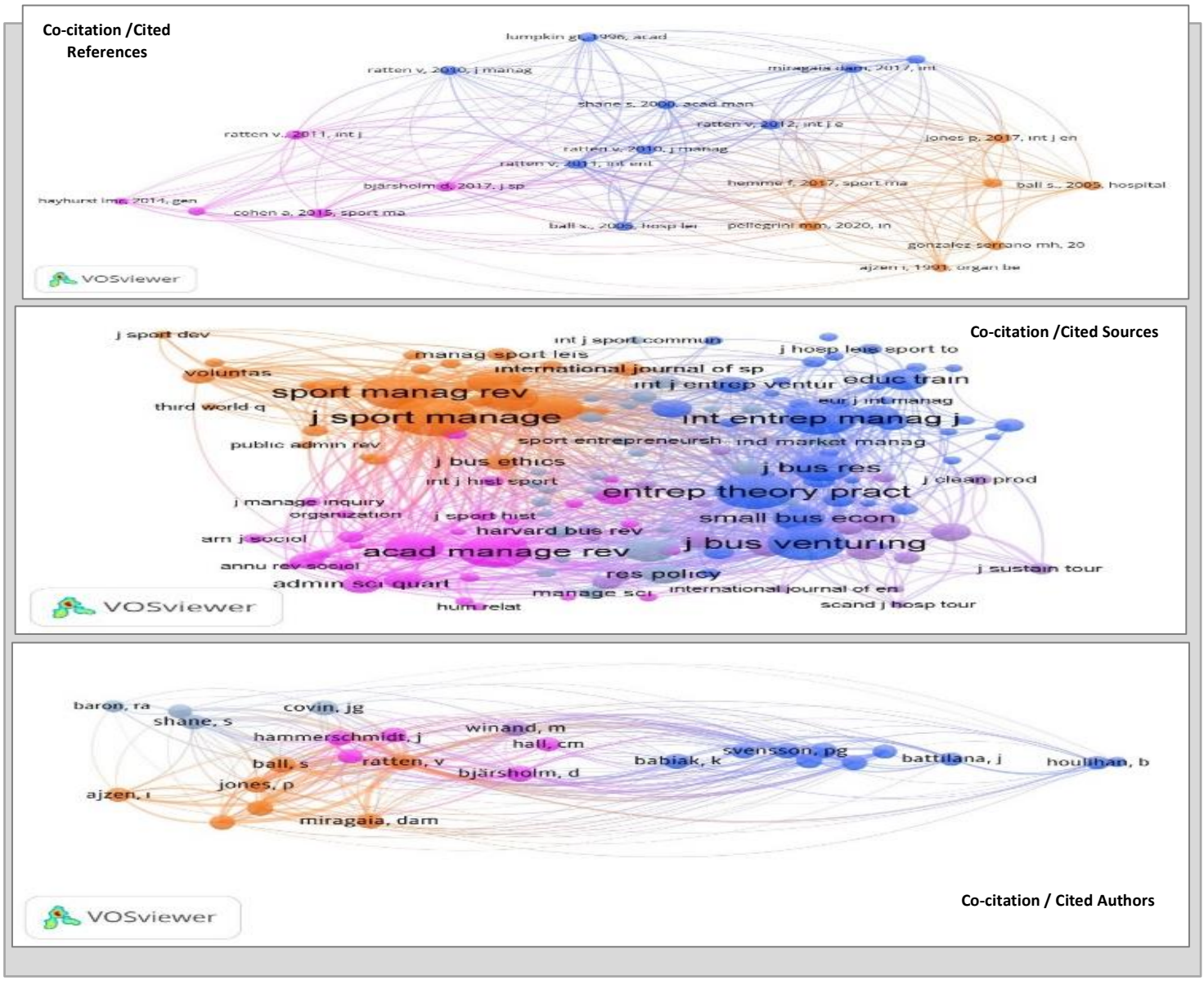


Figure 8. *Co-Citation Analysis Network Map of Sports Entrepreneurship*

In order to create a map of the co-citation network of the references cited to sport entrepreneurship research in Figure 8, the minimum number of citations was determined as 20, as in Bozdemir and Çivi (2019). In this context, the co-citation network map of the references consists of 21 nodes, 3 clusters, 189 links and 1207 total link strength. It is seen that Ratten

V. 2011 (96 citations-291 total link strength) is the most cited reference, followed by Ratten V. 2010 (57 citations-236 total link strength) and Ratten V. 2012 (47 citations-184 total link strength).

In order to create a map of the co-citation network of sources cited in sport entrepreneurship research, the minimum number of citations was set as 20, similar to Bozdemir and Çivi (2019). In this context, the common attribution network map of the resources consists of 155 nodes, 5 clusters, 9252 links and 176463 total link strength. It is understood that Journal of Sport Management (444 citations-16415 total link strength) is the most frequently cited source of co-citation, followed by Entrepreneurship Theory and Practice (388 citations-13989 total link strength), Journal of Business Venturing (379 citations-14675 total link strength) and Sport Management Review (371 citations-14646 total link strength).

In order to create a map of the co-citation network of authors cited in sport entrepreneurship research, the minimum number of citations was set as 30 as in Palaz et al. (2023). In this context, the authors' co-citation network map consists of 27 nodes, 5 clusters, 267 links and 6490 total link strength. The most cited authors in co-citations were Ratten V. (595 citations-3090 total link strength), followed by Svensson, P. (90 citations-899 total link strength) and Gonzalez-Serrano, M. H. (75 citations-834 total link strength). All these results were found to be in close parallel with the total connection power values.

Discussion

When all these situations are evaluated, it is seen that Gonzalez- Serrano M. H. and Ratten V. are pioneering researchers in the field of sports entrepreneurship and have significantly influenced the development of sports entrepreneurship. In parallel with this, it was observed that Univ Valencia and La Trobe Univ. stood out the most in the institutional analysis conducted within the scope of the research. This is thought to be due to the fact that Gonzalez- Serrano M. H. and Ratten V. are working at Univ Valencia and La Trobe Univ. However, it was noteworthy that the publication-citation distribution of the analyzed studies did not show an equal distribution. This shows that since there is not enough research in the field of sport entrepreneurship, existing research in the literature is cited more. However, the fact that the studies were mostly published in SSCI index, and that the title, keywords, abstract, research area, citation topics and science network categories of the studies were mostly focused on categories such as “management”, “hospitality, leisure, sport & tourism” revealed that sports entrepreneurship is researched in the field of social sciences. This situation has once again revealed the need to provide an interdisciplinary environment in order to conduct research that will fill the gap in the sport entrepreneurship literature. Within the scope of the research, it has been determined that sport entrepreneurship has been addressed in a limited number of studies. Within the scope of this research, in parallel with the literature, it was found that there is not enough research on sports entrepreneurship in the national and international literature and that this rate is at a low level. It is thought that this research will contribute to generating ideas for further research by drawing attention to the importance of the subject. Within the scope of this research, in which the relevant literature on bibliometric analysis of sports entrepreneurship was analyzed through a single database, data were analyzed through a single database in parallel with the literature. In this context, the data obtained from the WoS database constitute the limitation of this research. It has been determined that the relevant literature that performs bibliometric analysis of sport entrepreneurship has many limitations in terms of screening (language, type, theme, WoS category, etc.). Within the scope of this study, unlike the literature, there were no limitations in terms of language, genre, theme and WoS category. This contributed to the analysis of more data compared to the relevant literature. In this research, where bibliometric network mapping of sports entrepreneurship was carried out, 32 concepts were sought for answers and these concepts were presented by using graphics, Sankey diagram, VOSviewer, MapChart and Wordclouds programs, which contributed to make this research different from the relevant literature.

Conclusion and Recommendations

Sports entrepreneurship is the process of organizing sports resources to produce products, develop solutions and present them to people in order to meet people's sports needs and find solutions to sports-related problems. Therefore, sports entrepreneurship is the sports dimension of entrepreneurship and it is seen that research on sports entrepreneurship is increasing day by day. The aim of this research is to provide an overview of sport entrepreneurship, to draw attention to the importance of the concept and to generate ideas for further research. In this context, the conclusions reached based on the research results are as follows:

In the international literature review, few studies on bibliometric analysis of sport entrepreneurship were found. Some of

them (Escamilla-Fajardo et al., 2020; González-Serrano et al., 2020; González-Serrano et al., 2020a; Lara-Bocanegra et al. 2022, Hammerschmidt et al. 2023) WoS, while the others (Pellegrini et al., 2020; Cardella et al., 2021; Sánchez Franco et al., 2023) were prepared with data obtained from the Scopus database. In this context, it was determined that the topics of the researches conducted using the data obtained from the WoS database were "sustainable entrepreneurship and innovation in sports", "entrepreneurship and innovation in football", "entrepreneurship and intrapreneurship in sports" and "entrepreneurship, innovation and creativity in sports management". It was observed that these studies were scanned with the keywords "sustainable, green, entrepreneurial, innovative, sport", "football, innovation, entrepreneur", "sport, innovation, creativity, entrepreneur". In the researches conducted using the data obtained from the Scopus database, it was seen that the focus was on identifying popular topics in the fields of "sport and entrepreneurship", "sport entrepreneurship", "sport management". It was observed that these studies were searched with the keywords "initiative" and "sport". However, it has been determined that the studies conducted in WoS and Scopus databases have some limitations in terms of language, index, WoS categories, theme, and document type. It was determined that the studies that carried out bibliometric analysis on sports entrepreneurship were prepared between 2019-2023 in WoS and between 2020-2023 in Scopus. This result reveals that bibliometric analyses on sports entrepreneurship have become a matter of curiosity since 2019.

Within the scope of the research, bibliometric network mapping of 494 publications on sports entrepreneurship in the WoS database was carried out by searching for answers to 32 parameters. According to the results obtained from the advanced screening part, it was found that the first research on sports entrepreneurship was conducted in 1991. It was determined that the most publications on sports entrepreneurship were made in 2020 and the most citations were made in 2021. It is noteworthy that the number of citations has increased especially since 2009 and the number of publications has increased since 2017. This result revealed that the research on sports entrepreneurship in the international literature is linked to the fact that it started in 2019. At the same time, it was determined that the most research on sports entrepreneurship in the database was in the article category, the publications were indexed in the SSCI index, the publisher of the most research was Taylor & Francis, the most research was published in English, and the most open access status was All Open Access. This shows that there is a parallel between the fact that the language of publication of WoS is English and the published research is in English. At the same time, the fact that most of the research in the field of sports entrepreneurship is completely open access is an important factor that contributes to the current outlook in the literature. However, it was determined that the most cited topics and science network categories were "management" and "hospitality, entertainment, sports and tourism" in parallel with each other, and words such as "sports", "entrepreneurship", "management", "business", "innovation" were mostly used in the title, keyword, abstract, research area and WoS categories of the studies, It can be said that this result is in parallel with the results of Hammerschmidt et al. (2023). According to the results obtained from the cited references section, it was determined that the author of the most cited title related to sport entrepreneurship was Hall, C.M. and Ratten, V. The author of the most cited research was Ratten, V. According to the results obtained from the co-author analysis section, it was determined that the co-authors who conducted the most research were Ratten, V. The institutions that conducted the most research in co-authorship were Univ Valencia, and the country that conducted the most research in co-authorship was USA. According to the results obtained from the common word analysis part, it was concluded that the most related keywords related to sports entrepreneurship are "entrepreneurship", "sport", "sport entrepreneurship", "social entrepreneurship". It can be said that this result is in line with the results of Hammerschmidt et al. (2023). According to the results obtained from the citation analysis part, it was determined that the most document citation network related to sport entrepreneurship was realized by Fauchart E. 2011, the most influential authors were Ratten, V., the most institutional citation network was Univ Valencia, and the most resource citation network was realized by Sport in Society. At the same time, it was found that the most effective country collaboration in the country citation network of sport entrepreneurship research is USA. According to the results obtained from the Bibliographic Matching Analysis, it was determined that Fauchart-2011 document, Sport in Society source, Ratten V. author, Univ Valencia institution and USA country were intensely related. According to the results obtained from the co-citation analysis section, it was concluded that the most cited reference in co-citations was Ratten V. 2011, the most cited sources in co-citations were Journal of Sport Management and the most cited authors in co-citations were Ratten V.

All the results explained above have revealed the originality of this research in order to gain a general perspective on sports entrepreneurship. *As in Dertli and Dertli's* (2023) *research, this research once again reveals that the creation of interdisciplinary research environments has become more important than in previous periods. In future bibliometric studies on sport entrepreneurship, it is recommended that the data in Scopus and WoS databases should be handled together and*

multidisciplinary research should be carried out on the subject. As a separate suggestion, since most of the research on sports entrepreneurship is carried out in article type, it is important to carry out research in different types such as books and book chapters.

Etik Komite Onayı: Bu araştırma kapsamında elde edilen veriler WoS veri tabanından alınmış olup bu kapsamdaki verilerin etik kurul izni gerektirmemesi nedeniyle etik kurul onayı alınmamıştır.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları: Fikir- YE; Tasarım- YE; Denetleme- YE; Kaynaklar- YE ve ŞD; Veri Toplanması ve/veya İşlemesi ŞD; Analiz ve/ veya Yorum- ŞD; Literatür Taraması- YE ve ŞD; Yazıyı Yazan- YE ve ŞD; Eleştirel İnceleme- YE ve ŞD
Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmişlerdir.
Finansal Destek: Yazarlar, bu çalışma için finansal destek almadığını beyan etmiştir.

Ethics Committee Approval: The data obtained within the scope of this study were obtained from the WoS database and ethics committee approval was not obtained since the data within this scope do not require ethics committee approval.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept - YE; Design- YE; Supervision- YE; Resources- YE and ŞD; Data Collection and/or Processing- ŞD; Analysis and/or Interpretation- ŞD; Literature Search- YE and ŞD; Writing Manuscript- YE and ŞD; Critical Review- YE and ŞD
Conflict of Interest: The authors have no conflicts of interest to declare.
Financial Disclosure: The authors declared that this study has received no financial support.

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ATATURK UNIVERSITY PUBLICATIONS

Araştırma Makalesi *Research Article* DOI: 10.62425/rses.1478771

Egzersize Katılım Motivasyonu Ölçeği'nin Geliştirilmesi (EKMÖ): Geçerlik ve Güvenirlik Çalışması

Development of the Exercise Participation Motivation Scale (EPMS): Validity and Reliability Study

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ÖZ

Egzersize katılım; kişisel ve çevresel nedenlerden dolayı çoğu zaman ertelediğimiz bir aktivitedir. Bireyi egzersize motive edecek unsurların bilinmesi, egzersize katılımı arttırarak sağlıklı yaşamın desteklenmesine yardımcı olabilir. Bu araştırmada, egzersize katılım motivasyonu ölçeğinin geçerli ve güvenilir şekilde geliştirilmesi amaçlanmıştır. Bu bağlamda araştırmaya haftada en az 2 kez egzersiz yapan 440 katılımcı dâhil edilmiştir. Katılımcıların 227'si erkek, 213'ü kadındır. Ayrıca 317'si bekar, 123'si evli, yaş ortalaması ise 22,97'dir. Araştırmada madde havuzunun oluşturulması, Hür İrade Kuramı özelliğine uygun maddelerin hazırlanması ve literatür taraması sırasında yapılan içerik analiziyle sağlanmıştır. Madde havuzu uzman görüşüne sunulmuş, pilot uygulama yapılmıştır. Kapsam geçerliği sınandıktan sonra yapı geçerliği incelenmiştir. Bu bağlamda sırasıyla AFA, DFA, güvenirlik testleri (Cronbach Alfa, Spearman Brown, Guttman Split-Half), düzenlenmiş madde-toplam korelasyonu, madde analizlerinden (%27 alt üst gruplar analizi) yararlanılmıştır. Buna göre, özdeğeri 1'den büyük olan faktörlerde yer alan maddelerin kovaryans değerlerinin, madde hata varyanslarının uygun olduğu görülmüştür. Ardından uyum indeksleri de incelenerek madde analizi ile EKMÖ'nün yapısına kanıt sağlanmıştır. Elde edilen yapının güvenirliklerinin yüksek olduğu da tespit edilmiştir. Yapılan tüm analizler sonucunda EKMÖ'nün 21 madde 3 faktörden (içsel motivasyon, motivasyonsuzluk, dışsal motivasyon) oluştuğu, geçerli ve güvenilir bir ölçme aracı olduğu tespit edilmiştir.

Anahtar Kelimeler: Motivasyon, Egzersize Katılım, Egzersiz Motivasyonu, Geçerlik ve Güvenirlik

ABSTRACT

Participation in exercise is an activity that we often put off for personal and environmental reasons. Knowing the factors that will motivate the individual to exercise can help to support a healthy life by increasing participation in exercise. This study aimed to measure exercise motivation within the context of Self-Determination Theory. A total of 440 participants who exercise at least twice a week were included in the study. 227 of the participants were male and 213 were female. In addition, 317 of them are single, 123 of them are married and the average age is 22.97. The creation of the item pool, preparation of items consistent with the Self-Determination Theory, and content analysis during literature review were conducted for this purpose. The item pool was then presented to experts, and a pilot study was carried out. After testing content validity, construct validity was examined. In this context, AFA (Adaptive Factor Analysis), DFA (Confirmatory Factor Analysis), reliability tests (Cronbach's Alpha, Spearman Brown, Guttman Split-Half), organized item-total correlations, and item analyses (%27 upper-lower groups analysis) were utilized. Accordingly, it was observed that the covariance values of the items in factors with eigenvalues greater than 1 and the error variances of the items were appropriate. Subsequently, fit indices were examined, providing evidence for the structure of the Exercise Participation Motivation Scale (EMS) through item analysis. The reliability of the obtained structure was also found to be high. Based on all analyses conducted, it was determined that the EPMS consists of 21 items and three factors (intrinsic motivation, amotivation, extrinsic motivation), and it is a valid and reliable measurement tool.

Keywords : Motivation, Exercise Participation, Exercise Motivation, Validity and Reliability

Geliş Tarihi/Received 05.05.2024
Kabul Tarihi/Accepted 05.11.2024
Yayın Tarihi/Publication Date 25.12.2024

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Cite this article: Namlı, S., & Tekkurşun Demir, G. (2024). Development of the exercise participation motivation scale (epms): validity and reliability study. *Research in Sport Education and Sciences, 26*(4), 177-186.

Giriş

Genel sağlık durumunun korunması ve ileriye götürülmesi amacıyla (Wang & Zhou, 2021), düzenli yapılan fiziksel etkinlikler bütününe egzersiz denilmektedir. Civan vd., (2018), egzersizi; hareketsiz yaşam tarzından kurtulmak, sağlıklı bir yaşam sürmek ve kişinin kendine ayırdığı zamanları değerlendirmek için plan ve program dahilinde yapılan, bireyin fiziksel uygunluğunun gelişmesini ve geliştikten sonra korunması hedeflenen tekrarlı hareketler bütünü olarak tanımlamaktadır. En sade hali ile vücutta bulunan enerjiyi harcamak için vücudun planlı, programlı, düzenli ve bilinçli olarak aksiyon halinde olması olarak tanımlanabilir (Bay & Yılmaz, 2021). Egzersiz yapmak, sağlığın korunması ve hastalık durumunun tedavi edilmesinde kullanılan yaygın bir yöntemdir. Birçok hastalığı engellemek ve tedavi etmek için egzersizin yararlarını gösteren kanıtlar vardır (Vina vd., 2012).

Düzenli egzersiz; kalp hastalığı, tip 2 diyabet (Swift vd., 2018), yüksek tansiyon (Cornelissen vd., 2011), obezite ve kanser gibi birçok kronik hastalığın önlenmesine yardımcı olabilir (Powell vd., 2011). Ayrıca kas kuvvetinin korunması ve arttırılmasında, vücut postürünün korunmasında, osteoporozun önlenmesinde (Gomes vd., 2017), kalp ritminin düzenlenmesinde (Choi vd., 2017; Lavie vd., 2015), kolesterol ve trigliserit seviyelerini düzenleyerek damar hastalıkları risklerini azaltır (Kelley & Kelley, 2017).

Egzersizin faydalarına bakıldığında sadece fiziksel katkılarını dile getirmek yanılgıdır. Ruh sağlığı üzerinde de çok fazla etkisi bulunmaktadır. Depresyon ve anksiyete semptomlarındaki azalmalar da dahil olmak üzere ruh sağlığını iyileştirdiği çalışmalarla kanıtlanmıştır (Ersoy, 2016; Stubbs vd., 2017). Egzersizin ayrıca hafıza ve dikkat dâhil olmak üzere bilişsel işlevi geliştirdiği (Chang vd., 2018) ruh sağlığı üzerinde olumlu bir etkiye sahip olabilecek uyku kalitesindeki gelişmelerle ilişkili olduğu bilinmektedir (Kelley & Kelley, 2017). Kişinin kendisini iyi hissetmesi ve mutlu olmasına, iletişim becerilerinin gelişmesine, stresle başa etme yeteneğinin artmasına, özgüven ve benlik saygısının artmasına katkıları vardır (Demirel vd., 2014).

İnsan yaşamının ilk yıllarından son dönemine kadar egzersiz yapmaya ihtiyaç duyar. Fiziksel aktivite çocukluk ve gençlik yıllarında, kas ve kemik gelişiminin yanında motor becerileri gelişimi içinde önemlidir. Yetişkinlik yıllarında; kas gücünü korur, solunum, kalp ve kemik sağlığını kuvvetlendirir. Yaşlılarda ise çeviklik sağlar ve sosyal katılımı yükseltmeye yardımcı olur (WHO, 2016). Diğer yandan yaşlılıkta; kanser riskinden düşüş (Christensen vd., 2011; Wang & Zhou, 2021), vücut direnci arttırılması ve enfeksiyonlara karşı daha dirençli olunması (Langoni vd., 2019), daha aktif ve sağlıklı yaşam sürülmesi için yine uzmanlar tarafından önerilmektedir (Demirel vd., 2014; Utlu, 2021). Hamilelerde normal doğumu kolaylaştırmak, bebeğin anne karnında sağlıkla büyümesini sağlamak, annenin kan dolaşımının düzenli olması için egzersize ihtiyacı bulunmaktadır (Uzun-Aksoy & Gürsoy, 2021).

Egzersiz; insanlarda sağlık için önemli bir rol oynamasıyla birlikte, bireyin yeni bir fiziki görünüme ulaşmasıyla fiziki görümünde olumlu düşünceler oluşmasıyla bireylerin motive olmasını ve sebep aranmaksızın egzersize güdülenmelerini sağlamaktadır (Karakaş vd., 2015). Kişinin kendisine ayırdığı zaman dilimlerinde yaptığı egzersiz zihinsel açıdan sağlık, sosyalleşme, fiziki hareketlilik değerlerini yükselttiği ve psikolojik olarak daha iyi hissettikleri sonucuyla egzersizlere katılmak için motivasyonlarının arttığı görülmüştür (Ağaoğlu, 2015; Bekar, 2019).

Motivasyon; en genel tanımı ile bireyi harekete geçiren itici güçtür (Broussard & Garrison, 2004). Bireyin bir noktaya yoğunlaşmasına sebep olan, iç ve dış faktörlerin birleşimiyle oluşan, psikolojik bir süreç olarak da tanımlanabilir (Kinicki & Kreitner, 2010; Özdemir, 2022). Motivasyon kendi arasında içsel ve dışsal motivasyon olarak ikiye ayrılmaktadır. Hür İrade Kuramı veya diğer adıyla Öz Belirleme Kuramına göre, içsel motivasyon, dışsal motivasyon ve motivasyonsuzluk durumları ile motivasyon kavramı açıklanmaktadır (Sağıroğlu & Ayar, 2017). İçsel motivasyon bireyin motivesinin nasıl sağlandığıyla, dışsal motivasyon ise bireyi ne aracılığı ile motive olduğu ile ilgilenmektedir (Ulukuş, 2016). Örneğin; egzersiz yaparken kilo verip mutlu olmak içsel motivasyonu sağlarken, kilo verdiğiniz için fiziksel görünüşünüzle ilgili başkaları tarafından övgü almanız dışsal motivasyonunuzu arttırır. Maslow, ihtiyaçlar hiyerarşisi pramidini oluştururken bizi eyleme geçiren her şeyin ihtiyaçlardan kaynaklandığını belirtmektedir. Kısaca ihtiyaçlar bizim motivasyon kaynağımızın temelini oluşturur. Öyleyse, ihtiyaç ne kadar fazla ise motivasyon o denli yüksek olacaktır varsayımına ulaşabilir. Bu bağlamda hastalık seviyesine gelmeyinceye kadar veya aşırı kilo problemi yaşamayıncaya kadar yani gerçekten çok ihtiyaç duymadığı sürece egzersiz yapmak konusunda motivasyonların daha düşük olması beklenebilir. Araştırmalarda insanlar genellikle egzersiz yapmak için

yeterli motivasyona sahip olmadığını doğrular niteliktedir. Bunun nedenleri arasında zaman kısıtlamaları, yorgunluk, iş veya aile sorumlulukları, egzersize elverişsiz iklim koşulları, tesis mesafesi veya yokluğu, egzersiz yapmaya engel sağlık sorunları sayılabilir. Bu nedenle, egzersizi teşvik etmek için motivasyon stratejileri yaygın olarak kullanılmaktadır. Sosyal destek, egzersiz partnerleri, sağlık koçları, teknoloji aracılığı ile online egzersiz videoları ve egzersiz müziği egzersiz niyetleri üzerinde olumlu bir etkiye sahip olabilir (Dishman & Buckworth, 1996).

Egzersiz niyetlerini etkileyen bir diğer faktör de bireylerin algılarıdır. Bireyler egzersizi eğlenceli veya zorlayıcı olarak algılayabilir ve bu algılar egzersiz yapma niyetlerini etkileyebilir. Araştırmalar, egzersizin keyifli olarak algılanmasının egzersiz niyetini artırabileceğini göstermektedir. Bu nedenle, egzersizi keyifli hale getirmek için çeşitli stratejiler kullanılabilir. Örneğin, spor salonlarında müzik ve ışık kullanımı, açık havada egzersiz, egzersiz niyetlerini artırma stratejileri olarak kullanılabilir (Rhodes vd., 2009). Bu stratejilerin etkililiğini ölçmek, bireyi egzersiz yapmaya teşvik edecek unsurları ortaya çıkarmak, bireylerin egzersize katılım motivasyonlarının nedenini bilmek toplumun egzersiz yapmayı bir yaşam biçimine dönüştürmesine yardımcı olacak temel unsurlardır.

Bu araştırma da bireylerin egzersize katılım motivasyonlarını belirlemeyi hedefleyen bir ölçüm aracı geliştirmek için tasarlanmıştır. Egzersiz ile spor kavramının birbirinin yerine kullanılarak, egzersiz yapan bireylerin spora katılım motivasyonlarının ölçülmesi, alanda egzersize katılım motivasyonunu ölçebilecek yeterli ölçek olmamasından kaynaklandığı düşünülmektedir. Nitekim bilindiği üzere bu iki kavramın birbirinden farklı kavramlar olması ve literatürde egzersiz yapan bireylerin egzersize katılım motivasyonlarını ölçecek bir ölçme aracının olmaması çalışmanın gerekliliğini göstermektedir.

Yöntem

Çalışmanın bu bölümünde araştımanın modeli ve ölçeğin geliştirilmesi aşamalarına dair bilgilere yer verilmiştir.

Araştımanın Modeli

Bu araştırmanın yöntemi, nitel ve nicel veri toplama tekniklerini bir arada kullanıldığı karma bir yöntemle tasarlanmıştır. Araştırmanın ilk etabında literatür incelemesi ve görüşmeler yoluyla nitel veriler toplanmış, ardından maddelerin oluşturulup uygulanmasıyla nicel veriler elde edilmiştir. Araştırmanın deseni, nicel verilerin analizi ile sonuçlara ulaşılması nedeniyle keşfedici ardışık desen olarak tasarlanmıştır (Creswell & Clark, 2015). Bu yaklaşım, araştırmanın derinlemesine incelenmesine olanak tanımaktadır.

Araştırma Grubu (Evren-Örneklem)

Araştırmada katılımcıların seçilmesinde ölçüt örnekleme kullanılmıştır. Buna göre araştırmaya haftada en az iki kez düzenli egzersiz yapan bireyler dahil edilmiştir. Araştırma örneklem hesaplaması, madde havuzunun 10 katı katılımcı sayısına göre belirlenmiştir (Kline, 1994). 36 maddelik soru havuzunun on katı olan toplam 360 kişiye ölçekler uygulanmış eksik ve hatalı doldurulan ölçekler çıkartıkdıktan sonra 338 katılımcıdan veriler elde edilmiştir. Araştırmaya 338 birey (168 erkek, 170 kadın) katılmıştır. Daha sonra doğrulayıcı faktör analizi için araştırmaya 102 birey (59 erkek, 43 kadın) dahil edilmiştir. Bu bağlamda araştırmanın çalışma grubu, toplam 440 (227 erkek, 213 kadın) katılımcıdan oluşmaktadır. Katılımcıların 317'si bekar, 123'si evli, yaş ortalaması ise 22.97'dir. Katılımcılara yüz yüze ve Google formlar üzerinden ulaşılmış, gönüllülük esas alınmıştır. Buna göre araştırmanın ilk aşamasında gönüllü olur formu doldurtulmuş, araştırmanın amacı katılımcılara kısaca açıklanmıştır.

Madde havuzunun oluşturulması: Geliştirilecek ölçeğin amacına yönelik; motivasyon kavramı, bireyleri egzersiz yapmaktan alıkoyan nedenler ve egzersiz yapmaya teşvik eden nedenlere ilişkin literatür taraması yapılmıştır. Literatür araştırmalarının yanı sıra düzenli olarak egzersize devam eden 5 kişiye (2 kadın, 3 erkek), ''sizi egzersiz yapmaya teşvik eden nedenleri maddeler halinde yazar mısınız? ''sizi egzersiz yapmaktan alıkoyan sebepleri maddeler halinde yazar mısınız?'' soruları yöneltilerek her iki yöntem aracılığıyla elde edilen bilgilerden; içsel motivasyon, dışsal motivasyon ve motivasyonsuzluk kavramlarını içeren 39 maddelik soru havuzu oluşturulmuştur. Araştırmacılar tarafından benzer olduğu tespit edilen 3 madde araştırma taslak çalışmasından çıkartılmış ve nihai 36 soruluk madde havuzu uzmanlara yönlendirilmiştir.

Verilerin Analizi

Araştırmada elde edilen verilerin analizleri için SPSS 26.0 istatistik programı kullanılmıştır. Katılımcıların özelliklerini belirlemek için tanımlayıcı istatistikler ve geliştirilmek istenen ölçeğin geçerlilik- güvenilirlik analizleri yapılmıştır.

Bu çalışma için etik komite onayı, Erzurum Teknik Üniversitesi Bilimsel Araştırma ve Yayın Etik Kurulu'ndan (Tarih: 14.03.2024, Karar No: 15, Toplantı No:03) alınmıştır. Ayrıca çalışmaya katılan katılımcılardan yazılı onam alınmıştır.

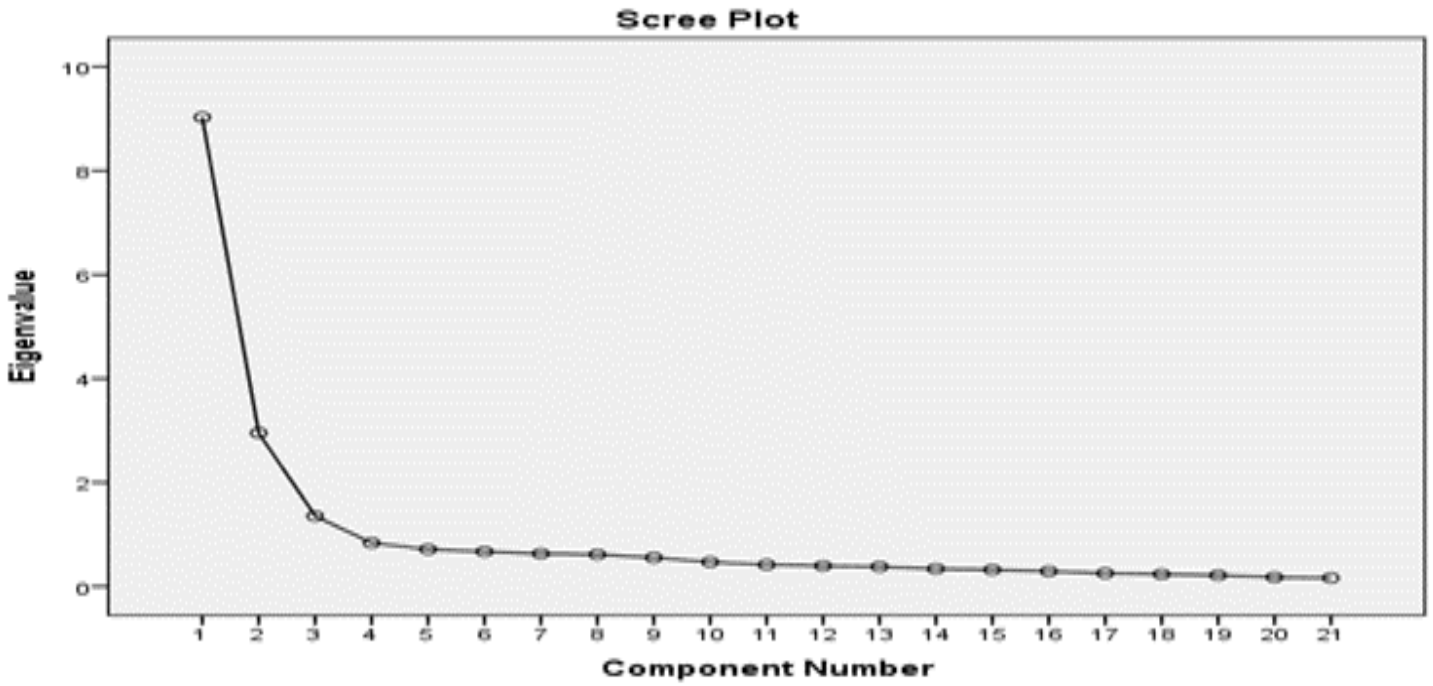
Bulgular

Kapsam Geçerliği

Anlaşılırlığının, yazılan alt boyutu yansıtıp yansıtmadığının sınanması amacıyla taslak madde havuzu (36 madde), dört spor bilimleri fakültesi akademisyenlerine (1 profesör, 2 doçent, 1 doktor), bir dil uzmanına yönlendirilmiştir. Dönütler sonrasında taslak madde havuzunun uygun alt boyutlar altında olmadığı tespit edilen maddeler (2 madde) uzmanların tavsiyesi ile uygun alt boyuta yazılmıştır. Sonraki aşamada anlaşılırlık için yalnızca çekim ekine dayalı bir maddede düzeltme yapılması dil uzmanınca tavsiye edilmiştir. Ardından pilot uygulama için 19 kişiye online olarak taslak madde havuzu yönlendirilmiştir. Pilot uygulama katılımcılarından, olası anlaşılmayan bir madde veya herhangi bir pürüz görürlerse not almaları, tarafımıza iletmeleri istenmiştir. Pilot uygulama sonunda anlaşılmayan veya pürüzlü görülen bir madde olmadığı tarafımıza iletilmiştir. Bu uygulamalar ardından madde havuzu geniş katılımcılara uygulanmak üzere online olarak Google Formlar aracılığıyla fitnes merkezlerine devam eden bireylere yönlendirilmiştir.

Açımlayıcı Faktör Analizi (AFA)

Elde edilen nihai madde havuzundaki maddeler AFA ile analiz edilmiştir. Bu bağlamda Varimaks döndürme tekniği kullanılmış ve .45 kesme değer olarak alınmıştır. Maddelerin oluşturulmasında birden fazla faktöre yük veren maddeler, kesme değer altında üstündeki ve birden fazla faktöre .10'dan fazla yük veren maddeler (15 madde) madde havuzundan çıkarılmıştır (Büyüköztürk, 2014). Yapılan işlemler sonunda EKMÖ'nün yapısı doğrulanmış, KMO (.93) ile Barlett Sphericity testi (4533.157) sonuçlarının yapı geçerliğini desteklediği görülmüştür (sd=210; *p*=.00). Bu sonuçlara kanıt olarak Şekil 1 sunulmuştur.



Şekil 1. *EKMÖ'nün yığılma grafiği*

Tablo 1.
EKMÖ'nün alt boyutları, maddeleri, faktör yük ve düzeltilmiş madde toplam korelâsyonu, varyans ve özdeğerleri

TMN		EKMÖ'nün maddeleri	Faktör Yük Değerleri	Düzeltilmiş madde toplam korelâsyonu
		İçsel Motivasyon Açıklanan Varyans Oranı 42.98 Özdeğer 9.02		
5	**1**	Egzersize katılmak stresimi azaltır.	.85	.42
12	**2**	Eklemlerimi güçlendirdiği için egzersize katılmak beni keyiflendirir.	.85	.54
14	**3**	Kanımdaki yağların normal seviyede kalmasını sağladığı için egzersize katılmaktan haz alırım.	.84	.54
7	**4**	Egzersize katılmak beni mutlu eder.	.81	.46
15	**5**	Kan şekerimin normal seviyede kalmasını sağladığı için egzersize katılmaktan haz alırım.	.80	.50
2	**6**	Egzersize katılmak beynimi boşalttığı için huzurlanırım.	.80	.61
3	**7**	Kilo sorununu ortadan kaldırdığı için egzersize katılmak beni mutlu eder.	.79	.69
11	**8**	Egzersiz katılmak beni can sıkıntısından kurtarır.	.78	.56
13	**9**	Egzersiz katılmak beni sosyalleştirdiği için neşelenirim.	.78	.74
10	**10**	Egzersize katılmaktan zevk alırım.	.74	.62
6	**11**	Egzersize katıldığımda özgürleştiğimi hissederim.	.70	.67
8	**12**	Egzersize katıldığımda kendimi ruhsal olarak dinlenmiş hissederim.	.65	.57
4	**13**	Egzersize katılmak beni negatif duygulardan uzaklaştırır.	.63	.65
		Dışsal Motivasyon Açıklanan Varyans Oranı 14.06 Özdeğer 2.95		
24	**14**	Sportif giyinmek (renkli ayakkabılar, eşofmanlar, vb.) Beni egzersize teşvik eder.	.73	.72
25	**15**	Basın yayındaki egzersizle ilgili olan haberler bende egzersiz yapma isteği uyandırır.	.70	.65
26	**16**	Ünlü sporcuların haberleri beni egzersiz yapmaya teşvik eder.	.68	.68
29	**17**	Egzersiz katıldığımda takdir edilmek egzersize katılım isteğimi arttırır.	.65	.66
		Motivasyonsuzluk Açıklanan Varyans Oranı 6.44 Özdeğer 1.35		
31	**18**	Egzersize katılmamın bana ne kazandırdığından emin değilim.	.85	.63
32	**19**	Egzersize katılmamın bana zararı veya faydası var mı bilmiyorum.	.83	.57
34	**20**	Egzersize katılıp katılmamak çok da umurumda değil.	.82	.47
36	**21**	Egzersize katılmaya motivasyonum yok.	.81	.45
		EKMÖ'nün açıklanan toplam varyans oranı	%63.48	

TMN: Taslak madde no

Tablo 1'de yapılan AFA sonucunda EKMÖ'ye ilişkin 3 faktör (içsel motivasyon, motivasyonsuzluk, dışsal motivasyon), EKMÖ maddeleri, faktör yük, düzeltilmiş madde toplam korelâsyonu, varyans ve özdeğerlerine ait bilgiler yer almaktadır. EKMÖ'nün içsel motivasyon faktörünün ilk 13 maddeden (1., 2., 3., 4., 5., 6., 7., 8., 9., 10., 11., 12., 13.) oluştuğu, dışsal motivasyon faktörünün 14., 15., 16., 17. maddelerinden oluştuğu ve motivasyonsuzluk faktörünün 18., 19., 20., 21. maddelerinden oluştuğu görülmektedir. İçsel motivasyon faktörünün açıkladığı varyans 42.98, özdeğeri 9.02; dışsal motivasyon faktörünün açıkladığı varyans 14.06, özdeğeri 2.95; motivasyonsuzluk aktörünün açıkladığı varyans 6.44, özdeğeri 1.35'tir. EKMÖ'nün toplam varyans oranı ise %63.48'dir. Literatürde açıklanan toplam varyans oranının en az %40 olması gerektiği bildirilmektedir (Creswell & Clark, 2015). Ölçeğin madde toplam korelasyon değerlerinin .42 ile .74 arasında olduğu tespit edilmiştir. Büyüköztürk (2014)'e göre madde toplam korelâsyonunun en az .30 olması gerekmektedir.

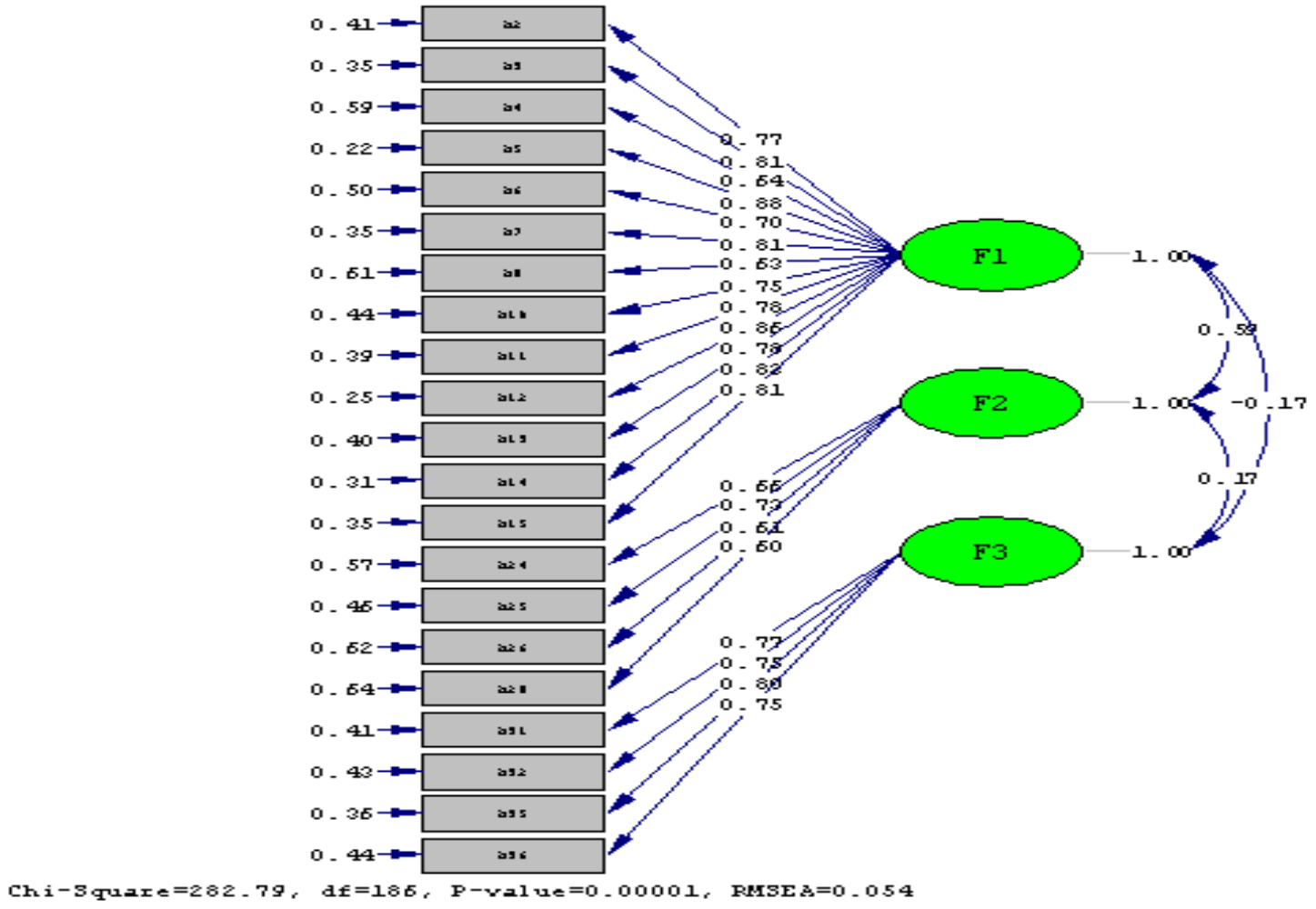
Doğrulayıcı Faktör Analizi (DFA)

Çalışmanın doğrulayıcı faktör analizine ilişkin bulgular Tablo 2'de verilmiştir.

Tablo 2.
EKMÖ'nün DFA Sonuçları

Model Uyum İndeksi	İyi Varsayılan Aralık	Kabul Edilebilir Aralık	EKMÖ
x^2 / sd	0< x^2 / sd<2	2< x^2 / sd<5	1.52
RMSEA	0.00<RMSEA<0.05	0.05<RMSEA<0.10	.05
PGFI	0.95<PGFI<1.00	0.50<PGFI<0.95	.72
PNFI	0.95<PNFI<1.00	0.50<PNFI<0.95	.85
GFI	0.85<GFI<1.00	0.90<GFI<0.95	.87
AGFI	0.90<AGFI<1.00	0.85<AGFI<0.90	.86
IFI	0.95<IFI<1.00	0.90<IFI<0.95	.99
NFI	0.95<NFI<1.00	0.90<NFI<0.95	.96
CFI	0.95<CFI<1.00	0.90<CFI<0.95	.99

EKMÖ'ye yapılan DFA sonucunda x^2/sd oranı 1.52 olarak saptanmıştır. Schermelleh-Engel ve Müler (2003) 1.52 olan x^2/sd oranını iyi varsayılan aralık olarak tanımlamaktadır. Elde edilen diğer uyum indeksleri sırası ile x^2= 360.24, sd= 249, RMSEA= .05, PGFI=.72, PNFI= .85, GFI= .87, AGFI= .86, IFI= .99, NFI= .96, CFI= .99'dur. Buna göre EKMÖ'nün yapısı iyi varsayılan aralık ile kabul edilebilir aralıktadır (Alpar, 2013). Elde edilen bu tabloya kanıt Şekil 2'de verilmiştir.



Şekil 2. *DFA Diyagramı*

Şekil 2'de F1=İçsel Motivasyon (İM), F2= Dışsal Motivasyon (DM), F3= Motivasyonsuzluk (M) faktörlerini temsil etmektedir. DFA sonucunda elde edilen alt boyutlara ilişkin açıklama şu şekildedir:

İçsel motivasyon (İM): katılımcıların egzersize katılımda içsel motivasyonlardan beslenmesidir. Egzersize katılırken bireyin iyi hissetmesi, mutlu hissetmesi gibi içsel kaynakları temsil eder.

Dışsal motivasyon (DM)n: bu alt boyut katılımcıların egzersize çevreden gelen uyarıcılardan tepkilerden beslenmesini, ödül almak, tebrik edilmek gibi dışsal kaynakları temsil eder.

Motivasyonsuzluk (M): katılımcıların egzersizin kendisine sağlayacağı faydaları algılayamamasını, egzersize katılmaya yönelik isteksiz olmasını ve egzersize katılmanın çıktılarının ne olacağına dair motive eden unsurları temsil etmektedir.

Tablo 3.
EKMÖ Güvenirlik Analizi

	İM	DM	M	EKMÖ Toplam
Cronbach Alpha	.95	.75	.85	.89
Guttman Split-Half	.90	.72	.78	.80
Spearman-Brown	.91	.73	.79	.81

Yapılan analizler sonucunda Tablo 3'de görüldüğü üzere EKMÖ'nün alt boyutlarının (İçsel Motivasyon, Dışsal Motivasyon, Motivasyonsuzluk) ve EKMÖ toplam puanının güvenirlik analiz düzeylerinin .70 ve üzerinde olduğu tespit edilmiştir. Alan yazında ölçme aracının güvenirlik düzeyinin .70 olması onun güvenilir, .80 ile 1 arasında olması ise yüksek güvenilir olduğunu göstermektedir (Tavşancıl, 2014).

Tablo 4.
Madde Analizi Sonuçları (% 27'lik üst ve alt gruplar testi)

Madde No	Faktörler	Alt % 27 Grup		Üst % 27 Grup		t	*p*
		$\bar{x}$	ss	$\bar{x}$	ss		
1.	İM	3.46	1.08	4.67	.53	-9.853	.00*
2.		3.40	1.04	4.70	.48	-11.164	.00*
3.		3.15	1.16	4.61	.56	-11.179	.00*
4.		3.32	1.06	4.76	.42	-12.440	.00*
5.		3.15	1.10	4.58	.62	-11.132	.00*
6.		3.41	1.13	4.75	.45	-10.787	.00*
7.		3.42	1.13	4.69	.59	-9.728	.00*
8.		3.39	.98	4.65	.53	-11.093	.00*
9.		3.23	1.13	4.62	.54	-10.881	.00*
10.		3.56	.98	4.71	.45	-10.523	.00*
11.		3.25	1.08	4.57	.67	-10.190	.00*
12.		3.44	1.06	4.75	.43	-11.240	.00*
13.		3.34	1.13	4.66	.60	-10.143	.00*
14.	DM	2.75	1.33	4.42	.86	-10.443	.00*
15.		2.24	1.26	4.23	.87	-12.856	.00*
16.		2.41	1.22	4.12	1.12	-10.142	.00*
17.		2.55	1.22	4.12	.91	-10.174	.00*
18.	M	1.75	1.08	2.76	1.33	-5.827	.00*
19.		1.79	.99	2.66	1.23	-5.416	.00*
20.		2.04	1.25	2.75	1.18	-4.090	.00*
21.		2.18	1.34	2.64	1.23	-2.483	.00*

Tablo 4'de EKMÖ'nün madde analizleri (% 27'lik üst ve alt gruplar arasındaki toplam puan farkı) incelenmiş ve yapılan t testi sonucunda anlamlı farklılık tespit edilmiştir. Bu anlamlılık her bir maddenin ayırt ediciliğinin olduğunu göstermektedir (Erkuş, 2014).

Tartışma

Araştırmada egzersize katılım motivasyonu ölçeğinin güvenilir ve geçerli bir ölçme aracı olup olmadığının sınanması amaçlanmış ve bu doğrultuda şu aşamalar izlenmiştir:

ESKMÖ'nün madde havuzu literatür taraması sonrasında hazırlanmış ve uzman görüşüne sunulmuştur. Elde edilen görüşler doğrultusunda pilot uygulama yapılmış ve ardından taslak madde havuzu, nihai madde havuzuna çevrilmek amacıyla geniş katılımcı kitlesine sunulmuştur.

Elde edilen veriler doğrultusunda ölçeğin yapı geçerliliği AFA ile sınanmıştır. Buna göre 3 faktörden oluşan 21 maddeli ve 5'li likertli (1 kesinlikle katılmıyorum, 2 katılmıyorum, 3 kararsızım, 4 katılıyorum, 5 kesinlikle katılıyorum) EKMÖ elde edilmiştir. EKMÖ'nün 42.98 açıkladığı varyansa ve 9.02 özdeğere sahip olan İçsel Motivasyon alt boyutu ilk 13 maddeyi içermektedir. Dışsal motivasyon faktörü 14.06 oranda varyansı açıklamakta, özdeğeri 2.95 olup 14., 15., 16., 17. maddelerinden oluşmaktadır. EKMÖ'nün ters maddelerini içeren Motivasyonsuzluk faktörü ise 6.44 oranda varyansı açıklamakta, özdeğeri 1.35 olup ölçeğin son 4 maddesinden oluşmaktadır. EKMÖ'nün toplam varyans oranı ise %63.48'dir. Ayrıca EKMÖ'nün madde toplam korelasyon değerlerinin .42 ile .74 arasında olduğu tespit edilmiştir. Yapılan AFA'nın ardından yapı geçerliğine kanıt sağlamak adına DFA yapılmıştır. Buna göre elde edilen DFA sonuçları şöyledir: x^2/sd oranı 1.52 olarak saptanmıştır. DFA'ya göre elde edilen diğer uyum indeksleri sırası ile x^2= 360.24, sd= 249, RMSEA= .05, PGFI=.72, PNFI= .85, GFI= .87, AGFI= .86, IFI= .99, NFI= .96, CFI= .99'dur. DFA sonucunda da ölçeğin uyum indekslerinin kabul edilebilir ve iyi varsayılan aralıklarda yer aldığı, her bir maddenin ölçeğin yapısını doğruladığı saptanmıştır.

Araştırmada ölçeğin güvenirlik analizleri yapılmıştır. Buna göre İçsel Motivasyon faktörünün Cronbach Alpha değerinin .95, Guttman Split-Half değerinin .90, Spearman-Brown değerinin .91 olduğu saptanmıştır. Dışsal Motivasyon faktörünün Cronbach Alpha değerinin .75, Guttman Split-Half değerinin .72, Spearman-Brown değerinin .73 olduğu tespit edilmiştir. Motivasyonsuzluk faktörünün Cronbach Alpha değerinin .85, Guttman Split-Half değerinin .78, Spearman-Brown değerinin .79 olduğu saptanmıştır. Ayrıca EKMÖ Toplam puanının Cronbach Alpha değerinin .89, Guttman Split-Half değerinin .80, Spearman-Brown değerinin .81 olduğu sonucuna varılmıştır.

Ölçekte yer alan maddelerin madde ayırt ediciliğinin tespiti için yapılan t testinde her bir madde için anlamlı farklılık elde edilmiştir. Ölçeğin maddelerinin ayırt ediciliği kanıtlanmıştır.

Sonuç ve Öneriler

Tüm yapılan analizler sonucunda EKMÖ'nün 21 madde 3 faktörden (içsel motivasyon, motivasyonsuzluk, dışsal motivasyon) ve 5'li likert tipinde, geçerli ve güvenilir bir ölçme aracı olduğu tespit edilmiştir.

Bireylerin egzersize katılım motivasyonlarını belirlemeyi amaçlayan bu ölçme aracı araştırmacılar tarafından kullanıma hazır bir ölçme aracı olarak literatüre kazandırılmak istenmiştir. Düzenli egzersize katılımın önündeki engellerin araştırılarak bireylerin egzersize katılımının artması, motivasyonlarının yükseltilmesi ve erken yaştan itibaren egzersiz bilincinin yerleşmesi için gerekli politikaların oluşturulması araştırmacıların önerileri arasındadır.

Etik Komite Onayı: Bu çalışma için etik komite onayı, Erzurum Teknik Üniversitesi Bilimsel Araştırma ve Yayın Etik Kurulu'ndan (Tarih: 14.03.2024, Karar No: 15, Toplantı No:03) alınmıştır.
Katılımcı Onamı: Yazılı onam bu çalışmaya katılan katılımcılardan alınmıştır.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları:. Fikir – S.N., G.T.D.; Tasarım – S.N., G.T.D.; Denetim – S.N., G.T.D. Kaynaklar – S.N., G.T.D.; Veri Toplama ve/veya İşleme – S.N., G.T.D.; Analiz ve/veya Yorum – S.N., G.T.D.; Literatür Taraması – S.N., G.T.D.; Yazma – S.N., G.T.D.; Eleştirel İnceleme – S.N., G.T.D.; Diğer – S.N., G.T.D.
Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmiştir.
Finansal Destek: Yazarlar, bu çalışma için finansal destek almadığını beyan etmiştir.

Ethics Committee Approval: Ethics committee approval for this study was obtained from Erzurum Technical University Scientific Research and Publication Ethics Committee (Date: 14.03.2024, Decision No: 15, Meeting No: 03).
Participant Consent: Written informed consent was obtained from the participants who participated in this study
Peer-review: Externally peer-reviewed.
Author Contributions: Concept - S.N., G.T.D.; Design - S.N., G.T.D.; Supervision - S.N., G.T.D. Resources - S.N., G.T.D.; Data Collection and/or Processing - S.N., G.T.D.; Analysis and/or Interpretation - S.N., G.T.D.; Literature Search - S.N., G.T.D.; Writing Manuscript - S.N., G.T.D.; Critical Review - S.N., G.T.D.; Other - S.N., G.T.D.
Conflict of Interest: The authors have no conflicts of interest to declare.
Financial Disclosure: The authors declared that this study has received no financial support.

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ATATURK UNIVERSITY PUBLICATIONS

Research Article *Araştırma Makalesi* DOI: 10.62425/rses.1489665

The Effects of Opium Seed Oil Massage on Oxidant-Antioxidant Status and Biochemical Parameters

Haşhaş Yağı Masajının Oksidan-Antioksidan Statü ile Bazı Biyokimyasal Parametreler Üzerine Etkilerinin Araştırılması

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ABSTRACT

In this study, it was aimed to examine the effects of oxidant-antioxidant status and massage applicati on swith opium oil on some blood values. After the study, the question of whether opium oil can be used as aromatrapic massage oil was sought to be answered. Thirty healthy women between the ages of 18-25 participated in thestudy. Ten of the participants were divided as control group, 10 as vaseline group and 10 as poppy oil group. Vaseline and poppy oil groups received general massage for an average of 30-40 minutes 3 days a week for 8 weeks. Blood was taken 4 times from all groups. The fatty acids of the opium oil to be used before the massage were analyzed. Covariance analysis was used by making normality distribution in statistical analysis. Tukey-Kramer test was used for group differences. The level of significance was set at *p* .05. There were statistically significant differences in biochemical and hematological values between the groups (*p* <.05). As a result, it has been observed that massage with opium oil increases HDL values and increases the Dopamine hormone. it was seen that it caused a significant decrease in WBC, MPV and Basophil level samong hematological parameters, significantly decreased the MDA level in the Vaseline group, and the massage application with petroleum jelly significantly reduced the level of DNA damage. New research is needed to use opium oil as a massage oil.

Keywords: Opium oil, Massage, Aroma therapy, Hematology, Treatment, Oxidative stres

ÖZ

Bu araştırma da oksidan-antioksidan statü ile haşhaş yağı ile yapılan masaj uygulamaların bazı kan değerleri üzerine etkisinin incelenmesi amaçlanmıştır. Araştırma öncesi gerekli izinler alınmıştır. Araştırmaya yaşları 18-25 yaş arası olan 30 sağlıklı kadın katıldı. Katılımcıların 10'u kontrol grubu, 10'u vazelin grubu ve 10'u da haşhaş yağı grubu olarak ayrıldı. Vazelin ve haşhaş yağı gruplarına 8 hafta boyunca haftada 3 gün ortalama 30-40 dakika genel masaj uygulandı. Tüm gruplardan 4 kez kan alındı. Alınan kan değerlerinden biyokimyasal, hematolojik parametreler, DNA hasarı, bazı vitamin değerleri incelenmiştir. İstatistiksel analizlerde normallik dağılımı yapılarak Kovaryans analizi kullanılmıştır. Grup farklılıkları için Tukey-Kramer testine bakıldı. Anlamlılık düzeyi *p* ,05 olarak belirlendi. Gruplar arası biyokimyasal ve hematolojik değerlerde istatistiksel olarak farklılıklar görülmüştür (*p* <,05). Sonuç olarak afyon yağı ile yapılan masajın HDL değerlerini yükselttiği ve Dopamin hormonunu arttırdığı gözlemlenmiştir. Hematolojik parametrelerden WBC, MPV ve Bazofil düzeyinde önemli bir azalmaya neden olduğu, vazelin grubunda MDA düzeyini önemli ölçüde azalttığı, birlikte vazelinle gerçekleştirilen masaj uygulamasının DNA hasar düzeyini önemli ölçüde azalttığı görülmüştür. Haşhaş yağının masaj yağı olarak kullanılması için yeni araştırmalara ihtiyaç vardır.

Anahtar Kelimeler: Haşhaş yağı, masaj, Aromaterapi, Hematoloji, Tedavi, Oksidatif stres.

Geliş Tarihi/Received 25.05.2024
Kabul Tarihi/Accepted 11.11.2024
Yayın Tarihi/Publication Date 25.12.2024

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Cite this article: Ocak, Y., Fidan, A.F., Dündar, Ü., Başpınar, S.G., & Kurt, M. (2024). The effects of opium seed oil massage on oxidant-antioxidant status and biochemical. *Research in Sport Education and Sciences, 26*(4), 187-196.

Introduction

Throughout history, both medicinal and recreational use of opium has attracted more attention and other forms of use have been overshadowed. In fact, in the regions where opium is grown, the use of its seeds, oil and pulp is so intertwined with daily life that today it is the basic element of the food and nutrition culture of those regions (Arslan et al., 2000). Seeds should also be used since opium cultivation is economical, The seeds and the oil obtained from the seeds do not have narcotic properties (Azcan at al., 2004; Kapoor, 1995). The valuable seed oil is widely used as edible cooking oil and in the production of high-quality paints, varnishes and cosmetics. Its pulp is used as animal feed. Oil contents vary significantly depending on the origin and color of the seeds. Reported oil content values of seeds range from 41.4-49.1% in India, 47.0-53.0% in Pakistan and 44.0-57.0% in Turkey (Azcan et al., 2004). The fatty acid compositions of oils vary greatly even in seed samples from the same region. Determined the fatty acid compositions of opium seeds produced in Turkey by GC/MS and found the main components to be 56.4-69.2% linoleic and 16.1-19.4% oleic and 10.6-16.3% palmitic depending on the color of the seeds (Azcan et al., 2004). The composition of opium oil contains 62-72% linoleic acid and 15-20% oleic acid, which are unsaturated fatty acids and 4.8-9.5% palmitic acid and 2-2.9% stearic acid which are saturated fatty acids. The oil has a laxative effect internally and a skin nourishing effect externally. It is used as massage oil in aromatherapy. It is an oil rich in omega fatty acids. In addition, its seeds contain vitamins and minerals that are beneficial to human health (Arslan, 2009). Complaints such as acne, itching, allergies, and increased body hair are generally reported due to the use of baby oil, olive oil and massage oils in massage practice classes. Based on this information, this study aims to investigate the effects of opium oil massage on oxidant-antioxidant status and some biochemical parameters.

Methods

A total of 30 healthy volunteer women between the ages of 18 and 25 participated in this research at Afyon Kocatepe University Sports Sciences massage parlour. Before the research, ethics committee approval was received from Osmangazi University Clinical Research ethics committee with decision no. 05 dated 08.06.2016. Verbal consent was obtained from all participants who participated in the study. In the study, participants were given a classical Swedish massage, also known as manual hand massage. Before the study, the participants were questioned about their use of any medication, history of surgery, injury, etc., and whether they were taking antioxidant supplements. Participating women were given arm, neck, leg, back, and superficial abdominal massage (optionally) during the menstrual period.

Table 1.
Distribution of participant groups

Groups	N	Application protocols
Control Group (C)	10	Massage was not applied.
Liquid Vaseline Massage Group (VM)	10	Classic Swedish massage, known as manual hand massage, was applied to the participants in the VM group, 3 sessions a week (Monday-Wednesday-Friday) for 8 weeks, for a total of 24 sessions, using Liquid Vaseline (30-40 minutes).
Opium Oil Massage Group (PM)	10	Classic Swedish massage, known as manual hand massage, was applied to the participants in the PM group, 3 sessions a week (Monday-Wednesday-Friday) for 8 weeks, for a total of 24 sessions, using opium oil (30-40 minutes).

Table 1 shows distribution of participant groups. Blood samples were taken from the participants in all groups a total of 4 times: on the 1st week, 1 day before and 1 day after the 1st session, on the 4th week after the 12th session, and on the 8th week after the 24th session.

Taking Blood Samples: Blood samples were taken from the antecubital vein by an expert in this field, in accordance with the technique. Blood samples were collected into EDTA and serum tubes. Some of the blood samples are reserved for hematological parameters. Serum and plasma of the remaining blood samples were removed in accordance with the technique and placed in Eppendorf tubes and stored at -80 °C until the day of analysis.

Hematological parameters, biochemical parameters (Vit D, Vit E, ALT, AST, CK, total protein, Lactic Acid, Glucose, Cholesterol, HDL, LDL, Cortisol, Seratonin, Dopamine) and markers of Oxidant-Antioxidant status (Malondialdehyde (MDA), Reduced Glutathione (GSH), Total Antioxidant Status (TAS), Total Oxidant Status (TOS), Protein oxidation (PCO), DNA damage (8-OHdG), NOx) were investigated in the blood samples.

Determination of the Fatty Acids Composition of Opium Oil

Table 2.
Gas Chromatography/Mass Spectrometry (GC/MS) Conditions

System: Agilent 7890B GC 5977B Mass Selective Dedector System
Column: Agilent HP-Innowax (60 m, 0.25 mm inner diameter, 0.25 µm film thickness)
Injection Temperature: 250°C
Ion source temperature: 230°C
Ionisation mode: EI
Electron energy: 70 ev
Mass range: 35- 450 m/z
Temperature programme: 60°C (10 min), 4°C/min. 220°C (10 min) 1°C/min 240°C (20 min), Total 100 min

Determination of Vitamin E and D amounts in Opium Oil

Vitamin E and D amounts of opium oil were determined with the Waters Acquity UPC2 system, which was carried out at AÜBİBAM. Detection and quantification of the substance was made according to mass spectrum (QDA). A 5% solution of the sample was prepared with tert-Butyl methyl ether and 2 µL was injected into the system.

Table 3.
Chromatographic Conditions for Determination of Vitamin E and D Amount of Opium Oil

System: WatersAcquity UPC2
Column: WatersAcquity UPC2 C18 1.9µm (3.0x150 mm)
Column Temperature: 40 ºC
Mobile phase: % 98 CO2- % 2 ACN 1.0mL/dk
Back pressure: 1650 psi
Injection Temperature: 15ºC
Detector: 1) PDA 3 Size: 210-500 nm scanning Probe temp: 600ºC
Size: 294 nm Ion source temperature: 100ºC
QDA: Electron energy 15 V
Capillary voltage: 0.8kV
Mass range: 100-650
Ionisation mode: Positive
Carrier solvent MeOH0.3mL/min

Hematological Parameters

Hematological analyzes were carried out at Afyon Health Sciences University, Faculty of Medicine, Department of Biochemistry. Measurement of hematological parameters was performed on the Mindray BC-6800 hematology analyzer using Mindray brand commercial kits (Mindray Bio-Medical Electronics Co., Ltd., Shenzhen, China).

Biochemical Parameters

Vit D, Vit E, ALT, AST, CK, Total protein, Lactic Acid, Glucose, Cholesterol, HDL, LDL, Cortisol, Seratonin, Dopamine levels in blood samples were carried out at Afyon Health Sciences University Faculty of Medicine Department of Biochemistry.

Statistical analysis

All data in the study were analyzed with a mixed model (PROC MIXED) within the SAS package program (version 9.4, SAS Institute, Cary, NC). While the random effect is determined as the participant (person) in the model, fixed effects application were determined as time and application × time interaction. The values of each parameter determined before the study were selected as covariants for the relevant parameter. Additionally, Body mass index (BMI) was determined as a covariate for each subject. Since no statistical difference was detected between the groups between the subject ages ($p<0.05$), it was not included in the model as a covariateBoth covariates and their interactions with each other were included in the model and if it did not affect the model ($p<.10$), it was removed from the model by step wise back ward elimination as reported by Firkins et al., (2001). Degrees of freedom were calculated with the BW (Between-within degrees of freedom) command under the MODEL subcommand of the SAS program. Distribution of the data was checked with Kolmogorov-Smirnov and Shapiro-Wilk tests under the PROC UNIVARIATE command. Logarithmic transformation was applied to data that was not normally distributed. In addition, residual values have been normalized (stundentized residuals) to ensure normalization in all data. Marginal values (outliers) in the residual values of the observations were determined as <-4 and >4. Once an outlier was identified, it was removed from the analysis. As reported by Çetin and Bek (2019) the covariance structure of the model was chosen as the Exponent of Distance (SP POW) for samples with equal numbers but unequal intervals over time. the PDIFF command was used in the SAS program as a post hoc test to determine which group caused the difference. Tukey-Kramer correction was applied to the obtained significance values. In the tables, data are expressed as least squares mean (LSMEANS) ± SEM. In the analyses, the significance level was taken as $p<.05$.

Results

When the fatty acid content of opium oil was examined in the study, the highest rate was 67.7% linolenic acid. This was followed by oleic acid (18:1) with 19.2%; ω-9 and palmitic acid (16:0) with 8.1%.

Table 4
Fatty Acids Composition of Opium Oil

No	Compound *	Relative Percentage (%)
1	Hexadecanoic acid (= Palmitic acid); (16:0)	8.1
2	Octadecanoic acid (=Stearic acid); (18:0)	2.6
3	(Z)-9-Octadecenoic acid (=Oleic acid); (18:1); ω-9	19.2
4	(E)-9-Octadecenoic acid (=Elaidic acid); (18:1); ω-9	0.9
5	(Z,Z)-9,12-Octadecadienoic acid (=Linoleic acid); (18:2);ω-6	67.7
6	(Z,Z,Z)- 9,12,15-Octadecatrienoic acid (=linolenic acid); (18:3); ω-6	0.5
7	Eicosanoic acid (=Arachidic acid); (20:0)	0.2
8	Docosanoic acid (=Behenic acid); (22:0)	0.3
Total		**99.5**

* ≥ % 0.2

Table 4 shows fatty acids composition of opium oil. According to the vitamin E and vitamin D analysis results of the opium oil used in the study, it was determined that the sample contained 0.16% (mg/100mg) Vitamin E. Vitamin D was not detected in the sample.

Table 5
Hematological Parameters

Parameter	Experimental Groups				Values		
	Control	Vaseline	Opium	SEM	Application	Time	Application*Time
WBC (x10⁹/L)	6,1911[ab]	6,8260[a]	5,7759[b]	0,3291	0,0244	0,5218	0,8322
MCV	86,6333	86,7163	88,7758	2,2550	0,7603	0,764	0,8670
MON (x10⁹/L)	0,4006	0,4370	0,4021	0,02482	0,5610	0,6207	0,7807
MON%	6,3454	6,8613	6,5398	0,3479	0,5735	0,6965	0,8560
HGB	13,4654	13,1252	12,8281	0,2588	0,3314	0,3482	0,0890
HCT (%)	42,2260	41,4401	40,1108	0,6285	0,0603	0,1762	0,3983
PLT (x10⁹/L)	245,88	216,19	251,52	15,3555	0,4819	0,5064	0,3868
MPV (fL)	11,1277[a]	10,4918[ab]	10,1572[b]	0,2089	0,0413	0,0001	0,1255
PDW	15,0133	14,5025	14,6659	0,1686	0,3969	<.0001	0,1111
PCT (%)	0,2603	0,2343	0,2561	0,01559	0,5974	0,6790	0,1045
BASO	0,0394[a]	0,03718[a]	0,02515[b]	0,003566	0,0350	<.0001	0,4353
BASO%	0,6014	0,5832	0,4182	0,06126	0,1191	<.0001	0,6785
EOS	0,1872	0,1486	0,1348	0,02951	0,7341	0,6070	0,4685
EOS%	2,4112	2,0890	1,4493	0,3514	0,2208	0,9360	0,2396
LYM (x10⁹/L)	2,4205	2,0248	1,9363	0,1380	0,0519	0,2138	0,2297
LYM%	38,1424	31,6447	33,2295	1,6508	0,1677	0,8073	0,2908
MCH	27,5242	27,2197	28,4303	0,9113	0,6309	0,9320	0,8546
MCHC	31,5446	31,6757	31,9697	0,3434	0,7284	0,6414	0,6014
NEUT	3,1895	4,1049	3,5696	0,2381	0,1732	0,9141	0,9018
RDW_CV	14,0397	13,6266	13,5061	0,3264	0,5584	0,6474	0,5019
RDW_SD	41,9277	40,6495	41,7879	0,7511	0,4655	0,4866	0,6503

[a,b]:Different letters in the same line represent statistically significant differences. WBC: White Blood Cell Count; MCV: Mean Corpuscular Volume; MON: Monocyte Count; MON%: Monocyte Percentage; HGB: Hemoglobin; HCT (%): Hematocrit; PLT: Platelet Count; MPV (fL): Mean Platelet Volume; PDW: Platelet Distribution Width; PCT (%): Plateletcrit; BASO: Basophil Count; BASO%: Basophil Percentage;EOS: Eosinophil Count; EOS%: Eosinophil Percentage; LYM (x10⁹/L): Lymphocyte Count; LYM%: Lymphocyte Percentage; MCH: Mean Corpuscular Hemoglobin; MCHC: Mean Corpuscular Hemoglobin Concentration; NEUT: Neutrophil Count; RDW_CV: Red Cell Distribution Width - Coefficient of Variation; RDW_SD: Red Cell Distribution Width - Standard Deviation.

When the Leukocyte Count (WBC) was examined, it was found to be 6.19 x109/L in the control group, 6.82 x109/L in the vaseline group and 5.77 x109/L in the opium group. When all periods of the study are evaluated together and looked at overall, there is a significant difference in WBC value between the groups (p=.02). While both treatment groups showed no difference compared to the control; The Vaseline group had a significantly higher WBC value than the Opium group. Although there is a total effect of the application according to all times of the study, the change in WBC values over time is not significant (p=.52). Additionally, since the changes over time were not significant in the study, there was no application × time interaction (p=.83) as expected.

Table 6
Biochemical parameters

Parameter	Experimental Groups				Values		
	Control	Vaseline	Opium	SEM	Application	Time	Application*Time
MDA (nmol/ml)	54,8022[a]	39,8763[b]	45,4922[ab]	3,7173	0,0320	0,2418	0,1139
GSH (µmol/L)	25,3221	24,7031	25,7865	0,6065	0,6988	<.0001	<.0001
NO (nmol/ml)	3,6566	5,4132	3,9974	0,7711	0,4627	0,8995	0,0675
TAS (mmolTroloxEquiv./L)	0,8037	0,7299	0,6922	0,03437	0,0980	0,1121	0,1849
TOS (µmol H2O2Equiv./L)	10,9616	9,5512	9,4228	0,4877	0,0737	0,0002	0,0001
PC (ng/mL)	13,5978[b]	25,4294[ab]	32,5159[a]	3,5301	0,0147	0,7801	0,0562
OHdG (ng/mL)	3,1738[a]	1,6733[b]	2,6395[ab]	0,3724	0,018	0,120	0,870
AST (U/L)	17,8124	16,3076	15,7722	0,5196	0,0830	0,0245	0,0342
ALT (U/L)	12,5158	12,5288	11,3745	0,5586	0,2875	0,3187	0,3763
Total Cholesterol (mg/dl)	144,96	145,42	148,02	2,7944	0,0854	0,2091	0,1896
HDL (mg/dl)	55,2937[ab]	53,5804[b]	56,8504[a]	0,8532	<.0001*	0,0819	0,1739
LDL (mg/dl)	95,6786	94,1450	99,8762	2,7378	0,3423	0,4666	0,3995
Glucose (mg/dl)	77,6745	82,7381	80,5191	1,3057	0,0766	0,0777	0,2647
Cortisol (µg/dl)	13,9122	13,9044	11,548	0,7800	0,3888	0,3825	0,1403
Dopamine (ng/L)	174,7700	160,4000	218,4300	11,4301	0,0733	0,0020	0,0226
Serotonin (ng/ml)	70,6384	94,8680	108,86	4,3528	0,1125	0,1734	0,0010
CK (U/L)	78,2759	89,6772	86,1048	8,3913	0,5675	0,4778	0,9382
Creatinine (mg/dl)	0,6873a	0,6314b	0,6397b	0,01598	0,0392	0,0047	0,0773
Lactate (mg/dl)	49,8702b	58,775a	57,0188b	2,2949	0,0359	<.0001	<.0001
VitE (nmol/ml)	29,1296	30,0494	30,8623	1,1892	0,6110	0,1942	0,0651
VitD (ng/ml)	11,7317	13,0202	12,3657	0,6842	0,4774	0,0002	<.0001

[a,b]:Different letters in the same line represent statistically significant differences.*p <,05. MDA: Malondialdehyde; GSH: Glutathione; NO: Nitric Oxide; : Total Antioxidant Status; TOS :Total Oxidant Status; PC :Protein Carbonyl; OHdG : 8-Hydroxy-2'-deoxyguanosine; AST : Aspartate Aminotransferase; ALT :Alanine Aminotransferase HDL: High-Density Lipoprotein Cholesterol; LDL: Low-Density Lipoprotein Cholesterol;CK: Creatine Kinase; VitE :Vitamin E; VitD : Vitamin D

When malondialdehyde (MDA) levels, one of the lipid peroxidation indicators measured in our study, were examined, It was found to be 54.80 nmol/ml in the control group, 39.87 nmol/ml in the vaseline group and 45.49 nmol/ml in the opium group. While serum MDA concentration decreased significantly in the vaseline group compared to the control group (p=.03), the opium group was similar to the other two groups. While serum MDA concentration decreased significantly in the vaseline group compared to the control group (p=.03); The opium group was similar to the other two groups.

When protein carbonyl (PCO) levels, which are one of the markers that reflect oxidative stress status well as a complication of experimental diabetes, are examined, It was found to be 13.59 ng/mL in the control group, 25.42 ng/mL in the vaseline group and 32.51 ng/mL in the opium seed group. Although the application showed a significant difference on PC (p=.01), there was no time (p=.78) and application × time interaction (p=.05). While PC concentration increased significantly in the opium group compared to the control group (p=.01), the vaseline group was similar to the other two groups.

When this marker, used as a measure of DNA damage, was examined, it was found to be 3.17 ng/mL in the control group, 1.67 ng/mL in the vaseline group and 2.63 ng/mL in the opium seed group. The application showed a significant difference on OHdG (p=.01). While OHdG concentration decreased significantly in the vaseline group compared to the control group; The opium group was similar to the control group. It was not observed that the values fluctuated over time in both the control group and the application groups.

Discussion

Opium (Papaver somniferum L.) has been cultivated since ancient times because it is rich in oil. The opium obtained from the seeds and scraped seeds are capsules. Alkaloids from opium capsules and straw are widely used in the pharmaceutical industry, its seeds are widely used in various bakery products (Bernath, 1998; Singh et al., 1998). It is recognized that it significantly changes people's biochemistry, both immediately after massage sessions and throughout massage therapy treatment periods (Field et al., 2005). There are many studies in the literature examining the effects of massage on biochemical parameters and the effects of acute exercises on oxidative stress (Karabulut et al., 2013).

Özkan and Baydar (2006), determined the fatty acid composition of Opium (papaversomniferum l.) seeds in different colors in the following ranges: 70.94-73.15% linoleic acid, 13.56-14.61% oleic acid, 10.68-12.15% palmitic acid, 1.13-1.97% stearic. acid and 0.29-0.70% linolenic acid. In our study, the highest fatty acid content of opium oil, which is preferred as massage oil, was 67.7% linolenic acid ω-6. This was followed by oleic acid (18:1) with 19.2%; It was followed by palmitic acid (16:0) with ω-9 and 8.1%. However, while the vitamin E level of the opium oil used in the study was determined as 0.16% (mg/100mg), Vitamin D was not detected.

Our data obtained in the study show that opium oil, which is preferred as massage oil, contains high amounts of omega 6 fatty acids. The main active ingredient and source of ω-6 fatty acids taken in sufficient amounts through diet is linoleic acid (LA). As a result of the metabolism of linoleic acid, dihomo-gamma-linoleic acid (DGLA) and arachidonic acid are formed. Omega-6 fatty acids have been shown to protect skin health and regulate body temperature and water loss. Due to excessive amounts of omega-6 fatty acids in the blood, arteriosclerosis, thrombosis, rheumatoid arthritis or vision problems occur. The effects of omega-6 fatty acids on health can generally be listed as "inflammatory, hyperalgesic, thrombotic, mitogenic" (Watkins, 1991).

The ratio of omega-6 and omega-3 fatty acids in the body is very important. It has been reported that omega-3 fatty acids can inhibit lipid peroxidation in OA (osteoarthritis) by acting as antioxidants (Tayyebi-Khosroshahi et al., 2010; Sakata et al., 2015). However, it has been stated that the benefits of omega-3 fatty acids are affected by omega-6 fatty acids, which have pro-inflammatory properties. The reason for this is that eicosanoids synthesized from omega-3 fatty acids compete with omega-6 fatty acids and have opposing functions. The level of both fatty acids in the blood is determined by the intake from the foods consumed, so it is important to maintain the ratio balance between the intake of omega fatty acids, the ideal ratio is approximately 1-4:1. In ideal diet, the ratio is desired to be between 5:1 and 10:1 (Simopoulos, 2008). However, in today's world, due to the increase in the consumption of vegetable oils such as margarine, omega-6 intake has increased and this ratio has changed between 10:1 and 50:1 (Turan et al., 2013). Nowadays, it has been reported that changes in the society's diet may cause inflammation and oxidative stress, causing a tendency for this rate to increase (Calder, 2012; Simopoulos, 2016; Patterson et al., 2012; Yang et al., 2016).

Oxidative stress describes the disruption of the prooxidant-antioxidant balance in the body and tissues in favor of prooxidants. The formation of reactive oxygen species, known as prooxidants, is a natural consequence of normal aerobic life. A portion of ROS is needed for the development of normal cell function, provided that the oxidation of each molecule returns to the reduced state. The existence and development of cells in oxygen-containing environments is not possible

without powerful antioxidant enzymes and non-enzyme antioxidant systems. Prooxidants, which are constantly formed in aerobic life, must be regularly absorbed by antioxidants and balanced by consumption. Otherwise, oxidative damage occurs and pathophysiological events may occur with its accumulation. Excessive ROS production can overwhelm the body's natural antioxidant defense system, causing lipid peroxidation and damage to DNA and cell membranes (Sies et al., 2016; Mukhoirotin, 2020).

Yang et al. (2016) found that MDA levels increased as the ratio of omega-6/omega-3 fatty acids increased. To achieve an optimal ratio between the intake of omega-6 and omega-3 fatty acids, he emphasized the importance of increasing the consumption of dietary sources of omega-3 fatty acids (Angelia et al., 2019). Tourtas et al., (2011) reported that both omega-3 and omega-6 fatty acids have antioxidant effects on human TM (TrabecularMeshwork) cells exposed to oxidative stress. They stated that omega-6 fatty acids have a stronger suppressive antioxidative effect. As a result, they argued that a combined treatment could maximize the protective effect. Both ω-3 and ω-6 fatty acids are important for human health. Studies draw attention to the importance of taking these fatty acids in a certain ratio and maintaining the balance between them. In the analysis of the opium oil used in our study, it comes to mind that the high level of ω-6 fatty acid may have an effect on the changes in the parameters explained below.in our study, MDA, GSH, NO, TAS, TOS, PC and OHdG levels, which are oxidative stress markers, were investigated. The data revealed that there was no statistical change in NO and TAS levels between all 3 groups, neither in terms of application time nor time x application interaction. However, when the MDA levels of the groups are considered, it is seen that the MDA levels of the control group are numerically higher than the other groups. The data obtained showed that massage application significantly reduced MDA levels, however, massage application with opium oil did not change MDA levels and was at the level of the control group. This revealed that the massage applied in the study significantly reduced the lipid peroxidation level, while the massage applied with opium oil did not affect lipid peroxidation. Veiskaramyan et al. (2021) in a study they conducted on acute coronary syndrome patients, stated that aromatherapy with Melissa essential oil had a positive effect on stress and hemodynamic parameters. When the PC levels of the groups are examined, it is seen that the PC levels of the control group are numerically lower than the other groupsThe data obtained show that the massage application did not statistically change the PC level, but it was at the level of the control group. However, it has been observed that massage with opium oil increases PC levels statistically. This shows that the massage application with opium oil increases the protein oxidation level, but the massage application using vaseline as a lubricant does not affect the protein oxidation levels statistically. Additionally, PC levels did not differ over time or in terms of application x time interaction. OHdG levels differed between groups, and the decrease in the vaseline group compared to the control group was statistically significant. On the other hand, there is a similarity between the control group and the opium group, and the numerical decrease in the opium group is not statistically significant. These results revealed that massage with vaseline had a significant reducing effect on DNA damage in the subjects, while massage with opium seed caused a numerical decrease that was not statistically significant.

Changes in total cholesterol, HDL and LDL cholesterol levels are lipid profile indicators. In our study, no statistical change was found between groups in total cholesterol and LDL levels. In addition, a statistical difference was detected between the groups in the levels of HDL cholesterol, which has an important role in the reverse transport of cholesterol to the liver and has antioxidant, anti-inflammatory and endothelial function regulating effects (Kızılaslanoğlu & Güven, 2011) and the HDL level in the opium group increased significantly compared to the vaseline group. This reveals that massage with opium oil significantly increases the HDL level. In addition, HDL levels did not differ depending on time nor in terms of application x time interaction.

White blood cells (WBC) are divided into 5 main groups; these are phagocytic polymorphonuclear leukocytes (neutrophils), eosinophils, basophils, mononuclear phagocytes (monocytes) and lymphocytes (Bello, 2001). When WBC values were examined in our study; There was a significant difference in WBC values between groups. While both treatment groups showed no difference compared to the control; The Vaseline group had a significantly higher WBC value than the Opium group. However, the smallest numerical value among the groups was recorded in the opium group. Although there is a total effect of the application according to all times of the study, the change in WBC values over time is not significant. In addition, since time-dependent changes were not significant in the study, no application × time interaction was found as expected. In addition, there were statistically significant differences between the groups in basophil levels and MPV values, which are indicators of average platelet volume. Considering all periods of the study in total, the MPV value in the Control group was significantly higher than in the Opium; The Vaseline group was similar to the other two groups. It has been

observed that massage using opium oil significantly reduces the MPV level. When the basophil level is examined; It was observed that the basophil levels of the opium group were significantly lower than both the control and vaseline groups.

Conclusion and Recommendation

In this study, it was aimed to investigate the effects of Opium Oil Massage on Oxidant-Antioxidant Status and Some Biochemical Parameters. As a result, when the situation is evaluated based on the hematological and biochemical parameters evaluated in the research, massage application with opium oil caused a significant decrease in the hematological parameters WBC, MPV and Basophil levels and did not cause a significant change in the level of MDA, one of the lipid peroxidation indicators evaluated in the study, and massage applied with opium oil did not affect lipid peroxidation, however, it has been found that massage with vaseline significantly reduces MDA levels.

It can be said that the 0mega 3 and Omega 6 acids in opium oil do not have an antioxidative effect by reducing the MDA level. At the same time, although it was revealed that it significantly increased the protein oxidation level, massage application using vaseline as a lubricant did not statistically affect the protein oxidation levels, although it reduced the OHdG levels numerically below the control group levels, this decrease was not significant, however, it was observed that the massage application with petroleum jelly significantly reduced the level of DNA damage. It was observed that the average HDL level decreased significantly (opium oil statistically increased the HDL average value compared to the vaseline group) compared to the control group members who did not receive massage and the subjects who received massage with vaseline. This may be thought to be due to the high fatty acid content in opium oil. It showed that massage had a significant reducing effect on DNA damage in the application group, and that massage with opium oil caused a numerical decrease that was not statistically significant. It was observed that opium oil statistically increased the HDL average value compared to the vaseline group. This may be thought to be due to the high fatty acid content in opium oil. The same decrease, which caused a significant decrease in creatinine levels, was also seen in the massage application with vaseline. It was observed that there was an increase in the average value of dopamine hormone in the group receiving opium oil massage, although it was not statistically significant compared to the other groups.

As a result, it has been observed that massage with opium oil increases HDL values and increases the Dopamine hormone. In addition, no special analgesic effect was found. In order to use opium oil as massage oil, more comprehensive studies are needed to determine the effects of massage applications with opium oil on metabolic mechanisms.

Etik Komite Onayı: Bu çalışma için Eskişehir Osmangazi Üniversitesi Klinik Araştırmalar Etik Kurulu'ndan 08.06.2016 tarih ve 05 sayılı karar ile etik kurul izni alınmıştır.
Katılımcı Onamı: Çalışmaya katılan tüm katılımcılardan sözlü onam alınmıştır.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları: Fikir-SGB; Tasarım-SGB, YO; Denetleme-YO, SGB, ÜD; Kaynaklar-MD, SGB, AFF; Veri Toplanması ve/veya İşlemesi YO, SGB; Analiz ve/ veya Yorum-AFF, MD, YO, SBG; Literatür Taraması- AFF, MD, YO, SBG; Yazıyı Yazan; AFF, MD, YO, SBG
Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmiştir.
Finansal Destek: Bu çalışma Afyon Kocatepe Üniversitesi Bilimsel Araştırma Projeleri Komisyonu tarafından 17.TEMATİK.06 kimlik numarası ile desteklenmiştir.

Ethics Committee Approval: For the study, Ethics committee permission was obtained from Eskişehir Osmangazi University Clinical Research Ethics Committee with the decision dated 08.06.2016 and numbered 05.
Participant Consent: Verbal consent was obtained from all participants who participated in the study.
Peer-review: Externally peer-reviewed.
Author Contributions: : Idea-SGB; Design-SGB, YO; Supervision-YO, SGB, UD; Sources-MD, SGB, AFF; Data Collection and/or Processing-YO, SGB; Analysis and/or Interpretation-AFF, MD, YO, SBG; Literature Review- AFF, MD, YO, SBG; Manuscript Writing-; AFF, MD, YO, SBG
Conflict of Interest: The authors have no conflicts of interest to declare.
Financial Disclosure: This study was supported by Afyon Kocatepe University Scientific Research Projects Commission with the identification number 17.TEMATİK.06.

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ATATÜRK ÜNİVERSİTESİ YAYINLARI
ATATURK UNIVERSITY PUBLICATIONS

Research Article *Araştırma Makalesi* DOI: 10.62425/rses.1517401

Analysing Winter Olympic Medals Through Economic Variables: A Comprehensive Examination

Ekonomik Değişkenler Açısından Kış Olimpiyat Madalyalarının İncelenmesi: Kapsamlı Bir İnceleme

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ABSTRACT

The impact of economic development holds considerable significance across various domains, including the realm of sports, which has been extensively explored in existing literature. To establish this relationship between Olympic performance and economic factors, an examination was conducted on the medals obtained by countries during Winter Olympic Games spanning the game period from 1960 to 2018. The results of the Pedroni cointegration test signify the presence of a robust co-integration relationship across all test statistics conducted The Panel ARDL analysis reveals that Real GDP emerges as the singular influential factor affecting countries' medal scores in the long term, achieving statistical significance at the 1% level. Additionally, labor compensation exerts a discernible impact, albeit at a 10% significance level. Notably, in the short term, none of these variables exhibit any influence on medal scores, a finding corroborated by the results from the panel PMG analysis. Furthermore, among all variables examined, only Real GDP demonstrates Granger causality concerning medal scores. In contrast, none of the other variables exhibit a Granger causative relationship with medal scores. This profound insight underscores the specific and substantial role played by Real GDP in shaping the dynamics of medal scores, highlighting its unique influence on medal success.

Keywords: Economic growth, olympic, olympic medals, olympic performance, winter olympic games

ÖZ

Ekonomik kalkınmanın etkisi, spor alanı da dahil olmak üzere çeşitli alanlarda büyük önem taşımaktadır. Bu nedenle mevcut literatürde kapsamlı bir şekilde incelenmiştir. Olimpik performans ile ekonomik faktörler arasındaki ilişkiyi kurmak amacıyla, 1960'tan 2018'e kadar Kış Olimpiyatlarında ülkelerin kazandığı madalyalar incelenmiştir. Pedroni eşbütünleşme testi sonuçları, gerçekleştirilen tüm test istatistiklerinde güçlü bir eşbütünleşme ilişkisinin varlığını göstermektedir. Panel ARDL analizi, uzun vadede ülkelerin madalya skorlarını etkileyen tek faktörün reel GSYİH olduğunu ve bu etkinin %1 düzeyinde istatistiksel olarak anlamlı olduğunu ortaya koymaktadır. Ayrıca, iş gücü tazminatının da %10 anlamlılık düzeyinde belirgin bir etkisi bulunmaktadır. Kısa vadede ise, bu değişkenlerin hiçbiri madalya skorları üzerinde bir etki göstermemekte olup, bu bulgu panel PMG analizi sonuçlarıyla da desteklenmektedir. Ayrıca incelenen tüm değişkenler arasında yalnızca reel GSYİH madalya skorlarına ilişkin Granger nedenselliği göstermektedir. Diğer değişkenlerin hiçbirinin madalya skorları ile Granger nedensel bir ilişkisi bulunmamaktadır. Bu derinlemesine analiz, madalya skorlarının dinamiklerini şekillendirmede reel GSYİH'nin belirgin ve önemli rolünü vurgulamakta olup, madalya başarısı üzerindeki benzersiz etkisini gözler önüne sermektedir.

Anahtar Kelimeler: Ekonomik büyüme, olimpiyat, olimpiyat madalyaları, olimpiyat performansı, kış olimpiyat oyunları

Geliş Tarihi/Received 16.07.2024
Kabul Tarihi/Accepted 12.11.2024
Yayın Tarihi/Publication Date 25.12.2024

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Cite this article: Aygün, M., & Savaş, Y. (2024). Analysing winter olympic medals through economic variables: A comprehensive examination. *Research in Sport Education and Sciences, 26*(4), 197-209.

Introduction

The participation in sports contributes to both physical and mental development, and it occurs through active and passive engagement. This leads to individuals' development and gathering within the sports community. Therefore, participation in sports activities is of great importance. In terms of sports participation, the Olympic Games, which is the largest mega sports event, reveals the most decisive aspects of active or passive participation statistically (Buts et al., 2013; Gratton et al., 2000; Kasimati & Dawson, 2008). Therefore, the economic, environmental, cultural, and political impacts of mega sports events are inevitable (Scandizzo & Pierleoni, 2018). Based on these effects, it becomes clear that there is no single factor determining the success of major sports events like the Olympic Games.

According to the assumption put forward by sports economists, a country's Olympic performance is directly related to its economic resources and their utilization (Andreff, 2013). Shasha et al. (2022) conducted an Olympic evaluation with economic, demographic, geographic, and social factors using Quantile and Tobit approaches and cross-sectional data analysis, suggesting that per capita income and the number of athletes are not significantly associated with success. However, while Hoffmann et al. (2004) stated that economic and demographic variables have a significant impact, they also mentioned that state policy will only have a small effect on the medals won. In addition, the study on economic determinants of success in Olympic Games examined the relationship between population, per capita income, and medals using the Poisson Regression model, suggesting that economic factors are associated with medal outcome, particularly when the country is the host (Makiyan & Rostami, 2021; Lui & Suen, 2008). The success achieved in international sports organizations has mainly focused on four factors: population size, gross national product, hosting, and political regime (Knuepling & Broekel, 2022).

Countries invest a significant amount of money to compete with other nations, but there is no evidence of how successful their policies will be. It is evident that there are macro-level variables apart from politicians that determine success. Among these macro-level variables, economic prosperity, population, geographical diversity, urbanization, political and cultural systems emerge (De Bosscher et al., 2006). Additionally, the relationship between the number of medals and economic power and population at the macro level is highly valuable (Seiler, 2013; Tcha & Perchin, 2003). While it is commonly believed that the population size plays a significant role in winning medals, this is not accurate. This is because if population size were a determining factor, countries like China and India would have more medals (Bernard & Busse, 2004). When looking at the number of medals won, it can be observed that the United States, a wealthy country, has won over 100 medals in some games, while developing countries have fewer medals (Forrest et al., 2017). In addition to the indicators affecting the number of medals won in the Olympics, socio-economic variables (Johnson & Ali, 2004), population, unemployment rate (Vagenas & Vlachokyriakou, 2012), host effect (Rewilak, 2021; Csurilla & Fertő, 2022) geographical factors (Hoffmann et al., 2004; Otamendi & Doncel, 2014), education (Noland & Stahler, 2016a, 2017), economic effect (Makiyan & Rostami, 2021) and income level (Noland & Stahler, 2016b) are also seen to play a significant role.

Therefore, an in-depth examination of national income is necessary (Bernard & Busse, 2004; Rathke & Woitek, 2007). Gross national product provides a significant advantage in terms of participation and success in games in nations with higher population (Johnson & Ali, 2000; Rathke & Woitek, 2007; Andreff, 2008; Makiyan & Rostami, 2021). In particular, the fact that 15 European countries, including advanced countries such as Germany, Finland, France, the United Kingdom, Austria, Slovenia, etc., have a value-added contribution of 324 billion euros for sports indicates the importance placed on achieving success (Dimitrov et al., 2006). Yet, the primary source of Olympic performance remains unknown. Hence, factors such as i) income inequality, ii) technological advancement, iii) working hours, and iv) gross national product are considered to influence medal attainment. The only tangible evidence in determining the relationship between sporting development and economic variables lies in the medals won. Therefore, it is crucial for the International Olympic Committee (IOC) to investigate the origins of medals awarded to high-performing athletes.

The primary aim of this research is to investigate the economic variables influencing success in the Olympic Games, which have a long history dating back to antiquity. This study is one of the few that elucidates the connection between economic variables and Olympic medals.

The remainder of the paper develops as follows: in the first section, the focus is on elucidating the relationship between Olympic medals and countries' economic performance. The significance of this relationship in the existing literature is emphasized, underscoring the importance of further investigation. Moving on to the second section, the methodology and data employed in the study are introduced. Descriptive statistics are provided for the series, shedding light on the temporal progression of both countries' medal counts and economic performance. This section aims to gain valuable insights into the medal counts and economic performance of the countries under analysis. The third section presents the empirical results derived from the selected econometric method. These results serve as evidence of the outcomes obtained through the analysis. By employing a rigorous econometric approach, the study strengthens the reliability and validity of its findings. The last section encompasses the discussion of the study's findings and their implications. This section provides a comprehensive overview of the research outcomes, offering insights into the broader implications of the relationship between Olympic medals and economic performance.

Methodology and Data

Methodology

The influence of economic variables on the medal performance of utilized countries are defined as:

$$MEDALS_{it} = \beta_0 + \beta_1(RGDP)_{it} + \beta_2(LABOR)_{it} + \beta_3(TFP)_{it} + \beta_4(HOURS)_{it} + \epsilon_{it}$$

Where Medals meaning total score of medals in Olympic games, RGDP stands for real GDP, LABOR is for labor share, TFP is for total factor productivity and HOURS is for Average annual hours worked by persons engaged. i stands for countries and t for times.

This study employs a variety of methodologies to explore the interrelationships among variables. The initial step involves assessing the cross-sectional dependency of variables using several tests, including the Breusch-Pagan LM test, Pesaran scaled LM test, Bias-corrected scaled LM test, and Pesaran CD test. Subsequently, the Pesaran CIPs test, as proposed by Pesaran (2007), is applied to ascertain the stationarity of series in the presence of cross-sectional dependencies among variables.

The analysis proceeds to investigate the presence of cointegration among variables using the Pedroni cointegration test introduced by Pedroni (2004). While identifying cointegration is pivotal, this study delves further into understanding the impact of variables on medal scores. This exploration is conducted through panel ARDL/PMG analysis, enabling the unveiling of both short-term and long-term effects. Finally, the study explores the causal relationships among variables using the Dumitrescu-Hurlin Panel Causality Test, a method developed by Dumitrescu and Hurlin (2012). This comprehensive analytical approach offers a nuanced understanding of the intricate relationships and dynamics among the studied variables, providing valuable insights into the underlying mechanisms governing the phenomena under investigation.

Data

In this study, data spanning from 1960 to 2018 pertaining to winter games on available dates was utilized. The selection criteria for countries were stringent, considering only those nations that had won at least one medal in every winter game encompassed within the study period. Consequently, a limited pool of countries emerged, consisting of just nine nations: Austria, Canada, Finland, France, Germany, Italy, Norway, Sweden, and the United States, all of which met the medal-winning criterion from 1960 to 2018.

This focused approach, although narrowing down the participating countries significantly, enabled the application of rigorous econometric techniques. The specifics of the Winter Olympic Games, including the year and location, are meticulously detailed in Table 1 for reference.

Table 1
Year and place of winter olympic games

Year	Place	Year	Place
1960	Squaw Valley	*1992*	Albertville
1964	Innsbruck	*1994*	Lillehammer
1968	Grenoble	*1998*	Nagano
1972	Sapporo	*2002*	Salt Lake City
1976	Innsbruck	*2006*	Turin
1980	Lake Placid	*2010*	Vancouver
1984	Sarajevo	*2014*	Sochi
1988	Calgary	*2018*	Pyeong Chang

It is noteworthy that the Winter Olympic Games hosted in Beijing in 2022 were excluded from the analysis due to the unavailability of data in the Penn World Table prepared by Feenstra, Inklaar & Timmer (2015) beyond 2019. Consequently, the study concentrated on analyzing the data from a total of 16 winter games spanning the period from 1960 to 2018.

Table 2
Description of variables

	Variables	Explanations	Data Source
1	***MEDAL***	Total score of Medal (3*Gold, 2*silver, 1*bronze)	Olympics.com
2	***RGDP***	Real GDP at constant 2017 national prices (Logarithm)	PWT
3	***LABOR***	Share of labor compensation in GDP at current national prices	PWT
4	***TFP***	TFP (Total Factor Productivity) at constant national prices (2017=1)	PWT
5	***HOURS***	Average annual hours worked by persons engaged	PWT

PWT: Penn World Table

MEDAL: Total score of Medal **RGDP:** Real GDP at constant 2017 national prices **LABOR**: Share of labor compensation **TFP** : Total Factor Productivity **HOURS**: Average annual hours worked by persons engaged

The data utilized in this study is meticulously detailed in Table 2. To ensure a comprehensive understanding of the economic dynamics in the countries under scrutiny, a diverse range of economic variables has been incorporated into the analysis. This broad selection was made in recognition of the intricate economic structures of these nations; relying on a limited set of variables might not suffice to capture the complexity of their economies.

To gauge the multifaceted nature of these countries, an extensive exploration of numerous variables was undertaken. The medal data was sourced from olympics.com, where the total score was calculated using the formula: Total Score = (Gold Medals * 3) + (Silver Medals * 2) + (Bronze Medals * 1). This calculated total score was adopted as the medal variable in this research.

The variables used in this study focuses on the impact on economic variables on medal scores of countries which are economic growth, labor share, total factor productivity and average annual hours worked by persons. Technology is added into analysis as an important factor for medal score because of that sports technology encompasses the deliberate utilization of specialized tools and cutting-edge technologies by athletes to enhance their training and competitive environments, optimizing tasks and improving overall athletic performance through efficient and effective means (Omoregie, 2016). Hence,

the technology variable is measured as total factor productivity.

Additionally, economic growth is another variable which can have remarkable effect on medal scores of countries because of the fact that the rise of GDP per capita enables countries to afford to train athletes better, provide better medical care, and send a larger group of athletes to the Olympic Games (Bian, 2005).

Additionally, share of labor compensation and average annual hours worked variables are also added into analyses because of the fact that share of labor compensation can be beneficial indication of inequality in the countries. Inequality can have both economic and social results, hence, the impact of inequality on countries economic performance is well-studied in economic literature. However, the rise in inequality may have far-reaching consequences. The high costs associated with athlete training can pose a considerable challenge for talented individuals from underprivileged backgrounds, impeding their capacity to invest in enhancing their skills, hence, this financial impediment further compounds the pre-existing disparities in Olympic performance, perpetuating unequal opportunities for athletes based on their socio-economic status (Kufenko & Geloso, 2019).

Additionally, working hours can have fundamental impact on Olympic scores as the fact that some of athletes can work in companies and prepare for Olympic games as well. In this case, the preparation of these athletes with too much working hours can be obstacle for them to win medals. For the case of both have to work and train such as Nathalie Marchino Oly (Colombia) for Rugby Sevens, Lanni Marchant (Canada) for Athletics, Paul Adams Oly (Australia) for Shooting (Olympics.com).

Furthermore, the economic variables employed in the analysis were derived from the Penn World Table prepared by Feenstra, Inklaar & Timmer (2015). These variables encompassed Real GDP at constant 2017 national prices (in logarithm), share of labor compensation in GDP at current national prices, total factor productivity (TFP) at constant national prices (with 2017 as the base year), and average annual hours worked by persons engaged. These variables were chosen to assess the impact of economic factors on the performance of countries in the Olympic Games, providing a nuanced perspective on the interplay between economic indicators and medal success.

Furthermore, Figure 1 serves as a visual representation illustrating the mean values of the variables utilized in this study across different time periods. Examining the countries included in this study, it is evident that their medal scores remained relatively low with significant fluctuations prior to 1992. Subsequently, there was a notable increase in medal scores until 2002, followed by fluctuations in subsequent years.

In terms of economic indicators, Real GDP and Total Factor Productivity (TFP) exhibited a consistent upward trend over time. Conversely, average working hours exhibited a steady decline. Notably, labor compensations reached their peak before 1980, sharply decreasing thereafter with pronounced fluctuations observed, indicating a gradual decline in compensation rates over time. This graphical representation offers a clear overview of the evolving trends in these variables, providing valuable insights into the changing dynamics of the countries under study.

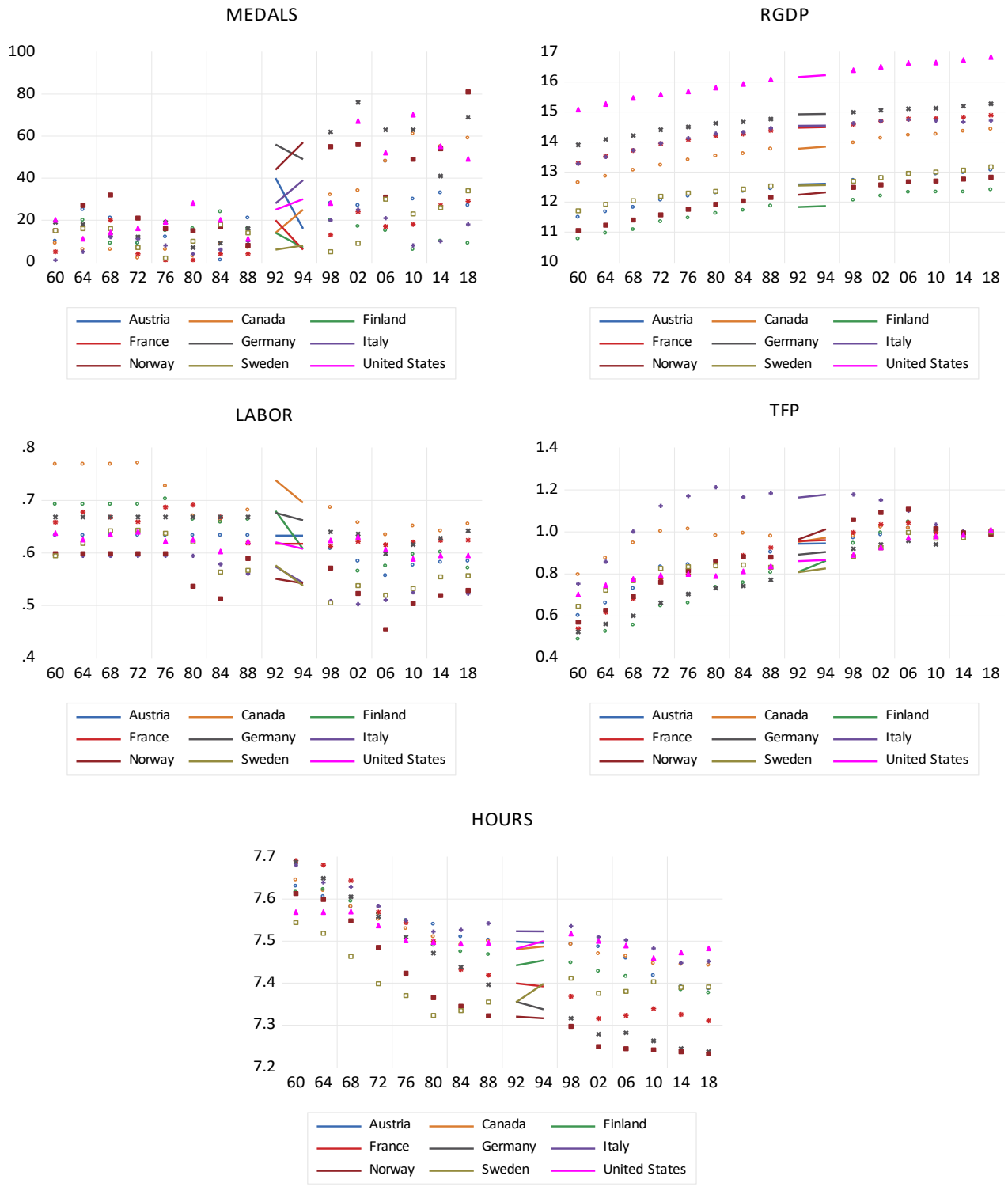

Figure 1. *Visualization of variables*

MEDAL: Total score of Medal **RGDP:** Real GDP at constant 2017 national prices **LABOR**: Share of labor compensation **TFP** : Total Factor Productivity **HOURS**: Average annual hours worked by persons engaged

Table 3 provides a comprehensive overview of the variables incorporated in the analysis, offering detailed descriptive statistics. These statistics include key measures such as the mean, standard deviation, minimum, and maximum values of each variable in the study. This tabular representation not only offers a snapshot of the central tendencies and variabilities within the dataset but also serves as a fundamental reference point for understanding the range and distribution of the variables under scrutiny.

Table 3
Descriptive statistics of variables

Variable	Obs	Mean	Std. dev.	Min	Max
MEDAL	144	23.34028	18.6522	1	81
RGDP	144	13.5473	1.439163	10.77505	16.81765
LABOR	144	.6162724	.0589054	.454113	.7709072
TFP	144	.891225	.155246	.4890219	1.211855
HOURS	144	7.464394	.1085663	7.231664	7.690961

MEDAL: Total score of Medal **RGDP:** Real GDP at constant 2017 national prices **LABOR**: Share of labor compensation **TFP** : Total Factor Productivity **HOURS**: Average annual hours worked by persons engaged

Moreover, the relationships among variables are illustrated through a correlation matrix visualization, accompanied by scatter plots. This approach effectively captures the year-over-year correlations among the variables under investigation. Figure 2 serves as a visual representation, providing a clear and insightful depiction of the correlations existing among the variables, further enriching the analytical depth of this study.

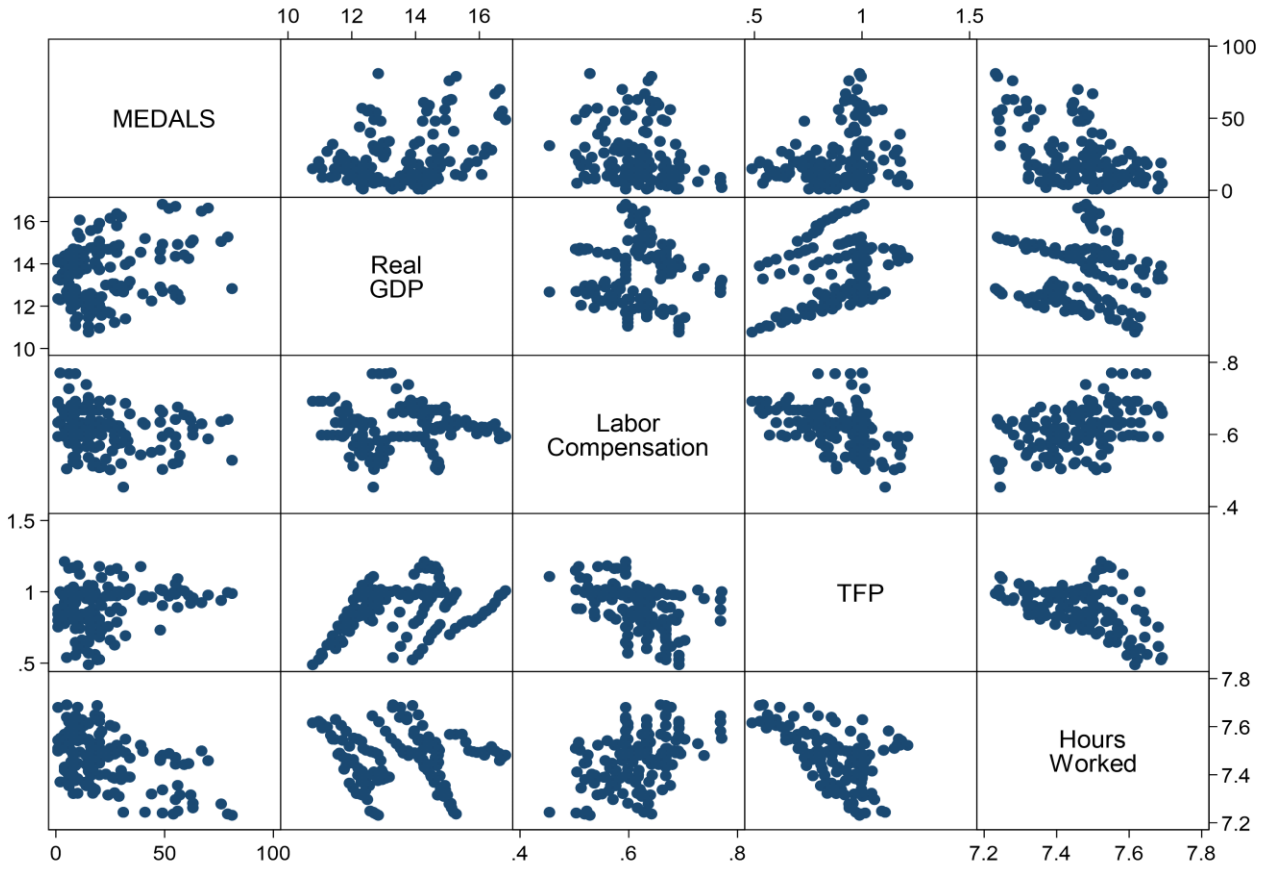

Figure 2. *Correlation matrix*

Furthermore, to enhance clarity and precision in visualizing the correlation degree among variables, a heat map is

employed to represent the correlation matrix. Figure 3 depicts the correlations among variables using this heat map approach, where blue areas signify negative correlations. In contrast, the spectrum from white to pink illustrates positive correlations, with white indicating lower correlations and pink indicating higher positive correlations.

The correlation matrix analysis reveals significant patterns. Specifically, Medal scores exhibit positive correlations with Real GDP and total factor productivity. Conversely, labor share and average working hours demonstrate negative correlations with the medal scores of countries participating in winter games. These findings provide valuable insights into the intricate relationships between economic variables and medal success, shedding light on the multifaceted dynamics at play in the context of this study.

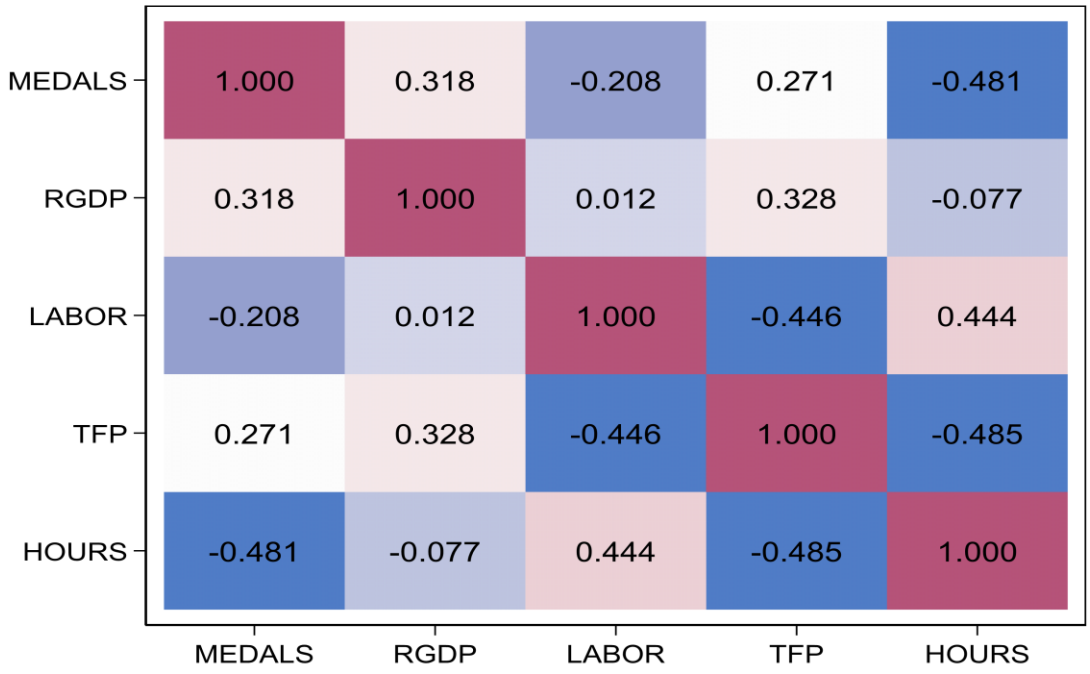

Figure 3. *Heat map correlation matrix*

To initiate the panel data analysis, the initial step involves assessing the cross-section dependency of the series, as it is indicated in Table 4. Various tests, including Breusch-Pagan LM, Pesaran scaled LM, Bias-corrected scaled LM, and Pesaran CD tests, are utilized for this purpose. The results from these tests uniformly indicate the presence of cross-section dependency. Consequently, the subsequent step involves conducting unit root tests, tailored to the identified cross-section dependency, ensuring a methodologically rigorous approach in the analysis.

Table 4
Cross-Section dependency test

Test	MEDAL	RGDP	LABOR	TFP	HOURS
			Statistics		
Breusch-Pagan LM	170.9598	562.2707	307.5216	390.9511	461.0737
Pesaran scaled LM	15.90516	62.02159	31.99913	41.83139	50.09541
Bias-corrected scaled LM	15.60516	61.72159	31.69913	41.53139	49.79541
Pesaran CD	8.739963	23.71041	17.24493	19.21188	21.26794

MEDAL: Total score of Medal **RGDP:** Real GDP at constant 2017 national prices **LABOR**: Share of labor compensation **TFP** : Total Factor Productivity **HOURS**: Average annual hours worked by persons engaged

The stationarity levels of the variables are determined using the CIPS unit root test introduced by Pesaran (2007). All series are subjected to testing under both constant and constant & trend options, examining both levels and first differences. The outcomes reveal that Medal is stationary at the level, indicating it as I (0). Conversely, all other series exhibit unit roots at their initial levels. However, after taking the first difference, all series achieve stationarity across all options. Consequently, it can be concluded that, except for Medal, all other variables are integrated of order one (I (1)), while Medal stands as a non-stationary variable (I (0)).

Table 5
Unit root test results

Variables	**Level**		**Difference**	
	Constant	***Constant & Trend***	***Constant***	***Constant & Trend***
MEDAL	-2.939***	-2.931**	-4.204***	-4.153***
RGDP	-1.683	-2.363	-3.683***	-3.960***
LABOR	-2.096	-1.956	-3.228***	-3.091**
TFP	-1.469	-1.552	-2.563***	-2.918**
HOURS	-2.268*	-1.884	-3.149***	-3.440***

MEDAL: Total score of Medal **RGDP:** Real GDP at constant 2017 national prices **LABOR**: Share of labor compensation **TFP** : Total Factor Productivity **HOURS**: Average annual hours worked by persons engaged

Moreover, the investigation delves into the co-integration relationships among variables using the Pedroni co-integration test, as proposed by Pedroni (2004). The results of this analysis are meticulously presented in Table 6. According to the Pedroni cointegration test results, cointegration is affirmed for all the test statistics conducted. The findings conclusively demonstrate that the medal score exhibits a co-integration relationship with Real GDP, labor compensation, total factor productivity, and average annual hours worked by individuals. These insights shed light on the intricate long-term relationships between medal success and these key economic factors, contributing substantially to the depth of our analysis.

Table 6
Pedroni cointegration results

	Statistic Tests	**Statistics**	**P-Value**
Between-dimension	**Group rho-Statistics**	3.0857	.0010
	Group PP Statistics	-6.1568	.0000
	Group ADF Statistics	-5.1606	.0000
Within-dimension	**Panel -Statistics**	-4.0831	.0000
	Panel rho Statistics	2.1580	.0155
	Panel PP Statistics	-6.4844	.0000
	Panel ADF Statistics	-5.2325	.0000

In this study, the Pooled Mean Group (PMG) estimation technique, as introduced by Pesaran et al. (1995) and Pesaran et al. (1999), is employed. This method enables the exploration of both short-term and long-term influences of variables on medal scores. The distinctive feature of the panel Autoregressive Distributed Lag (ARDL) model lies in its ability to accommodate both stationary (I (0)) and non-stationary (I (1)) time series data, facilitating a rigorous empirical examination.

The results, presented in Table 7, reveal that only Real GDP significantly influences medal scores of countries in the long run at a 1% significance level, with labor compensation exhibiting an influence at a 10% significance level. However, in the short run, none of the series exhibit an influence on medal scores according to the panel PMG results. It is noteworthy that the error correction variables are negative and significant, as it is expected. Therefore, the sole long-term influence on medal scores is attributed to Real GDP, while no short-term effects from any variables are observed in this analysis.

Table 7
Short and long run dynamics based on Panel ARDL/PMG model

	Coefficient	Std Error	Z	*p*-Value
		Long-run		
RGDP	49.25123	12.94316	3.81	.000
LABOR	139.1698	79.65433	1.75	.081
TFP	-37.53819	33.87505	-1.11	.268
HOURS	63.78218	52.86245	1.21	.228
		Short-Run		
EC	-.530685	.0630587	-8.42	.000
RGDP	-20.7801	31.99109	-0.65	.516
LABOR	-38.22834	45.92463	-0.83	.405
TFP	61.77867	38.25621	1.61	.106
HOURS	39.29615	101.1861	0.39	.698
Constant	-620.3366	78.55567	-7.90	.000

MEDAL: Total score of Medal **RGDP:** Real GDP at constant 2017 national prices **LABOR**: Share of labor compensation **TFP** : Total Factor Productivity **HOURS**: Average annual hours worked by persons engaged **EC**: Error Correction

The final econometric approach in this study is centered around causal analysis, with a specific reliance on the panel causality analysis developed by Dumitrescu and Hurlin in 2012. This study scrutinized the causal relationships and directional connections between variables by implementing the Dumitrescu-Hurlin Panel Causality Test, with lag selection determined using the Akaike Information Criterion (AIC) and 1,000 bootstrap replications employed to ensure robust results. Notably, this test serves as an enhanced and more nuanced iteration of Granger causality, allowing for a comprehensive examination of the intricate interrelationships among the variables under investigation.

Table 8
Dumitrescu-Hurlin panel causality test

H0	W-bar	Z-bar	Z-bar p-value	Z-bar tilde	Z-bar tilde p-value	Causality
RGDP does not Granger-cause MEDAL	13.6985	13.1029	.0180	4.0145	.0180	YES
LABOR does not Granger-cause MEDAL	8.6304	6.8958	.0860	1.8027	.0860	NO
TFP does not Granger-cause MEDAL	3.3738	5.0355	.1060	3.2771	.1060	NO
HOURS does not Granger-cause MEDAL	2.0881	2.3082	.3790	1.3389	.3820	NO

MEDAL: Total score of Medal **RGDP:** Real GDP at constant 2017 national prices **LABOR**: Share of labor compensation **TFP** : Total Factor Productivity **HOURS**: Average annual hours worked by persons engaged

The comprehensive outcomes of this analysis have been thoroughly documented in Table 8. The results distinctly indicate that among all variables examined, only real GDP demonstrates Granger causality concerning medal scores. None of the other variables exhibit a Granger causative relationship with medal scores. This discerning finding sheds light on the specific influence of real GDP on medal success, emphasizing its unique and significant role in shaping the dynamics of medal scores.

Conclusion

Olympic events and other mega sports events are highly important for economic development and sustainability (Aygün et al., 2023). Many scientists have conducted studies on the factors underlying Olympic success. While it is particularly accepted that economic size is important in Olympic success, it has also been stated that population, gross national product, and the number of athletes play a role in winning medals (Moosa & Smith, 2004; Lui & Suen, 2008). In addition to these factors, it is observed that being the host country (Johnson & Ali, 2004; Csurilla & Fertő, 2023; Singleton et al., 2024), national policies (Bian, 2005), traditions (Otamendi & Doncel, 2014), and gross national product (Csurilla & Fertő, 2022) are significant factors in medal outcome. Factors influencing the number of medals has been the subject of extensive discussion in the literature. Directing our attention to the Winter Olympic Games, our investigation reveals a discernible correlation between economic variables and medal success. The recognition of economic variables as a significant indicator of athlete performance hinges on the availability of financial resources, facilities, policies, and athlete support systems. It is believed that countries with a higher gross national product and more comprehensive sports policies will achieve greater stability in medal outcome. Therefore, the examination of economic indicators in relation to Olympic performance and medal outcome is a significant factor for the development of new sports policies in nations and for the formation of an informed sports culture aimed at performance and success improvement.

The results of the Pedroni cointegration test highlight a strong co-integration relationship evident in all test statistics conducted, establishing a robust connection between medal scores and crucial economic indicators such as Real GDP, labor compensation, total factor productivity, and average annual hours worked by individuals. An extensive examination of the Panel ARDL outcomes reveals that Real GDP emerges as the primary factor positively influencing countries' medal scores in the long term, achieving statistical significance at the 1% level. Additionally, labor compensation exerts a discernible influence, albeit at a 10% significance level. Interestingly, in the short term, none of these variables show any noticeable impact on medal scores, a conclusion supported by the results of the panel PMG analysis.

A noteworthy revelation from this study is that among all the variables analyzed, only Real GDP demonstrates Granger causality concerning medal scores. In contrast, none of the other variables exhibit a Granger causative relationship with medal scores. This significant insight underscores the specific and substantial role played by Real GDP in shaping the dynamics of medal scores, highlighting its distinctive influence on medal success.

These findings contribute to our understanding of the intricate interplay between economic development and sports performance, providing valuable insights for policymakers and stakeholders aiming to enhance national sporting achievements. Future research in this field may expand the analysis to encompass additional economic variables and explore the impact of specific policies and investments in sports infrastructure on Olympic outcomes. In addition to examining the Olympics from an economic standpoint, it is recommended to adopt a broader perspective that encompasses socio-economic, demographic, and other relevant variables. Given the comprehensive nature and extended time span covered in this study, it holds the potential to provide theoretical support and guidance for future research endeavors.

Etik Komite Onayı: Bu çalışmada yazarlar tarafından insan katılımcılarla gerçekleştirilen herhangi bir çalışma içermemektedir.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları: Fikir - M.A., Y.S.; Tasarım - M.A., Y.S.; Denetleme - M.A., Y.S.; Kaynaklar - M.A., Y.S.; Veri Toplama ve/veya İşleme - M.A., Y.S.; Analiz ve/veya Yorum - Y.S.; Literatür Taraması - M.A.; Yazıyı Yazan - M.A., Y.S.; Eleştirel İnceleme - M.A., Y.S.
Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmiştir.
Finansal Destek: Yazarlar, bu çalışma için finansal destek almadığını beyan etmiştir.

Ethics Committee Approval: This article does not contain any studies with human participants performed by any of the authors.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept - M.A., Y.S.; Design - M.A., Y.S.; Supervision - M.A., Y.S.; Resources - M.A., Y.S.; Materials - M.A., Y.S.; Data Collection and/or Processing - M.A., Y.S.; Analysis and/or Interpretation - Y.S. ; Literature Search - M.A. ; Writing Manuscript - M.A., Y.S.; Critical Review - M.A., Y.S.
Conflict of Interest: The authors have no conflicts of interest to declare.
Financial Disclosure: The authors declared that this study has received no financial support.

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ATATÜRK ÜNİVERSİTESİ YAYINLARI
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Research Article *Araştırma Makalesi* DOI: 10.62425/rses.1480170

The Effect of Human Rights and Organizational Virtue Levels in Sports in Personnel Empowerment

Sporda Insan Hakları ile Örgütsel Erdemlilik Düzeylerinin Personel Güçlendirmeye Etkisi

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ABSTRACT

The aim of the research is to determine the relationship between human rights in sports and organizational virtuousness levels of academicians working in the field of sports sciences and personnel empowerment through different variables. The study group of the research consisted of a total of 335 participants (63 females and 272 males) working in various universities of Turkey. To determine the current situation, the model of the research is a relational survey method. In this study, Human Rights Attitude Scale in Sport (HRASS) developed by Sadık (2014), Organisational Virtuousness Scale (OVS) developed by Cameron et al., (2004) and adapted into Turkish by Erkmen and Esen (2012), and Employee Empowerment Scale (EES) developed by Spreitzer (1995) and adapted into Turkish by Sürvegil et al., were used as data collection tools. In the analysis of the data, T-Test, Post Hoc Test, One-way ANOVA, Pearson Correlation and Linear Regression Analysis methods were used in addition to descriptive statistics on data with thinned normality distribution. As a result of the analysis, it was determined that the participants' Human Rights Attitudes in Sports, Organizational Virtue, and Employee Empowerment levels were above the average scores. Considering the average scores of the participants, it can be stated that the results are supported by the literature. In addition to a low positive significant relationship between HRASS and OVS, a moderate positive relationship was found between HRASS and EES. Additionally, a low-level positive relationship was detected between the participants' OVS and EES. A statistically significant relationship was detected between HRASS, OVS and EES, and it was determined that human rights and organizational virtue in sports had a 15% explanation power of employee empowerment. As a result, it can be stated that academicians' human rights in sports and organizational virtuousness levels positively affect employee empowerment.

Keywords: Human rights, Human rights in sport, Organisational virtuousness and Employee empowerment.

ÖZ

Araştırmanın amacı, spor bilimleri alanında çalışmakta olan akademisyenlerin sporda insan hakları ile örgütsel erdemlilik düzeylerinin personel güçlendirmeyle ilişkisini ve farklı değişkenler aracılığıyla tespit etmektir. Araştırmanın çalışma grubunu Türkiye'nin çeşitli üniversitelerinde çalışmakta olan 63'ü kadın 272'si erkek olmak üzere toplamda 335 kişi oluşturmaktadır. Mevcut durumun tespitinin gerçekleştirilebilmesi adına araştırmanın modeli ilişkisel tarama yöntemidir. Çalışmada kullanılan veri toplama araçları ise; Sadık (2014) tarafından geliştirilen Sporda İnsan Hakları Tutum Ölçeği (SİHTÖ), Cameron ve arkadaşlarının (2004) geliştirdiği Erkmen ve Esen (2012) tarafından Türkçe'ye uyarlanan Örgütsel Erdemlilik Ölçeği (ÖEÖ) ve Spreitzer (1995) tarafından geliştirilen, dilimize çevirisinin yapılarak geçerlilik ve güvenirliliği Sürvegil ve arkadaşları (2013) tarafından yapılan Personel Güçlendirme Ölçeği (PGÖ) kullanılmıştır. Verilerin analizinde normallik dağılımı incelenmiş verilere betimsel istatistiklerin yanı sıra T-Testi, Post Hoc Testi, One-way ANOVA, Pearson Korelasyon ve Doğrusal Regresyon Analiz yöntemleri kullanılmıştır. Analiz sonucunda katılımcıların Sporda İnsan Hakları Tutumları, Örgütsel Erdemlilik, ve Personel Güçlendirme düzeylerinin ortalama puanların üzerinde olduğu tespit edilmiştir. Katılımcıların aldıkları ortalama puanlar dikkate alındığında sonuçların literatür tarafından da desteklendiği ifade edilebilir. SİHTÖ ile ÖEÖ arasında düşük düzeyde pozitif anlamlı bir ilişki tespit edilmiş olmasının yanı sıra, SİHTÖ ile PGÖ arasında pozitif yönde orta düzeyde bir ilişki saptanmıştır. Ayrıca katılımcıların ÖEÖ ile PGÖ arasında düşük düzeyde pozitif yönlü bir ilişki tespit edilmiştir. SİHTÖ, ÖEÖ ile PGÖ arasında istatistiksel açıdan anlamlı bir ilişki tespit edilmiş olup, sporda insan hakları ile örgütsel erdemliliğin personel güçlendirmeyi %15 oranında açıklama gücünün olduğu saptanmıştır. Sonuç olarak akademisyenlerin sporda insan hakları ile örgütsel erdemlilik düzeylerinin personel güçlendirmeyi pozitif yönde etkilediği ifade edilebilmektedir.

Anahtar Kelimeler: İnsan Hakları, Sporda İnsan Hakları, Örgütsel Erdemlilik ve Personel Güçlendirme

Açıklama (Bu çalışma "Sporda İnsan Hakları ile Örgütsel Erdemlilik Düzeylerinin Personel Güçlendirmeye Etkisi" adlı doktora tezinden üretilmiştir.)

Geliş Tarihi/Received 07.05.2024
Kabul Tarihi/Accepted 13.11.2024
Yayın Tarihi/Publication Date 25.12.2024

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Cite this article: Soyer, A., İbiş, S., & Güngör, N.B. (2024). The Effect of Human Rights and Organizational Virtue Levels in Sports in Personnel Empowerment. *Research in Sport Education and Sciences, 26*(4), 210-221.

Introduction

Human rights, in addition to being a universal concept in protecting and developing the rights of individuals in their lives, are defined as the set of rights that individuals acquire due to being human (Üste, 2007). While human rights are delivered to individuals by the authorities, there should be no discrimination due to factors such as religion, language and gender. The concept of human rights is a concept open to development on the axis of the constantly changing and transforming world, which includes features such as the freedoms that individuals acquire from birth and cannot be transferred to others (Kaya & Yılmazer, 2016). The basis of the concept of human rights is individual-centered. Due to this feature, the human rights element has a multidisciplinary structure (Gözler, 2022). Another element that is in constant transformation and development in the lives of individuals who is on the move since the prehistoric age is sports. Sports can be considered as an element that helps people coordinate with the environment, helps individuals complete themselves physically and mentally, contributes to their own development in terms of health, creates an environment of peace in an international context, and contributes positively to people's communication processes (Yetim, 2000; Masdeu-Yelamos, Carty & Clardy, 2019). The concept of sports, which is an integral part of individuals' lives, enables people to be patient and energetic throughout their lives and strengthens the individual-society relationship. Through sports, individuals act towards common goals (Ramazanoğlu et al., 2005). Due to these features of sports, it is thought that the sports element plays an important role in the implementation of human rights (Donnelly, 2008). Sports is described as a human right that meets the needs of people living in the modern world. All living people have the right to participate in leisure activities and sports activities for various purposes. In many documents developed by many authorities such as the United Nations, the International Olympic Committee and the European Union, it is stated that the concept of sports is one of the human rights (Isidori & Benetton, 2015). Plato accepts justice, which is an important concept in the implementation and development of rights, as the most important element among the virtues (Karakulak, 2007). The concept of virtue means people's desire to be the best or the factors that enable people to be perfect (Caza et al., 2004). One of the indispensable elements of organizations, which are structures formed by individuals coming together for a specific purpose, is virtue (Karakaya et al., 2021). The concept of organizational virtuousness can be explained as the level of reflection of the virtuous behaviors of the employee working in the institution to the organization in their activities and perception levels (Vallett, 2010). Organizations with a perception of organizational virtue are both effective and efficient, as well as open to innovation. Employee working in organizations with high levels of virtue can solve the problems they may encounter (Karakaya et al., 2021). In addition, employee working in institutions with high levels of organizational virtuousness feel powerful (Bright et al., 2014).

The concept of employee empowerment explains the psychological state of individuals (Spreitzer, 1995). The belief in self-sufficiency of the employee working in the institution and making decisions without receiving approval from their superiors are among the characteristics of employee empowerment (Karakaş, 2014). Employee empowerment, which is related to concepts such as motivation, participation in decision-making processes and delegation of authority, is explained as the ability of employee to continue their duties and responsibilities (Çuhadar, 2005; Doğan & Kılıç, 2008). In order for institutions to be successful, they need to strengthen their staff (Honold, 1997). In the light of the information provided above, this study aims to determine to what extent the human rights attitudes in sports and organizational virtuousness levels of academics working in sports sciences predict employee empowerment. When the relevant literature was examined, no study was found that investigated human rights, organizational virtuousness and employee empowerment in sports together. It determines that studies on human rights in sports are implemented in different samples (Soyer et al, 2024; Turan et al., 2018; Çavuşoğlu et al., 2020; Sadık, 2014). In addition to the studies on organizational virtuousness and employee empowerment that examine together, there are many studies that examine both elements separately (Akbolat et al., 2017; Tapan, 2019; Erkmen & Esen, 2012).

Methods

Research Model

Correlational survey was used in this research, which aimed to determine the effect of participants' human rights in sports and organizational virtuousness levels on employee empowerment. This model helps determine the existence or level of change between two or more variables (Karasar, 2007). Starting from this point, the relationship between dependent and

independent variables was determined depending on the purpose of the research.

Study Group

The study group of the research consists of academicians, working in the field of sports sciences at public and foundation universities serving throughout Turkey. Participants participated in the research voluntarily. 38 of the participants have the title of professor doctor, 88 associate professor doctor, 82 doctor lecturer, 51 lecturer and 76 research assistant. While 101 (30.1%) of the participants have administrative duties, 234 (69.9%) do not have administrative duties. Ethics committee approval for this study was received from Niğde Ömer Halisdemir University (Date: 29 November 2023, Decision No: 18-02). Also written informed consent was obtained from the participants who participated in this study.

Data Collection

Personal information form, Human Rights Attitude Scale in Sport, Organizational Virtue Scale and Employee Empowerment Scale were used as data collection tools in the research. Data collection tools were applied to academics working in sports sciences working at various universities living in 61 different cities of Turkey. In order to determine the effect of the human rights attitudes in sports and organizational virtuousness levels of the academics included in the scope of the research on employee empowerment, the determined scales were delivered to the participants online after obtaining the necessary research permissions.

Human Rights Attitude in Sports Scale

In the study, the 5-point Likert type "Human Rightss Attitude in Sport Scale", consisting of 29 questions developed by Sadık (2014), was used. The scale questions are closed-ended and the answers are (1) strongly disagree, (2) disagree, (3) undecided. (4) agree and (5) strongly agree. In addition to the reliability coefficient calculated with the Cronbach Alpha internal consistency coefficient in the development of the scale, the reliability coefficients of the scale factors are respectively .88 in the personality rights sub-dimension, .79 in the social rights sub-dimension and .83 in the solidarity rights sub-dimension. The scale reliability was determined to be .82. The scale can be evaluated based on the total score (Sadık, 2014). In this research, the Cronbach Alpha values of the sub-dimensions of the Human Rights in Sports Scale were determined to be .78, .72 and .74, respectively. The value of the rank scale reliability was calculated as .76. In the light of the data determined above, it was understood that these values were sufficient in terms of the reliability of the scale.

Organizational Virtue Scale

The "Organizational Virtue Scale" developed by Cameron et al. (2004) was adapted into Turkish and its validity and reliability were determined by Erkmen and Esen (2012). The scale consists of 15 questions and consists of optimism sub-dimension, trust and kindness sub-dimension, honesty and forgiveness sub-dimension. Participants' answers consist of options between 1 (completely disagree) and 6 (completely agree). The scale can be evaluated based on the total score. It was determined that the internal consistency value of the Organizational Virtue Scale was .94, and the internal consistency values of its sub-dimensions were .82, .87 and .93, respectively. (Erkmen and Esen, 2012). In this study, the internal consistency value of the Organizational Virtue Scale was calculated as .96. Cronbach Alpha values of the subscales of the scale were determined to be .94, .91, and .83, respectively. Once the scores were obtained, it is demonstrates that this scale was reliable.

Employee Empowerment Scale

The psychological empowerment scale developed by Spreitzer (1995) was adapted to Turkish by Sürvegil et al. in 2013 and its validity and reliability were established. The scale consists of 12 questions and 4 sub-dimensions: impact, competence, meaningfulness and autonomy. In addition, the scale is a 5-point Likert type and the expressions are; (1) strongly disagree, (2) disagree, (3) undecided, (4) agree, (5) strongly agree. According to the results of the exploratory factor analysis applied in the research, it was observed that the impact sub-dimension was .89, the competence sub-dimension was .85, the meaningfulness sub-dimension was .83 and the autonomy sub-dimension was .85, and the Cronbach Alpha value of the Psychological Empowerment Scale was calculated as .81. Additionally, the scale can be evaluated based on the total score

(Sürvegil et al., 2013). According to the results obtained in this research, the Cronbach Alpha value of the Employee Empowerment Scale was calculated as .83. It was determined that the scores obtained from the subscales of the scale were .87, .86, .77, and .93. It is possible to say that the Employee Empowerment Scale ensures its reliability due to the scores it has received.

Analysis of Data

At the end of the data collection, the data obtained was checked by the researcher in order to prevent possible errors and be ready for analysis, and by checking the obtained surveys, 25 incorrect or inconsistent answers were removed from the data group. In the data analysis process, firsly normality test was performed. Skewness and Kurtosis values were determined by examining the Shapiro-Wilk test significance results. These values for the measurement tools used in the research were between -1.5 and +1.5, and it was determined that the data had a normal distribution (Tabachnick and Fidell, 2013). The suitability of the data for regression analysis was examined by the presence of a linear relationship determined in the scatter diagram. It was determined that the data is distributed appropriately. In addition to descriptive statistics, T-test, One-way ANOVA, Pearson Correlation and Linear Regression Analysis methods were used. SPSS-24.00 package program was used to analyze the data.

Results

Table 1

T-test results of the mean scores of the participants on human rights attitude in sports, organizational virtue and employee empowerment, according to the administrative task variable

Scales	Administrative Task	N	x̄	S	sd	t	*p*
Human Rights in Sports	Have	101	3.88	.29	333	.465	.64
	Don't Have	234	3.87	.30			
Organizational Virtue	Have	101	3.48	1.18	333	.487	.63
	Don't Have	234	3.41	1.30			
Employee Emprovement	Have	101	4.40	.49	333	4.405	.00
	Don't Have	234	4.14	.49			
p<.05	Total	335					

It was determined that there was no statistically significant difference between the total mean score obtained from the Scales of Human Rights Atittude in Sports and the Organizational Virtue Scale and the administrative task variable (table 1). However, it was determined that the administrative task variable and the employee empowerment scale showed a significant difference in favor of those with administrative tasks, t1(333)=.465, *p*>.05, t2(333)=.487, *p*>.05; t3(333)=.00, *p*<.05.

Table 2

Oneway Anova Test Results of Participants' Mean Scores on Human Rights Attitude in Sports, Organizational Virtue and Employee Empowerment, According to Title Variable

Scales	Academic title	N	x̄	S	Source of Variance	sd	F	*p*
Human Rights in Sports	Prof. Dr.	38	3.91	.29	Between Groups	4	.302	.88
	Assoc. Dr.	88	3.86	.28				
	Assistant professor	82	3.86	.33				
	Lecturer	51	3.87	.31	Within Groups	330		
	Assistant	76	3.88	.25				
	Total	335	3.87	.29	Total	334		
Organizational Virtue	Prof. Dr.	38	3.64	1.17	Between Groups	4	.712	.58
	Assoc. Dr.	88	3.33	1.27				
	Assistant professor	82	3.36	1.16				
	Lecturer	51	3.35	1.31	Within Groups	330		
	Assistant	76	3.57	1.37				
	Total	335	3.43	1.26	Total	334		
Employee Empowerment	Prof. Dr.	38	4.41[ad]	.49	Between Groups	4	4.195	.03
	Assoc. Dr.	88	4.32[be]	.46				
	Assistant professor	82	4.19	.53				
	Lecturer	51	4.11	.53	Within Groups	330		
	Assistant	76	4.09[ae]	.48				
	Total	335	4.22	.51	Total	334		

p<.05, Post Hoc Tukey analysis is indicated by letters. A; professor, B; associate professor, C; assistant professor, D; lecturer and E; assistant.

Attitude Scale towards Human Rights in Sports and Organizational Virtue between the total score average obtained from the scale and the title variable It was determined that there was no statistically significant difference (table 2). F1(.330)=.88, *p*>.05, F2(330)=.58, *p*>.05. There is a statistically significant difference between the total score average and the title variable. It has been determined that there is a difference and this difference is in favor of professors and associate professors. It was determined that the scores the participants received increased as the title degree increased. F3(330)=.03, *p*<.05.

Table 3

Oneway Anova Test Results of the Mean Scores of the Participants on Human Rights Attitude in Sports, Organizational Virtue and Employee Empowerment, According to the Region of Residence Variable

Scales	Region	N	x̄	S	Source of Variance	sd	F	*p*
Human Rights in Sports	1	73	3.89	.26	Between Groups	6	.302	.93
	2	38	3.86	.27				
	3	35	3.86	.27				
	4	39	3.91	.25	Within Groups	328		
	5	71	3.84	.38				
	6	59	3.87	.26				
	7	20	3.87	.33				
	Total	335	3.87	.29	Total	334		
Organizational Virtue	1	73	3.54[a]	1.24	Between Groups	6	.2697	.01
	2	38	3.27	1.20				
	3	35	3.16	1.43				
	4	39	3.45	1.35	Within Groups	328		
	5	71	3.73[d]	1.23				
	6	59	3.47	1.22				
	7	20	2.59[g]	.81				
	Total	335	3.43	1.26	Total	334		
Employee Empowerment	1	73	4.35[a]	.46	Between Groups	6	2.398	.02
	2	38	4.22	.43				
	3	35	4.20	.54				
	4	39	4.26	.50	Within Groups	328		
	5	71	4.04[d]	.57				
	6	59	4.23	.47				
	7	20	4.25	.52				
	Total	335	4.22	.51	Total	334		

p<.05, Post Hoc Tukey analysis is indicated by letters. 1 (Marmara Region-a), 2 (Black Sea Region-b), 3 (Aegean Region-c), 4 (Mediterranean Region-d), 5 (Central Anatolia Region-d), 6 (Eastern Anatolia Region-e) and 7 (Southeastern Anatolia Region-g).

It was determined that there was no statistically significant difference between the total score mean obtained from the Scale of Human Rights Attitude in Sports and the region of residence variable (table 3). F1(328)=.93, *p*>.05. When comparing the total score mean obtained from the Organizational Virtue Scale with the region of residence variable, it was determined that there was a significant difference and this difference was in favor of the Central Anatolia Region. F2(328)=.01, *p*<.05. In addition, a significant difference was detected in the total mean score obtained from the Employee Empowerment Scale in favor of the Marmara Region according to the region of residence variable. F3(328)=.02, *p*<.05.

Table 4
Examining the Relationship Between the Human Rights Attitudes in Sports Scale, Organizational Virtue Scale and Employee Empowerment Scale with Pearson Product Moment Correlation

Scales	Human Rights in Sport	Organizational Virtue	Employee Emprovement
Human Rights in Sport	1	.195**	.368
Organizational Virtue	.195**	1	.188**
Employee Emprovement	.368**	.188**	1

**p<.001

When Table 4 was examined, a low-level positive relationship was detected between the human rights attitude in sports scale and the organizational virtuousness scale (r=.195, p<.05). A moderate positive relationship was detected between human rights in sports and Employee empowerment (r=.368, p<.05). Additionally, a low-level positive significant relationship was detected between the participants' organizational virtuousness scale and the Employee empowerment scale (r=.188, p<0.05).

Table 5
Regression Analysis Results on the Effect of Human Rights Attitude in Sports and Organizational Virtue on Employee Empowerment

Independent Variables	**β**	**t**	**p**	**F**	**$_{adj}R^2$**
(Constant)		5.168	.000**	52.167	.13
Human Rights in Sport	.37	7.223	.000**		
Dependent Variable: Employee Emprovement				Method: Enter	
(Constant)		49.745	.000**	12.157	.03
Organizational Virtue	.19	3.487	.000**		
Dependent Variable: Employee Emprovement				Method: Enter	
Independent Variables	**β**	**t**	**p**	**F**	**$_{adj}R^2$**
Human Rights in Sport	.34	6.675	.000**	29.148	.15
Organizational Virtue	.12	2.331	.000**		
Dependent Variable: Employee Emprovement				Method: Enter	

**p<.001

When Table 5 was examined, a statistically significant effect was detected in the relationship between human rights attitudes in sports, organizational virtuousness and employee empowerment, ß1=.37; p<.05, ß2=.19; p<.05. When the Squared Multiple Correlations (adjR2) value stated in the table was examined, it can be said that human rights have 13% explanation power for employee empowerment and organizational virtue has 3% explanation power for employee empowerment. In addition, when another Squared Multiple Correlations (adjR2) value stated in the table was examined, it was determined that human rights and organizational virtue had a 15% explanatory power on employee empowerment.

Discussion and Conclusion

In this research, in which the effects of human rights in sports and organizational virtuousness levels of academicians working in the basic field of sports sciences on employee empowerment were examined, an attempt was made to express the study results by correlating the relevant literature. Within the framework of the research, firstly, academicians' towards human rights attitudes in sports, organizational virtuousness and employee empowerment levels were explained. Finally, the analysis results of the participants' mean scores from the above-mentioned scales according to demographic variables were included. Correlation and regression analysis results were emphasized in order to determine the relationship between independent and dependent variables.

It was determined that there was no statistically significant difference between the participants' mean score obtained from the HRASS and the administrative task variable. It was assumed that this result stemed from the fact that managers' attitudes and behaviors towards human rights should be oriented towards human rights elements (Kepenekçi, 1999). There

was no statistically significant difference between the academics' mean score obtained from the OVS and the administrative task variable. When the relevant literature was examined, there were studies that support (Aktay & Ekşi, 2009; Demirel & Akdemir, 2023) and did not support (Şahin et al., 2013; İşsever et al., 2016; Yıldız, 2019) the results of this research. It was thought that this difference in favor of teachers and administrators within the Ministry of Youth and Sports was due to the excess number of work years. A statistically significant difference was detected between the participants' mean score obtained from the EES and the administrative task variable. When the literature was examined, there were studies that contain results parallel to the results of this study (Çavuş, 2008; Amen, 2015; Taşlıyan et al., 2015; Candan et al., 2016; Turan &Mızrak, 2019). It was thought that academics took administrative tasks made them feelt more competent within the institution, feelt more autonomous in their work, and have more influence on the decisions they made within the institution. From this point of view, it can be stated that academics with administrative duties were became more powerful.

There were no statistically significant relationship was detected between the academics' mean score obtained from the HRASS and the title variable. When the literature was examined, no study was found examining the difference between human rights in sports and the title variable. The reason for this situation was that, as stated in the Universal Declaration of Human Rights (1948), all individuals were equal before the law in terms of human rights in terms of many factors such as gender, race and title. In addition, as stated in the UNESCO (2015) International Charter on Physical Education, Physical Activity and Sports, all living individuals can participate in physical education and physical activity without any conditions and people can benefit from these activities to the extent they wish. In the light of the information given above, it can be said that the participation of academics working in the field of sports sciences in sports activities and the use of sports facilities and equipment awere protected as a result of international agreements. No statistically significant relationship was found between the mean score obtained by the participants from the OVS and the title variable. When the relevant literature was examined, results were found against this research (Ugwu, 2012; Magnier-Watanabe, et al., 2017). The sample of the study conducted by Ugwu (2012) consisted of bankers, and the sample of the study conducted by Magnier-Watanabe et al. (2017) consisted of employee working in the factory. In the study conducted by Magnier-Watanebe, it was stated that department heads in the middle position in the hierarchical sense act as a bridge between employees and managers and that the problem in their virtuousness levels may be related to the level of welfare and working conditions. Based on this point, it was thought that the results were different because the working environments of academicians working at the university were different and the hierarchical structure does not have similar features. A statistically significant relationship was determined between the academicians' mean score obtained from PDS and the title variable. A significant difference was detected between the professor and the lecturer in favor of the professor, between the associate professor and the research assistant in favor of the associate professor, and between the professor and the research assistant in favor of the professor. In addition, the mean scores obtained by the participants from the EES increased from research assistant to professor. In the study on employee empowerment conducted on academicians in 2015, Amen (2015) found a significant difference between employee empowerment and the title variable in favor of the professor. In Taşlıyan et al. (2015) research, a significant difference was found between employee empowerment and the title variable. In the light of the information given above, it can be stated that as the titles of working individuals develop and change in their professional lives, employee empowerment occurs.

No statistically significant relationship was found between the participants' mean score obtained from the HRASS and the region of residence variable. When the literature was examined, no study was found that investigated the relationship between human rights in sports and the region where individuals live. In the light of the information given, the concept of human rights was an element of rights acquired by individuals in a regional sense, starting with Magna Carta in England, and over time, thanks to many declarations such as the British Petition of Rights, the British Declaration of Rights, the French Declaration of Human and Citizen Rights, the American Declaration of Rights and the Universal Declaration of Human Rights. It has become international and a right that all individuals living in the world can acquire. In this context, it was thought that individuals' access to human rights and human rights in sports was not related to the region where they live. A statistically significant relationship was determined between the mean score obtained by academicians working in the field of sports sciences from the OVS and the region of residence variable. It was determined that the significant relationship was in favor of academics working in the Central Anatolia Region. When the relevant literature was examined, no research was found examining the differences between organizational virtuousness and the region variable. The increase in the rate of migration from rural to cities and even from cities to metropolitan cities since the 1980s has caused social disorders, economic problems, and political and cultural conflicts (Sever, 2019). The majority of the population and industrial

enterprises in our country were seen in the Marmara Region (İşseveroğlu & Gençoğlu, 2011). In this context, it was likely that the people of our country can move from villages to cities and from cities to metropolitan cities due to their anxiety about finding a job. The disruption of social norms and orders can be described as an inevitable end due to many reasons such as migration situations and the disappearance of borders between countries, which was one of the effects of globalization. It was thought that the results in favor of academics working in the Central Anatolia Region in this research were due to the fact that social rules and family structures have changed less compared to the Marmara Region. A statistically significant relationship was found between the academicians' mean score obtained from PDS and the region of residence variable. There was a significant difference in favor of individuals working in the Marmara Region. When the literature was examined, the research conducted by Çakmak (2022) determined that there was no statistically significant difference between the employee empowerment of people working in the telecommunications sector and the place of residence. It can be stated that the reason for this result was that the cities where the research was conducted were located in the same region. In Turkey, where individualization has increased over time, it was thought that individuals thought from an individual perspective and their lifestyle was formed in this way. Considering the population density of Turkey, the Marmara Region comes first with 24,465,689 people and the Central Anatolia Region comes second with 12,705,812 people. It can be thought that the spread of the capitalist way of thinking, people feeling lonely in modern business life, and the rapid development of the competitive environment have forced academics to be strong in their business lives (Mustafayeva &Bayraktaroğlu, 2014; Sever & Paksoy, 2019; Republic of Turkey Ministry of Internal Affairs, 2019). It can be stated that the results of this research stemed from the fact that the population density wass in favor of the Marmara Region and individualization was became more widespread day by day. It was determined that there was a low level, positive and significant relationship between academicians' HRASS and PDS. When the literature was examined, no research was found examed the relationship between human rights and organizational virtuousness in sports. As a matter of fact, human rights were the set of rights that people acquire from birth. It was thought that virtue plays an important role in the development of individuals in their social and professional lives. It can be stated that human rights and organizational virtue in sports complement each other. When individuals associate their innate personality, social and solidarity rights with the basis of optimism, trust, kindness, honesty and forgiveness in their professional lives, the awareness level of the employee working in the institution can increase, and the communication processes of the employees within the institution can increase and the effectiveness and efficiency of the organization can be sustained. It was thought that it may affect it in some way. Misbehaviors that may occur within the organization can be resolved with the dimension of individuals' personality and solidarity rights, and through forgiveness, the process of solving problems within the organization can be accelerated, thus preventing any damage that may be caused to the organization. In addition, it was envisaged that academics' adoption of concepts such as personal rights, social rights, courtesy and honesty can play an important role in the success of organizations by affecting both the creation of an environment of trust within the institution and the optimism of individuals. A moderately positive and significant relationship was found between the participants' HRASS and PDS. When the relevant literature was examined, no research was found examining the relationship between human rights and employee empowerment in sports. It was thought that the relationship between human rights and employee empowerment in sports affects each other. It was thought that the more academics internalize their personal and social rights, the more effective and independent they can be within the institution. It can be stated that individuals' level of awareness about the rights transferred to them by the authorities through international agreements and constitutions in their countries plays a role in both making sense of the workflow within the institution and reflecting their competencies to the organization. In this context, it was envisaged that academics' knowledge and practice of human rights and taking initiative in processes within the organization can increase the impact and adequacy of their work. A low-level, positive and significant relationship was detected between the ESS and PDS scores of academics working in the field of sports sciences. When the relevant literature was evaluated; there were studies supporting the results of this research examined the relationship between employee empowerment and organizational virtuousness (Bright et al., 2014; Akbolat et al., 2017; Tapan, 2019; Say, 2022). It was thought that the relationship between organizational virtuousness and employee empowerment has an important place in the development of institutions while preserving their existing structures. The trust that academics have in their colleagues contributes to the understanding of communication processes within the organization. It can be stated that ensuring the relations between individuals working within the institution on the basis of courtesy and tolerance can increase the impact of the activities carried out in the workflow of the institution. It was thought that as academics' self-confidence increased, they can feel more effective and autonomous within the institution.

The relationship between academics' attitudes towards human rights in sports and organizational virtuousness and

employee empowerment was examined. A statistically significant relationship was found between the participants' human rights in sports and organizational virtuousness and employee empowerment. In line with the results of the research, it was determined that human rights and organizational virtue in sports explained employee empowerment by 15%. When the relevant literature was examined, no study was found examining the relationship between human rights in sports, organizational virtuousness and employee empowerment. The relationship between human rights in sports and organizational virtuousness was discussed in the previous section and in the light of the information given above; the degree to which academics internalized their innate rights affected both their personal rights and social rights. These rights were a necessity to determine at what points academicians have rights within the institution and the limitations of these rights. It was thought that the concepts of human rights and virtue have become inseparable parts intertwined with each other. The solidarity rights sub-dimension, which was one of the sub-dimensions of human rights in sports, can be associated with trust and courtesy, which were the sub-dimensions of organizational virtue. It can be stated that academicians acting with team spirit and solidarity in the activities to be carried out within the institution can ensure that the relationship between them was established on the basis of trust and courtesy. It was possible to say that as a result of the relationships formed and shaped within the organization in line with this foundation, the impact of the work that academics can do and the meaningfulness of the work they can perform can increase. It was also thought that academics' knowledge of their social rights and acting accordingly may lead to an increase in optimism levels among employees within the institution. It can be stated that in organizations where optimism was used, the impact and meaningfulness of the work done can increase. It was possible to say that academics' awareness of personality and solidarity rights has an impact on providing an environment of trust within the organization and the forgiveness of individuals. By providing an environment of trust within the organization, employees can feel a greater sense of independence. At the same time, by providing an environment of trust, the level of forgiveness can increase. It was thought that the problems that may occur in organizations with a forgiving feature can be prevented and the meaningfulness and adequacy of the work done can be increased.

According to the above-mentioned results, it was thought that the survival of institutions, their sustainable development, and the generation of academics who shape the future as virtuous individuals who were sensitive to human rights can be factors in our country's rise to the level of contemporary civilizations. In this regard, by supporting academics to increase their awareness of their personal, social and solidarity rights, ensuring that their attitudes and behaviors within the institution were virtuous, and ensuring that academics have self-confidence in the work they can do, can both strengthen their commitment to the organization and strengthen them. It was thought that academics' forgiveness, kindness and optimism levels in the face of problems that may occur within the organization can directly affect the success rate of the institution. As a matter of fact, it seemed possible that these characteristics can affect the effectiveness, autonomy and competence of academicians within the organization, and when these conditions were met, staff empowerment of academicians can occur.

Etik Komite Onayı: Bu çalışma için etik komite onayı Niğde Ömer Halisdemir Üniversitesi'nden (Tarih: 29 Kasım 2023, Karar No: 18-02) alınmıştır.
Katılımcı Onamı: Bu çalışmaya katılan katılımcılardan yazılı onam alınmıştır.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları: Fikir-A.S. Tasarım-A.S.; Denetleme-S.İ.; N.B.G.; Kaynaklar-A.S.; Veri Toplanması ve/veya İşlemesi- A.S.; Analiz ve/ veya Yorum-A.S.; Literatür Taraması-A.S.; Yazıyı Yazan-A.S.; Eleştirel İnceleme- A.S.;S.İ.;N.B.G.
Çıkar Çatışması: Yazarlar, çıkar çatışması olmadığını beyan etmiştir.
Finansal Destek: Yazarlar, bu çalışma için finansal destek almadığını beyan etmiştir.

Ethics Committee Approval: Ethics committee approval for this study was received from Niğde Ömer Halisdemir University (Date: 29 November 2023, Decision No: 18-02).
Participant Consent: Written informed consent was obtained from the participants who participated in this study
Peer-review: Externally peer-reviewed.
Author Contributions: Concept –A.S.; Design-A.S.; Supervision-*N.B.G.;S.İ. Resources-A.S.; Data Collection and/or Processing-A.S.; Analysis and/or Interpretation-A.S.; Literature Search-A.S.; Writing Manuscript-A.S.; Critical Review-A.S.; S.İ.; N.B.G.
Conflict of Interest: The authors have no conflicts of interest to declare.
Financial Disclosure: The authors declared that this study has received no financial support.

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