

University for Business and Technology in Kosovo

UBT Knowledge Center

UBT International Conference

2022 UBT International Conference

Oct 29th, 12:00 AM - Oct 30th, 12:00 AM

International Conference on Sport

University for Business and Technology - UBT

Follow this and additional works at: <https://knowledgecenter.ubt-uni.net/conference>

Recommended Citation

University for Business and Technology - UBT, "International Conference on Sport" (2022). *UBT International Conference*. 19.

<https://knowledgecenter.ubt-uni.net/conference/2022/bp/19>

This Event is brought to you for free and open access by the Publication and Journals at UBT Knowledge Center. It has been accepted for inclusion in UBT International Conference by an authorized administrator of UBT Knowledge Center. For more information, please contact knowledge.center@ubt-uni.net.

University for Business and Technology in Kosovo

UBT Knowledge Center

UBT International Conference

Oct 29th, 9:00 AM - Oct 30th, 6:30 PM

University for Business and Technology - UBT

Follow this and additional works at: <https://knowledgecenter.ubt-uni.net/conference>

Recommended Citation

University for Business and Technology - UBT, "International Conference on Sport" . UBT International Conference.

This Event is brought to you for free and open access by the Publication and Journals at UBT Knowledge Center. It has been accepted for inclusion in UBT International Conference by an authorized administrator of UBT Knowledge Center. For more information, please contact knowledge.center@ubt-uni.net.



Proceedings of the 11th Annual International Conference on
Sport

Edited by
Edmond Hajrizi



Leadership and Innovation

Education | Research | Training | Consulting | Certification



PROCEEDINGS

11th UBT ANNUAL INTERNATIONAL
CONFERENCE

29-30
OCTOBER

UBT Innovation
Campus

INTERNATIONAL CONFERENCE ON
SPORT

Conference Book of Proceedings International Conference

Pristina

ISBN 978-9951-550-93-2

© UBT – Higher Education Institution

International Conference on Business, Technology and Innovation Pristina, Kosovo 29-30

Editor: Edmond Hajrizi

Organizing Committee: Edmond Hajrizi, Hasan Metin, Visar Krelani, Hazir Cadraku, Retkoceri B, Selmani F, Muhamet Ahmeti, Selmani F, Muhamet Sherifi, Kastrati A, Mirlinda Reçica

Authors themselves are responsible for the integrity of what is being published. Copyright © 2019 UBT. All rights reserved.

Publisher, UBT

Editor Speech of IC - BTI

International Conference is the 11th international interdisciplinary peer reviewed conference which publishes works of the scientists as well as practitioners in the area where UBT is active in Education, Research and Development. The UBT aims to implement an integrated strategy to establish itself as an internationally competitive, research-intensive institution, committed to the transfer of knowledge and the provision of a world-class education to the most talented students from all backgrounds. It is delivering different courses in science, management and technology. This year we celebrate the 21th Years Anniversary. The main perspective of the conference is to connect scientists and practitioners from different disciplines in the same place and make them be aware of the recent advancements in different research fields, and provide them with a unique forum to share their experiences. It is also the place to support the new academic staff for doing research and publish their work in international standard level. This conference consists of sub conferences in different fields: - Management, Business and Economics - Humanities and Social Sciences (Law, Political Sciences, Media and Communications) - Computer Science and Information Systems - Mechatronics, Robotics, Energy and Systems Engineering - Architecture, Integrated Design, Spatial Planning, Civil Engineering and Infrastructure - Life Sciences and Technologies (Medicine, Nursing, Pharmaceutical Sciences, Phycology, Dentistry, and Food Science),- Art Disciplines (Integrated Design, Music, Fashion, and Art). This conference is the major scientific event of the UBT. It is organizing annually and always in cooperation with the partner universities from the region and Europe. In this case as partner universities are: University of Tirana – Faculty of Economics, University of Korca. As professional partners in this conference are: Kosova Association for Control, Automation and Systems Engineering (KA – CASE), Kosova Association for Modeling and Simulation (KA – SIM), Quality Kosova, Kosova Association for Management. This conference is sponsored by EUROSIM - The European Association of Simulation. We have to thank all Authors, partners, sponsors and also the conference organizing team making this event a real international scientific event. This year we have more application, participants and publication than last year.

Congratulation!

Edmond

Hajrizi, Rector of UBT and Chair of IC - BTI

Përmbajtja

UBT Knowledge Center.....	1
International Conference on Business, Technology and Innovation Pristina, Kosovo 29-30 2022.....	3
Physiological Health Outcomes of Green Exercise: A Systematic Study	6
Akan Bayrakdar ¹ [0000-0002-3217-0253] Işık Bayraktar ² [0000-0003-1001-5348] Agron Thaqi ³ [0000-0001-7306-0088].....	6
^{1,2} Alanya Alaaddin Keykubat University, Sport Science Faculty, Alanya, Türkiye	6
³ UBT College, Faculty of Sport and Movement Science, Prishtine, Kosovo.....	6
The acceptance of telerehabilitation in physical therapy:	17
A systematic review	17
Ana Sulaj 1[0000-0002-7921-0320] , Andromeda (Keci) Lalaj 2[0000-0001-9601-2142] , Angjela Çaveli 3[0000-0002-.....	17
1458-4292] Klejda Tani 4[0000-0002-4060-4971].....	17
Health Outcomes of Food Advertisements in Digital Games: A Systematic Study	34
Pelin Avcı ¹ [0000-0002-9185-4954] Akan Bayrakdar ² [0000-0002-3217-0253] Işık Bayraktar ³ [0000-0003-1001-5348] Agron Thaqi ⁴ [0000-0001-7306-0088]....	34
¹ Gazi University, Institute of Education Sciences, Türkiye	34
^{2,3} Alanya Alaaddin Keykubat University, Sport Science Faculty, Alanya, Türkiye	34
⁴ UBT College, Faculty of Sport and Movement Science, Prishtine, Kosovo.....	34
Evaluation of Balance Performance of Children with.....	43
Intellectual Disability	43
Mehmet DİNÇ ¹ [0000-0002-6093-2155], Ayşe Funda KESER ² [0000-0001-6788-9914], Yaren ATMACA ² [0000-0003-2243-9930] and Sibel NALBANT ³ [0000-0002-9930-376X]	43
¹ Alanya Alaaddin Keykubat University, Sport Sciences Faculty, Graduate Student/ Alanya, ANTALYA	43
² Physical Education and Sport Teacher/ Alanya, ANTALYA	43
³ Alanya Alaaddin Keykubat University, Sport Sciences Faculty, Associate Professor/ Alanya, ANTALYA	43
Incs@springer.com.....	43

Physiological Health Outcomes of Green Exercise: A Systematic Study

Akan Bayrakdar¹ [0000-0002-3217-0253] Işık Bayraktar² [0000-0003-1001-5348] Agron Thaqi³ [0000-0001-7306-0088]

^{1,2}Alanya Alaaddin Keykubat University, Sport Science Faculty, Alanya, Türkiye

³UBT College, Faculty of Sport and Movement Science, Prishtine, Kosovo

Abstract

This study aims to examine the physiological effects of green exercise. Generally, human and environment interaction studies take into account the extremes of the environment on people or how people affect the environment. It is known that exercise positively affects physiological health. This systematic study addresses declining levels of exercise in today's world societies and how the environment can help facilitate exercise. It also addresses the physiological health benefits that occur when exercising outdoors. Activities in many green environments including forests, seaside, rural areas, parks, green areas, and even gardens, benefit human health. The focus of this systematic study is to examine the literature in relation to the physiological changes that occur as a result of participating in green exercise. Accordingly, English-language articles published in PubMed, Web of Science, Google Scholar, and Sports DISCUS databases that were published between 2015 and 2022 were investigated. In total, 645 articles were studied. 12 of the articles reviewed by experts have been evaluated for use in the study. Studies show that green exercise improves physiological health, prevents diseases at the biochemical level, has a positive effect on rehabilitation programs, and even reduces health care costs. As a result, it is thought that exercising in green areas and outdoors will benefit, especially to overcome the health problems faced by developed countries. In addition, outdoor or nature should not be considered a playground for people who are just doing extreme sports and looking for excitement, it is very important to distribute it to the whole community in order to improve health.

Keywords: Green Exercise, Physiological, Health

1. Introduction

Regular physical activity contributes to physiological and psychological well-being (Warburton et al., 2006). In addition, there are many studies that show that doing physical activity in natural environments has a greater contribution to physiological and psychological

well-being(Pretty et al., 2005). In short, combining physical activity and green exercise will bring greater health benefits(Larkin, 2000). Therefore, the concept of "green exercise" has developed (Mackay & Neill, 2010). Green exercise, in its simplest form, means all kinds of activities carried out in nature.

Despite the positive effects of nature, in the 20th and 21st centuries, people began to live in more urban areas. Today, the number of people living in urban areas has exceeded the number of people living in rural areas. More services and occupations, and access to schools, hospitals, and recreational facilities have led to the preference for urban areas. However, it is known that there are fewer greenery areas in urban areas compared to rural areas(Pretty et al., 2005). But even if people continue their lives in urban areas, there are three levels of interaction with nature. These are; watching nature, being active in nature and spending time in nature(Pretty, 2004). It is reported by researchers that people who interact with nature as mentioned are healthier.

This study was conducted with the intention of filling the gap in the literature. Therefore, the systematic review serves three purposes. (i) to provide an overview of the physiological benefits of green exercise, (ii) to determine the effectiveness of green exercise on the evaluated results, (iii) and to guide the following studies to examine green exercise in humans, based on a review of existing findings.

2. Methodology

1. Study Strategy and Eligibility Criteria

A systematic literature review was conducted in 2022 using Web of Science, PubMed, Google Scholar and Sport Discus databases. In addition, articles published in English are included in the review. The primary search was based on title, abstract, and keywords, using Boolean logic for the combination of search terms. The search terms were determined based on previous reviews and agreements between authors. These are concepts such as nature, physical activity, and green exercise. Some limitations have been imposed on the study of comprehensive literature. In addition, the searches in the databases were carried out in the following order (green and nature*, outdoor and exercise*, park and green area*, physical activity and exercise*, physiology and green exercise*).

The components of the PICOS question, including population, intervention, comparators, outcomes, and study design, were answered to define eligibility criteria. The study covers only articles published between 2015 and 2022 in English-language peer-reviewed journals.

Table 1. Study Selection Criteria

PICOS	Eligibility Criteria
Population	Children and adults
Interventions	Any physical activity conducted in nature
Comparators	Comparison group not determined
Outcomes	Physiological consequences: changes due to stimulus response
Study Designs	No limitations with the study design

2.2 Scanning and Study Selection

The reference results of the database search were transferred to the Mendeley reference program. The studies were scanned in terms of inclusion criteria according to the title in the first stage, followed by abstract and full text scans. The scanning process was conducted independently by the authors. The authors discussed the results and the full texts were included in the analysis based on mutual agreement. About the included articles; authors, year, country, participants and sample group, objectives and hypotheses, findings, and results are included in the analysis table.

The "Effective Public Health Practice Project" (EPHPP) was used to evaluate the bias risk of the included studies (Thomas et al., 2004). EPHPP is used for observational, cross-sectional, cohort, and randomized controlled trial designs (Armijo-Olivo et al., 2012). The EPHPP tool has six equiponderant categories that are included in an overall rating to assess the quality of work. These are selection bias, study design, confounders, blinding, data collection practices, and withdrawal. The category of withdrawals and dropouts was also applied to cross-sectional studies since it contains information about the percentage of participants who completed the study. Each category received a strong (1), medium (2), or weak (3) rating, which is the basis for the overall rating of the work. In addition, systematic reviews and meta-analysis studies were not included in the study.

3. Results

The study selection process is given in Figure 1. A total of 645 articles were determined from four databases. After the duplicates were removed, 185 articles remained for scanning. At the end of the process, 12 studies were identified that met the inclusion criteria.

Figure 1. Flow chart of the study selection process

Table 2 presents a summary of the included studies.

No study published in 2016 matched the criteria for inclusion. While the sample groups of the three studies included in our study are children and adolescents (between the ages of 12 and 18) (Akpinar, 2019; Igarashi et al., 2015; Melo et al., 2021), all of the other studies were with adult individuals (Kabisch et al., 2021; Leng et al., 2020; Li et al., 2020; Navalta et al., 2021; Niedermeier et al., 2017; Ren et al., 2022; Wood & Smyth, 2019; Wooller et al., 2015).

When studies conducted on children and adolescents are examined, while outdoor and playground values decrease along with urbanization, the duration of physical activity decreases and weight gain occurs. Therefore, it is argued that screen time is negatively associated with green exercise (Akpinar, 2019). Despite this, no relationship was found between the urban green area rate, exposure to the green, species wealth in green areas and obesity rates (Melo et al., 2021). In another study, while watching real flowers reduced sympathetic nerve activity, it did not cause any change in parasympathetic nerve activity and the number of heartbeats (Igarashi et al., 2015).

Table 2. Properties of the included works

	Author, Year and Country	Properties of Sample Group	Tests and study methods	Study Problems or Hypotheses	Findings and Results
1	Li et al. (2020) China	Adult individuals -N=218 Age mean 55	1.6 km walk in green areas	-Walking in the city during the day has negative and walking in the city at night has positive effects on physiological reactions. -Walking in green areas during the day has positive effects and at night has negative effects. -Compared to green walking at night, the positive effects of city walking are greater.	Walking in green areas during the day has positive effects on lowering blood pressure. As a result, urban areas are noisy and uneasy during the day, unsuitable for walking, but amusing and attractive at night. Individuals living in the city, taking night walks in an urban area or in green areas where the air is less polluted will contribute to their health.
2	Wooller et al. (2015)	-adult individuals -N=29	-Heart rate and perceived effort rate were evaluated at the beginning and end of the test. Evaluations were made on a bicycle ergometer. The nature environment is created in such a way as to include visual, auditory, and texture components.	The aim of this study was to examine the relative contribution of sight, sound and smell to the perceptual effects of green exercise. It has been hypothesized that blocking the sensory input of natural environments visually, audibly, and olfactorily during exercise will	As a result, no conclusions are drawn about the relative contribution or predominance of certain senses on the green exercise effects. However, it has been determined that the performing green exercise causes changes in heart rate responses.

				have a reducing effect on heart rate and perceived difficulty level.	
3	Niedermeier et al. (2017) Austria	-adult individuals Between the ages of 18 and 70 -Age mean 32	-Blood pressure, salivary cortisol concentration, and heart rate -The participants were divided into 3 groups as mountain hiking, treadmill walking, and sedentary control condition outdoor.	The study is to analyze the acute effects of the environment and longer-term physical activity on the physiological parameters associated with stress. Hypothesis: It has been assumed that exercise status may have more positive effects than sedentary status, and a green exercise environment may have additional positive effects compared to indoor exercise.	A significant decrease in salivary cortisol levels was observed in the 3-hour mountain hiking group compared to the sedentary control group. No such effect was found for blood pressure and heart rate. Physiological parameters depending on stress due to the natural environment did not show additional positive effects on salivary cortisol level, blood pressure and heart rate variable.
4	Kabisch et al. (2021) Germany	-adult individuals -Age mean 63.5 -N=33	-ECG -Blood pressure value -Heart Rate -Participants are divided into three groups.	-In the study, it was aimed to examine the effects of psycho-physiological health variables in elderly people before, during, and after a visit to an old urban park, a newly developed	-Significant decreases in pulse and systolic blood pressure were found during periods of visits to an old park. In addition, significant drops in heart rate were detected during visits to a crowded urban

				<p>park, and a street environment with a high density of people. Hypothesis: It is assumed that the health outcomes in green environments (old park and new park) will be beneficial in health variables and the urban crowded street environments will be negative.</p>	<p>street. As a result, visiting urban green spaces is important for improving cardiovascular health, especially in older people.</p>
5	<p>Ren et al. (2022) China</p>	<p>-College student -N=6 -age mean 22</p>	<p>-Blood pressure -Pulse rate -Evaluations were made on 3 different streets. Tree cover is high, medium and low.</p>	<p>-The study investigated the effects of street trees on urban thermal comfort and human physiological index in a highly urbanized and densely populated city. Hypothesis: The study of the daily differences and relationships in urban thermal comfort and human physiological conditions on different streets.</p>	<p>It has been determined that there is a more comfortable thermal environment with lower physiological equivalent temperatures on the street where the tree cover is high. Streets with high tree cover reduce heat stress more. In addition, thermal stress increases on streets with low tree cover, in parallel, blood pressure and pulse rates increase.</p>
6	<p>Li et al. (2020) China</p>	<p>-adult individuals -N=18</p>	<p>-Heart Rate -Heart rate change</p>	<p>The study aimed to investigate the</p>	<p>As a result, it was stated that watching nature</p>

		-age mean 27,94	-test procedure: subjects watched for 2 minutes in front of a nature video and a black screen.	effects of watching nature videos on isometric exercise. Hypothesis: Heart rate and heart rate variability during wall sit exercise	videos increased pleasure during wall sitting exercise, decreased perceived effort, decreased heart rate, and increased cardiac autonomic recovery after exercise.
7	Leng et al. (2020) China	-adult individuals -N=188 -Age mean 67.5	-Recommendation of exercise prescription for cardiovascular diseases	Objective: The study, considering the extremely cold climate in winter cities, is conducted to relate the exercise characteristics of the elderly living in green areas with the principles of exercise prescription for cardiovascular health, and to determine the missing factors of green areas to promote exercise for cardiovascular health.	The results could play an important role in promoting exercise for cardiovascular health, green space planning in winter cities, disease prevention, treatment, and rehabilitation for elderly and other cardiovascular patients.
8	Akpınar (2019)	- Adolescent s -Between the ages of 13 and 19 -N=384 -Age mean 15.57	-Green exercise duration and frequency -BMI measurement -Data were collected in eight different urban green areas in Turkey (green	-Hypothesis: the relationship between the characteristics of urban green areas and the self-reported frequency and duration of	With urbanization, outdoor playgrounds and recreation areas are decreasing, while the duration of physical

			road, public park, neighborhood parks and recreation areas).	green exercise by young people, the relationship between overall health and BMI	activity is decreasing and weight gain is occurring. It has been revealed that the characteristics of urban green areas are not significantly related to the frequency and duration of green exercise in boys, while increased BMI and screen time are negatively related to green exercise.
9	Navalta et al. (2019) ABD	-adult individuals -N=10	-Heart Rate -Blood pressure -Measurement areas: Laboratory, Out-of-town environment, outdoor green environment, outdoor brown environment, light brown environment below sea level	In the study, it was aimed at whether exercise performed in a desert environment increased the benefits reported by green exercise.	The findings showed that cardiovascular responses are generally similar in natural environments, and the findings also encompass perceptual measurements. The data obtained show that exercise performed in a desert environment provides as many benefits as the exercise performed in a green environment.
10	Wood & Smyth (2019) UK	-adult individuals -N=45 -Age mean 69.9	-Heart rate variability -heart rate variability was monitored continuously for 24 hours. They kept a diary of	-Investigating the relationships between nature exposure and green exercise	As a result, it was determined that childhood exposure to nature and participation in green exercise is an important

			daily activities, during sleeping and waking hours.	in childhood and adulthood -To study the effect of exposure to nature during childhood and adulthood, and the effect of green exercise on adult heart rate variability.	predictor of adherence to nature. It has also been established that exposure to nature and green exercise in childhood are significantly related to stress reactions and heart rate change during sleep.
11	Melo et al. (2021) Portugal	-Children and adolescents -N=382 - Between the ages of 12 and 18	-Physical activity -BMI -Obesity	-It was aimed to investigate whether the number of green spaces in the city, the level of green exposure, and the amount of species wealth in green areas in Portuguese adolescents are related to physical activity and BMI and whether these relationships change in compliance with the socioeconomic poverty index.	As a result, there was no relationship between the number of urban green spaces, exposure to the green, and species wealth in green spaces, and overweight and obesity rates in the Portuguese adolescent population.
12	Igarashi et al. (2015) Japan	- Adolescents -Age mean 16,4 -N=40	-Heart rate variability -Sympathetic nervous activity -Parasympathetic nervous activity Watching artificial or real flowers for 3 minutes.	-The study was conducted in order to evaluate the physiological effects of visual stimulation of real or artificial flowers (violets)	As a result, watching real flowers reduced sympathetic nervous activity. However, no changes were observed in parasympathetic nerve activity and pulse.

				according to autonomic nervous activity.	
--	--	--	--	--	--

When studies conducted in adults were examined, it was found that walking in green areas during the day has positive effects on lowering blood pressure (Li et al., 2020). Changes in heart rate responses have been observed with green exercise and exposure to nature (Kabisch et al., 2021; Li et al., 2021; Ren et al., 2022; Wood & Smyth, 2019; Wooller et al., 2015). But in a study that examined acute effects, positive effects on heart rate changes were not observed (Niedermeier et al., 2017). In addition, walking on the streets with a more green ratio improves cardiovascular health (Kabisch et al., 2021; Leng et al., 2020), and it also positively affects blood pressure, since temperatures are lower on streets with an excess green ratio (Ren et al., 2022). It is stated that watching green nature images during sports performance increases the decrease in perceived effort and cardiac autonomic recovery (Li et al., 2021). As a different finding, we need to specify that it was found that exercises performed in a desert environment provided benefits, as did exercises performed in a green environment. (Navalta et al., 2021). As a result, it was determined that childhood exposure to nature and participation in green exercise is an important predictor of adherence to nature. It has also been established that exposure to nature and green exercise in childhood are significantly related to stress reactions and heart rate change during sleep (Wood & Smyth, 2019).

In conclusion, after a thorough review of the green exercise literature, it can be said that exercising outdoors or in virtual green environments has physiological health benefits. Researchers have stated that exposure to nature compared to indoor places will bring more benefits.

References

1. Akpınar, A. (2019). Green Exercise: How Are Characteristics of Urban Green Spaces Associated with Adolescents' Physical Activity and Health? *International Journal of Environmental Research and Public Health*. <https://doi.org/10.3390/ijerph16214281>
2. Armijo-Olivo, S., Stiles, C. R., Hagen, N. A., Biondo, P. D., & Cummings, G. G. (2012). Assessment of study quality for systematic reviews: A comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: Methodological research. *Journal of Evaluation in Clinical Practice*, 18(1), 12–18. <https://doi.org/10.1111/j.1365-2753.2010.01516.x>
3. Igarashi, M., Aga, M., Ikei, H., Namekawa, T., & Miyazaki, Y. (2015). Physiological and Psychological Effects on High School Students of Viewing Real and Artificial Pansies. *OPEN ACCESS Int. J. Environ. Res. Public Health*, 12, 12. <https://doi.org/10.3390/ijerph120302521>
4. Kabisch, N., Püffel, C., Masztalerz, O., Hemmerling, J., & Kraemer, R. (2021). Physiological and psychological effects of visits to different urban green and street environments in older people: A field experiment in a dense inner-city area. *Landscape and Urban Planning*, 207. <https://doi.org/10.1016/j.landurbplan.2020.103998>
5. Larkin, M. (2000). How green is your workout? *Lancet*, 355(9216), 1702. [https://doi.org/10.1016/S0140-6736\(05\)73110-X](https://doi.org/10.1016/S0140-6736(05)73110-X)
6. Leng, H., Li, S., Zhao, H., Song, Y., & Yuan, Q. (2020). Planning for Supportive Green Spaces in the Winter City of China: Linking Exercise of Elderly Residents and Exercise

- Prescription for Cardiovascular Health. *International Journal of Environmental Research and Public Health Article Int. J. Environ. Res. Public Health*, 17, 5762. <https://doi.org/10.3390/ijerph17165762>
7. Li, H., Liu, H., Yang, Z., Bi, S., Cao, Y., & Zhang, G. (2020). The Effects of Green and Urban Walking in Different Time Frames on Physio-Psychological Responses of Middle-Aged and Older People in Chengdu, China. <https://doi.org/10.3390/ijerph18010090>
 8. Li, H., Zhang, X., Bi, S., Liu, H., Cao, Y., Zhang, G., Kemper, H. C. G., & Tchounwou, P. B. (2021). Green Exercise: Can Nature Video Benefit Isometric Exercise? <https://doi.org/10.3390/ijerph18115554>
 9. Mackay, G. J., & Neill, J. T. (2010). The effect of “green exercise” on state anxiety and the role of exercise duration, intensity, and greenness: A quasi-experimental study. *Psychology of Sport and Exercise*, 11(3), 238–245. <https://doi.org/10.1016/j.psychsport.2010.01.002>
 10. Melo, J., Ribeiro, A. I., Aznar, S., Pizarro, A., & Santos, M. P. (2021). Urban Green Spaces, Greenness Exposure and Species Richness in Residential Environments and Relations with Physical Activity and BMI in Portuguese Adolescents. *Public Health*, 18. <https://doi.org/10.3390/ijerph18126588>
 11. Navalta, J. W., Bodell, N. G., Tanner, E. A., Aguilar, C. D., & Radzak, K. N. (2021). Effect of exercise in a desert environment on physiological and subjective measures. *International Journal of Environmental Health Research*, 31(2), 121–131. <https://doi.org/10.1080/09603123.2019.1631961>
 12. Niedermeier, M., Grafetstätter, C., Hartl, A., & Kopp, M. (2017). A Randomized Crossover Trial on Acute Stress-Related Physiological Responses to Mountain Hiking. *International Journal of Environmental Research and Public Health Article*. <https://doi.org/10.3390/ijerph14080905>
 13. Pretty, J. (2004). How nature contributes to mental and physical health. *Spirituality and Health International*, 5(2).
 14. Pretty, J., Peacock, J., Sellens, M., & Griffin, M. (2005). The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*, 15(5), 319–337. <https://doi.org/10.1080/09603120500155963>
 15. Ren, Z., Zhao, H., Fu, · Yao, Xiao, · Lu, & Dong, Y. (2022). Effects of urban street trees on human thermal comfort and physiological indices: a case study in Changchun city, China. *Journal of Forestry Research*, 33, 911–922. <https://doi.org/10.1007/s11676-021-01361-5>
 16. Thomas, B. H., Ciliska, D., Dobbins, M., & Micucci, S. (2004). A Process for Systematically Reviewing the Literature: Providing the Research Evidence for Public Health Nursing Interventions. In *Worldviews on Evidence-Based Nursing* (Vol. 1, Issue 3).
 17. Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. In *CMAJ* (Vol. 174, Issue 6, pp. 801–809). <https://doi.org/10.1503/cmaj.051351>
 18. Wood, C. J., & Smyth, N. (2019). *International Journal of Environmental Health Research* The health impact of nature exposure and green exercise across the life course: a pilot study. <https://doi.org/10.1080/09603123.2019.1593327>
 19. Wooller, J.-J., Barton, J., Gladwell, V. F., & Micklewright, D. (2015). *International Journal of Environmental Health Research* Occlusion of sight, sound and smell during Green Exercise influences mood, perceived exertion and heart rate. <https://doi.org/10.1080/09603123.2015.1109068>

The acceptance of telerehabilitation in physical therapy:

A systematic review

**Ana Sulaj 1[0000-0002-7921-0320] , Andromeda (Keci) Lalaj 2[0000-0001-9601-2142] ,
Angjela Çaveli 3[0000-0002-**

1458-4292] Klejda Tani 4[0000-0002-4060-4971]

1 Sports University of Tirana, Faculty of Rehabilitation Sciences, Kinesiology Department

2 Sports University of Tirana, Faculty of Rehabilitation Sciences, Kinesiology Department

3 Physical Therapist at Tirana Health Clinic

4 Sports University of Tirana, Faculty of Rehabilitation Sciences, Kinesiology Department

1 asulaj@ust.edu.al 2 alalaj@ust.edu.al 3 cavelianxhela@yahoo.com

4 ktani@ust.edu.al

Abstract: The aim of this study is to review the data collected from articles, reviews and research papers on telerehabilitation of the last 5 years. We searched the Medline/PubMed, PEDRO and Cochrane Library databases. To find the necessary articles to carry out this review, we have used keywords such as telerehabilitation, digital health and virtual rehabilitation. Articles where the interventions to be evaluated is telerehabilitation by physical therapy of cardiac, neurological and musculoskeletal pathologies, were included. Some studies have shown that the efficacy of tele-rehabilitation is comparable to in person rehabilitation or better than no rehabilitation, while others demonstrate equal efficacy of tele-rehabilitation or even superior than one-on-one physiotherapy. This method was shown to be effective in conditions such as osteoarthritis, low back pain, post-operative patients, multiple-sclerosis, cardiac and pulmonary rehabilitation.

Studies showed that a physiotherapeutic intervention with telerehabilitation is feasible and an acceptable method for patients with cardiac, nervous or musculoskeletal conditions. Tele-rehabilitation has shown to be useful in enabling physiotherapists to access patients who are unable to attend one on one rehab because of transportation difficulties and various other reasons for non-attendance.

Key Words: telerehabilitation, digital health, virtual rehabilitation

2

1. Introduction

The Covid-19 pandemic has pushed governments around the world to suddenly cut off some health care services, one of which physical therapy, in order to avoid the spread of the virus. Knowing how necessary physiotherapy was in pandemic conditions, whether for the consequences of inactivity, musculoskeletal pain or various pathologies, health care professionals managed to offer their service through mobile technologies, creating telerehabilitation. Telerehabilitation is an audio-visual technological system that enables an alternative way of providing rehabilitation services to patients with spinal cord injuries, postoperative neurological deficits [1], cardiac pathology [2], respiratory diseases [3] or musculoskeletal disorders [4,5]. The sophistication of technology has thus facilitated communication between the health care professionals and the patient at a distance, however it is still unclear whether this way of virtual rehabilitation is being accepted in healthcare or how effective it is. Since telerehabilitation is still a relatively new method of delivering healthcare it requires wider exploration and research of both its advantages and disadvantages compared to traditional physical therapy. Some of the challenges this method poses include lack of national e-health policies or laws, issues with data privacy or security, access to a reliable internet service and speed, lack of patient's digital knowledge and skills (therefore, acceptance from the patients), technologies that were difficult to use, software and hardware issues, sustainability, cost-effectiveness etc.

The aim of this review was to understand how telerehabilitation is being integrated into medicine and whether this form of physical therapy delivery through mobile technology is being accepted or not.

2. Methodology

To make this review we have searched in reliable scientific sources such as Medline/PubMed, PEDRO and Cochrane Library using keywords such as telerehabilitation, digital health and virtual rehabilitation in physiotherapy. The databases displayed 219 articles, but only 21 were selected that met the inclusion criteria. The articles that we have included in this literature review must be from the

3

last 5 years, since telerehabilitation received the biggest boost during the period of the Covid-19 pandemic, and also the articles must focus on telerehabilitation based on physiotherapeutic methods in cardiac, nervous, musculoskeletal and respiratory pathologies. All articles studying telerehabilitation focused on pharmacology or other

services that weren't physical therapy were excluded.

3. Results

Telerehabilitation can be an efficient method to be used by physical therapists which was observed in the study conducted by Hernando-Garijo I et al., 2021 [6] who conducted a 15-week intervention with 2 sessions per week in women with fibromyalgia, based on video-assisted aerobic exercise. The intervention group that performed the telerehabilitation program resulted in greater improvement in pain intensity ($p=0.022$), mechanical pain sensitivity ($p<0.05$) and psychological stress ($p=0.005$) compared to the control group.

Similarly, Paolucci T et al., 2022 [7] investigated the effectiveness of telerehabilitation in 28 women with fibromyalgia aged 56.61 ± 8.56 years. Carried out via the Zoom platform, the program was based on breathing and relaxation techniques and included 8 sessions once a week of 1 hour each. Clinical measurements for physical stress and fear of mobility were performed at the beginning of the intervention, after the 8-week program and 1-month follow-up through different questionnaires. The main conclusion was that telerehabilitation reduced physical and psychological stress, fear and disability ($p<0.001$) and improved quality of life for patients with FM, but showed less positive effects on aspects of resilience and management skills.

Preoperative telerehabilitation has also demonstrated benefits in improving muscle strength, joint amplitude and functionality before Total Knee Arthroplasty (TKA), thus contributing to better post-surgical functional recovery in geriatric female patients with osteoarthritis [8]. Author Azma K., et al 2018 [9] studied 54 patients with knee osteoarthritis comparing telerehabilitation with office physiotherapy (OBPT) through a 6-week program. At the end of the study it was observed that telerehabilitation was as effective as OBPT in improving patients' function and

4

considering the reduced time and cost that telerehabilitation offers, it is a program that can be recommended in this category of patients.

The effectiveness of telerehabilitation has also been proven for neurological diagnoses by a team of researchers in Taiwan [10] who researched the effects of the interactive system with Kinect cameras in the rehabilitation of individuals with chronic AVC. The experimental group of 15 patients underwent rehabilitation with 3 sessions per week for 4 weeks in an individual room that simulated the home environment through virtual reality, while the control group, again with 15 subjects and the same duration and frequency, performed traditional sessions with physiotherapists in the dedicated rehabilitation area. The Kinect camera telerehabilitation system demonstrated superior or equal efficacy to conventional physiotherapy in improving balance in patients with chronic stroke.

In a randomized control Lee S. J et al., 2022 [11] studied the effects of dance therapy through telerehabilitation (9 subjects) on trunk control and increased balance in patients with AVC compared to traditional therapy (8 subjects). Dance therapy through telerehabilitation brought significant improvement in trunk control and

balance and was not at all inferior to traditional therapy.

Likewise, Chen J., et al 2020 [12] analyzed the effectiveness of a 12-week motor training in home conditions through telerehabilitation in patients with subcortical AVC. 52 patients with AVC and hemiplegia were randomly divided into the motor training group via home telerehabilitation (TR) and the conventional rehabilitation (CR) group. This study showed the benefits of the telerehabilitation program in motor function, concluding that telerehabilitation is an efficient and safe method for patients with AVC.

If we compare a similar exercise regimen for patients with chronic heart failure, in one group followed physically in the hospital and in the experimental group through an online videoconference software in the patients' home environment, we notice that telerehabilitation is not inferior to the program followed in hospital, and above all promotes more regular attendance of rehabilitation sessions by patients [13].

A 2021 study by Gonzalez-Gerez JJ, et al [14] evaluated the effectiveness of a new program based on breathing exercises applied through telerehabilitation tools in COVID-19 patients with mild to moderate symptoms in the acute stage. Forty

5

subjects were randomized into the experimental group based on pulmonary telerehabilitation and the control group that did not perform physical activity. The pulmonary telerehabilitation program of only one week is effective and safe in the treatment of patients with COVID.

Real-time video-based telerehabilitation was also studied by Tsai, L. L et al., 2017 [15]. Thirty-six COPD patients were divided into two groups: the home-supervised telerehabilitation group and the control group. The intervention group performed exercise therapy for 8 weeks, 3 times a week, while the control group underwent only usual care. This study concluded that telerehabilitation improved resistance training capacity, self-efficacy ($p < 0.007$) and a trend towards a statistically significant increase in Chronic Respiratory Disease Questionnaire total scores was observed.

4. Discussion

Rehabilitation is vital to increasing people's capacity to live and carry out necessary activities or tasks of daily living and to improve quality of life. Recently, with the help of telecommunications, networks can be used to provide the necessary health services remotely without the physical presence of health care professionals. This method has also been studied in children with different disabilities by Alonazi A., 2021 [16] to help family members and to develop their capacity to take care of their children. Both rehabilitation specialists and children's parents or guardians appear to be satisfied with telerehabilitation services provided to their children remotely. Furthermore, studies highlighted that telerehabilitation interventions should be tailored to the specific needs of children, as it is not one-size-fits-all, and this was particularly important during the COVID-19 pandemic or other emergencies when children have limited access to PT services. Another study conducted by Seron P et al., 2021 [17] examined the effectiveness of telerehabilitation in physiotherapy by reviewing 53 studies among which 15 were based on cardiorespiratory rehabilitation, 14 on musculoskeletal pathology, 13 on neurorehabilitation and 11 others in different

states of health. Despite conflicting results, telerehabilitation in physical therapy may be comparable to in-person rehabilitation or better than no rehabilitation for

6

conditions such as osteoarthritis, back pain, hip or knee replacement, multiple sclerosis and cardiopulmonary rehabilitation.

In recent decades, the growing interest in technology and virtual rehabilitation was already known, despite the fact that their role has gained more importance after the spread of the COVID-19 pandemic. The advantages of the latter have been demonstrated in several medical fields and studied by several authors, one of them being Berton A et al., 2020 [18] who examined the use of technologies such as telerehabilitation, virtual rehabilitation (VR) and gamification in benefit of orthopedic rehabilitation. Age and social context influence technology adaptability and this may modify treatment compliance and outcomes. Virtual remote technologies allow the delivery of high-quality care at reduced costs.

After total knee arthroplasty, patients may experience dysfunctions that limit their ability to follow traditional physical rehabilitation. In this literature review, 11 studies with a total of 1825 participants compared traditional rehabilitation and telerehabilitation in post-arthroplasty patients, and the latter is comparable to conventional therapy in terms of functional improvement, and because it is more cost effective it can be the preferred treatment alternative [19]. A systematic literature review by Jansson M. M, et al., 2020 [20] examined the effects and safety of telerehabilitation in patients with lower limb joint replacement. Patients who completed the telerehabilitation protocol showed improvement in physical functions similar to patients who performed traditional physiotherapy. Also, Eichler S., et al., 2019 [21] investigated the effectiveness of a specific 3-month telerehabilitation routine in helping patients with physical functionality and return to work compared to typical care given to patients after total knee or hip replacement. Both groups had improvement in the 6-minute walk test, as well as in other functional parameters (pain and quality of life), where telerehabilitation was equivalent to usual care in these patients for the measured parameters. The @ctivehip program studied by Mora-Traverso M. et al., 2022 [22] is a 12-week multidisciplinary home-based telerehabilitation program aimed at improving quality of life and psychological factors in patients with hip fracture. The control group received traditional care and rehabilitation provided by the Andalusian Public Healthcare System. This program is a promising treatment in improving the quality of life and psychological factors

7

(anxiety and depression) in older patients with hip fracture, as well as in the return to the previous level of fitness. Ortiz-Piña M. et al., 2021 [23] also studied the effects of a 12-week multidisciplinary telerehabilitation program on the functional recovery of elderly patients with hip fracture compared to rehabilitation at home in the presence of a therapist. Differences between groups after the intervention were not statistically significant. Yet again, telerehabilitation appears to be a valuable treatment option for

the elderly with hip fracture.

In a 2022 publication by Shah N. et al., [24] the effectiveness of telerehabilitation for spinal pain was studied, where 428 patients who were treated with telerehabilitation during the 6 months of the COVID-19 quarantine were compared with 428 patients who received multimodal rehabilitation in the clinic in the 6-month period before the quarantine. Telerehabilitation achieved significant reductions in pain and disability in these patients, more so than in-clinic therapy. These encouraging results indicate that the efficacy and wider application of this rehabilitation method for the treatment of spinal pain should be further explored. Telerehabilitation has proven to be effective in cardiac pathologies and this has been demonstrated by the authors Batalik L. et al., 2020 [25] who studied remote cardiac telerehabilitation, its efficiency and use, they included in their review 12 recent studies. For each intervention, the efficiency and safety of this therapy for cardiac patients were evaluated. Results indicate that telerehabilitation is a usable, effective, and above all safe alternative in the rehabilitation of patients with heart disease. Another author supporting the use of cardiac telerehabilitation is Brouwers, R et al., 2020 [26] who concludes that multidisciplinary or exercise-based TRK is a safe and low-cost alternative. The implementation of this therapy may lead to increased participation in cardiac rehabilitation, long-term improvement of cardiovascular risk management, and ultimately reduced health and social costs.

5. Conclusion

Telerehabilitation has proven to be a useful technique to enable physiotherapists access to patients who cannot attend one-on-one physical therapy due to various difficulties. Studies have shown that a physiotherapeutic intervention carried out

8

through telerehabilitation is an acceptable, efficient and safe method for patients with cardiac, neurological, respiratory and musculoskeletal pathologies and it was observed a significant increase in functionality and quality of life.

Considering the need for physiotherapy in the pandemic period as well as the reduced time and cost offered by this method of providing physiotherapy services, we can say that telerehabilitation has been accepted in the medical field and is recommended to be used.

References

1. Fiani, B., Siddiqi, I., Lee, S. C., & Dhillon, L. (2020). Telerehabilitation: Development, Application, and Need for Increased Usage in the COVID-19 Era for Patients with Spinal Pathology. *Cureus*, 12(9), e10563. <https://doi.org/10.7759/cureus.10563>
2. Brouwers, R., van Exel, H. J., van Hal, J., Jorstad, H. T., de Kluiver, E. P., Kraaijenhagen, R. A., Kuijpers, P., van der Linde, M. R., Spee, R. F., Sunamura, M., Uszko-Lencer, N., Vromen, T., Wittekoek, M. E., Kemps, H., & Committee for Cardiovascular Prevention and Cardiac Rehabilitation of the Netherlands Society of Cardiology (2020). Cardiac telerehabilitation as an alternative to centre-based cardiac

rehabilitation. *Netherlands heart journal : monthly journal of the Netherlands Society of Cardiology and the Netherlands Heart Foundation*, 28(9), 443–451.

<https://doi.org/10.1007/s12471-020-01432-y>

3. Taito, S., Yamauchi, K., & Kataoka, Y. (2021). Telerehabilitation in Subjects With Respiratory Disease: A Scoping Review. *Respiratory care*, 66(4), 686–698.

<https://doi.org/10.4187/respcare.08365>

4. Amin, J., Ahmad, B., Amin, S., Siddiqui, A. A., & Alam, M. K. (2022).

Rehabilitation Professional and Patient Satisfaction with Telerehabilitation of Musculoskeletal Disorders: A Systematic Review. *BioMed research international*, 2022, 7366063. <https://doi.org/10.1155/2022/7366063>

5. Turolla, A., Rossetini, G., Viceconti, A., Palese, A., & Geri, T. (2020).

Musculoskeletal Physical Therapy During the COVID-19 Pandemic: Is Telerehabilitation the Answer?. *Physical therapy*, 100(8), 1260–1264.

<https://doi.org/10.1093/ptj/pzaa093>

9

6. Hernando-Garijo, I., Ceballos-Laita, L., Mingo-Gómez, M. T., Medrano-de-la-Fuente, R., Estébanez-de-Miguel, E., Martínez-Pérez, M. N., & Jiménez-Del-Barrio, S. (2021). Immediate Effects of a Telerehabilitation Program Based on Aerobic Exercise in Women with Fibromyalgia. *International journal of environmental research and public health*, 18(4), 2075. <https://doi.org/10.3390/ijerph18042075>

7. Paolucci, T., de Sire, A., Ferrillo, M., di Fabio, D., Molluso, A., Patruno, A., Pesce, M., Lai, C., Ciacchella, C., Saggino, A., Agostini, F., & Tommasi, M. (2022). Telerehabilitation proposal of mind-body technique for physical and psychological outcomes in patients with fibromyalgia. *Frontiers in physiology*, 13, 917956.

<https://doi.org/10.3389/fphys.2022.917956>

8. An, J., Ryu, H. K., Lyu, S. J., Yi, H. J., & Lee, B. H. (2021). Effects of Preoperative Telerehabilitation on Muscle Strength, Range of Motion, and Functional Outcomes in Candidates for Total Knee Arthroplasty: A Single-Blind Randomized Controlled Trial. *International journal of environmental research and public health*, 18(11), 6071. <https://doi.org/10.3390/ijerph18116071>

9. Azma, K., RezaSoltani, Z., Rezaeimoghaddam, F., Dadarkhah, A., & Mohsenolhosseini, S. (2018). Efficacy of tele-rehabilitation compared with office-based physical therapy in patients with knee osteoarthritis: A randomized clinical trial. *Journal of telemedicine and telecare*, 24(8), 560–565.

<https://doi.org/10.1177/1357633X17723368>

10. Chen, S. C., Lin, C. H., Su, S. W., Chang, Y. T., & Lai, C. H. (2021). Feasibility and effect of interactive telerehabilitation on balance in individuals with chronic stroke: a pilot study. *Journal of neuroengineering and rehabilitation*, 18(1), 71.

<https://doi.org/10.1186/s12984-021-00866-8>

11. Lee, S. J., Lee, E. C., Kim, M., Ko, S. H., Huh, S., Choi, W., Shin, Y. I., & Min, J. H.

(2022). Feasibility of dance therapy using telerehabilitation on trunk control and balance training in patients with stroke: A pilot study. *Medicine*, 101(35), e30286.

<https://doi.org/10.1097/MD.00000000000030286>

12. Chen, J., Sun, D., Zhang, S., Shi, Y., Qiao, F., Zhou, Y., Liu, J., & Ren, C. (2020). Effects of home-based telerehabilitation in patients with stroke: A randomized controlled trial. *Neurology*, 95(17), e2318–e2330. <https://doi.org/10.1212/WNL.0000000000010821>
13. Hwang, R., Bruning, J., Morris, N. R., Mandrusiak, A., & Russell, T. (2017). Home-based telerehabilitation is not inferior to a centre-based program in patients with

10

- chronic heart failure: a randomised trial. *Journal of physiotherapy*, 63(2), 101–107. <https://doi.org/10.1016/j.jphys.2017.02.017>
14. Gonzalez-Gerez, J. J., Saavedra-Hernandez, M., Anarte-Lazo, E., Bernal-Utrera, C., Perez-Ale, M., & Rodriguez-Blanco, C. (2021). Short-Term Effects of a Respiratory Telerehabilitation Program in Confined COVID-19 Patients in the Acute Phase: A Pilot Study. *International journal of environmental research and public health*, 18(14), 7511. <https://doi.org/10.3390/ijerph18147511>
15. Tsai, L. L., McNamara, R. J., Moddel, C., Alison, J. A., McKenzie, D. K., & McKeough, Z. J. (2017). Home-based telerehabilitation via real-time videoconferencing improves endurance exercise capacity in patients with COPD: The randomized controlled TeleR Study. *Respirology (Carlton, Vic.)*, 22(4), 699–707. <https://doi.org/10.1111/resp.12966>
16. Alonazi A. (2021). Effectiveness and Acceptability of Telerehabilitation in Physical Therapy during COVID-19 in Children: Findings of a Systematic Review. *Children (Basel, Switzerland)*, 8(12), 1101. <https://doi.org/10.3390/children8121101>
17. Seron, P., Oliveros, M. J., Gutierrez-Arias, R., Fuentes-Aspe, R., Torres-Castro, R. C., Merino-Osorio, C., Nahuelhual, P., Inostroza, J., Jalil, Y., Solano, R., Marzuca-Nassar, G. N., Aguilera-Eguía, R., Lavados-Romo, P., Soto-Rodríguez, F. J., Sabelle, C., Villarroel-Silva, G., Gomolán, P., Huaiquilaf, S., & Sanchez, P. (2021). Effectiveness of Telerehabilitation in Physical Therapy: A Rapid Overview. *Physical therapy*, 101(6), pzab053. <https://doi.org/10.1093/ptj/pzab053>
18. Berton, A., Longo, U. G., Candela, V., Fioravanti, S., Giannone, L., Arcangeli, V., Alciati, V., Berton, C., Facchinetti, G., Marchetti, A., Schena, E., De Marinis, M. G., & Denaro, V. (2020). Virtual Reality, Augmented Reality, Gamification, and Telerehabilitation: Psychological Impact on Orthopedic Patients' Rehabilitation. *Journal of clinical medicine*, 9(8), 2567. <https://doi.org/10.3390/jcm9082567>
19. Tsang, M. P., Man, G., Xin, H., Chong, Y. C., Ong, M. T., & Yung, P. S. (2022). The effectiveness of telerehabilitation in patients after total knee replacement: A systematic review and meta-analysis of randomized controlled trials. *Journal of telemedicine and telecare*, 1357633X221097469. Advance online publication. <https://doi.org/10.1177/1357633X221097469>
20. Jansson, M. M., Rantala, A., Miettunen, J., Puhto, A. P., & Pikkarainen, M. (2022). The effects and safety of telerehabilitation in patients with lower-limb joint

11

- replacement: A systematic review and narrative synthesis. *Journal of telemedicine and telecare*, 28(2), 96–114. <https://doi.org/10.1177/1357633X20917868>
21. Eichler, S., Salzwedel, A., Rabe, S., Mueller, S., Mayer, F., Wochatz, M., Hadzic, M., John, M., Wegscheider, K., & Völler, H. (2019). The Effectiveness of Telerehabilitation as a Supplement to Rehabilitation in Patients After Total Knee or Hip Replacement: Randomized Controlled Trial. *JMIR rehabilitation and assistive technologies*, 6(2), e14236. <https://doi.org/10.2196/14236>
22. Mora-Traverso, M., Prieto-Moreno, R., Molina-Garcia, P., Salas-Fariña, Z., Martín-Martín, L., Martín-Matillas, M., & Ariza-Vega, P. (2022). Effects of the @ctivehip telerehabilitation program on the quality of life, psychological factors and fitness level of patients with hip fracture. *Journal of telemedicine and telecare*, 1357633X211073256. Advance online publication. <https://doi.org/10.1177/1357633X211073256>
23. Ortiz-Piña, M., Molina-Garcia, P., Femia, P., Ashe, M. C., Martín-Martín, L., Salazar-Graván, S., Salas-Fariña, Z., Prieto-Moreno, R., Castellote-Caballero, Y., Estevez-Lopez, F., & Ariza-Vega, P. (2021). Effects of Tele-Rehabilitation Compared with Home-Based in-Person Rehabilitation for Older Adult's Function after Hip Fracture. *International journal of environmental research and public health*, 18(10), 5493. <https://doi.org/10.3390/ijerph18105493>
24. Shah, N., Shetty, G. M., Kanna, R., & Thakur, H. (2022). Efficacy of telerehabilitation for spine pain during the Coronavirus pandemic lockdown: a retrospective propensity score-matched analysis. *Disability and rehabilitation. Assistive technology*, 1–8. Advance online publication. <https://doi.org/10.1080/17483107.2022.2107718>
25. Batalik, L., Filakova, K., Batalikova, K., & Dosbaba, F. (2020). Remotely monitored telerehabilitation for cardiac patients: A review of the current situation. *World journal of clinical cases*, 8(10), 1818–1831. <https://doi.org/10.12998/wjcc.v8.i10.1818>
26. Brouwers, R., van Exel, H. J., van Hal, J., Jorstad, H. T., de Kluiver, E. P., Kraaijenhagen, R. A., Kuijpers, P., van der Linde, M. R., Spee, R. F., Sunamura, M., Uszko-Lencer, N., Vromen, T., Wittekoek, M. E., Kemps, H., & Committee for Cardiovascular Prevention and Cardiac Rehabilitation of the Netherlands Society of Cardiology (2020). Cardiac telerehabilitation as an alternative to centre-based cardiac rehabilitation. *Netherlands heart journal : monthly journal of the Netherlands Society of Cardiology and the Netherlands Heart Foundation*, 28(9), 443–451. <https://doi.org/10.1007/s12471-020-01432-y>

Technological innovations in physiotherapeutic rehabilitation

**Andromeda (Keci) Lalaj 1[0000-0001-9601-2142] Ana Sulaj 2[0000-0002-7921-0320] ,
Vjollca Shpata 3[0000-0002-1676-**

9899], Jonida Drizaj 3[0000-0003-0207-134X]

1 Sports University of Tirana, Faculty of Rehabilitation Sciences, Kinesiology Department

2 Sports University of Tirana, Faculty of Rehabilitation Sciences, Kinesiology Department

**3 Sports University of Tirana, Faculty of Rehabilitation Sciences, Rehabilitation
Department**

**3 Sports University of Tirana, Faculty of Rehabilitation Sciences, Rehabilitation
Department**

1 alalaj@ust.edu.al 2 asulaj@ust.edu.al 3 vshpata@ust.edu.al

3 jdrizaj@ust.edu.al

Abstract: The study aims to understand the effectiveness of the technological innovations implemented in physiotherapeutic rehabilitation.

In order to conduct this review during the search there were used keywords like robotic devices, mobile applications, virtual games and rehabilitation. 120 results were displayed, from which, after reviewing the preliminary titles, about 60 articles were deleted along with duplicates. From the review of the abstracts, 20 of them were selected after meeting the inclusion criteria. The articles have been selected from trusted sources such as PubMed & Wiley Library. Included in this review are all articles which consider the role of robotic devices, virtual games and mobile apps in physical rehabilitation. Also, excluded are articles that focus on the engineering and design part of games or articles that focused only on patient diagnostic equipment.

The use of technological devices such as Lokomat, exoskeletons and walkbots has shown effectiveness in the rehabilitation of patients by improving gait, speed and balance. Also, VR games and mobile apps promote the acceleration of rehabilitation time and patient engagement.

The use of Lokomat and VR enables effectiveness in physical rehabilitation in combination with conventional therapy. Mobile apps as a new tech approach should be further consider in new studies for their effectiveness as home rehabilitation form.

Key Words: Robotic devices, rehabilitation, Lokomat

1 Introduction

2

Nowadays, physiotherapy has undergone many changes and evolutions, related to technology and its approaches. Digital health technologies are now one of the era's challenges, but also help for the medical field. For example, wearable sensor technologies can generate in-depth physiological and performance measurements outside of the laboratory environment, thereby, providing insight into real-world user behavior [1]. Technological advances are now widely used in the rehabilitation of stroke patients [2][3], in spinal cord injury patients [4], problems with walking [5][6], gait and speed [4][7]. One of the biggest challenges related to these approaches is their implementation in the fields of rehabilitation due to the complications that modern technologies can present, the acceptance by the patient and the clinician [8] as well as the difficulties that their use can present [9]. It was thought to carry out this review to understand how effective is the technology implemented in physiotherapeutic rehabilitation, because we are living in the age of digitalization and we need to understand if technology is a help for the patient and therapist or if its effectiveness goes further by replacing sometimes the therapist, especially for home rehabilitation. There is increasing interest in the implementation of technology in professional fields, but there is not a big number of studies focused on technology role in physical rehabilitation. Through this review paper, we aim to highlight that technological approaches are a great help for rehabilitators, but on the other hand, the latter cannot replace a rehabilitator, regardless of the development they may achieve. Therefore, the focus in this review will be on robotics, virtual reality (VR) and the use of applications (apps).

2 Methodology

To carry out this review, the keywords robotic devices, mobile applications, virtual games and rehabilitation were used. 120 results were displayed, from which, after reviewing the preliminary titles, about 60 articles were deleted along with duplicates. From the review of the abstracts, 20 of them were selected after meeting the inclusion criteria. The articles have been selected from trusted sources such as PubMed, Wiley Library, Elsevier and some prestigious journals such as: JMIR rehabilitation and assistive technologies, Journal of Visualized Experiments etc. All those articles that consider the role of virtual games, robotic devices and applications in rehabilitation are included. All articles that focused on the engineering and design part of games or articles that focused only on patient diagnostic equipment were excluded.

3 Results

3.1 Can robotic devices help in the rehabilitation process of the patient?

Robotic devices may be of great help in the future, especially in improving balance

and walking according to [7] who stress that the use of robot-assisted gait training

3

(RAGT), physical therapy training and bodyweight support is really helpful for gait recovery in patients with stroke. There can also be seen improvements in gait speed. [5] in their study show that, both Lokomat and walkbot robotic gait training combined with conventional physiotherapy are quite effective in gait improvement of the acquired brain injury of surviving patients. There were two main components taken in consideration and used for outcome measures like Berg Balance Scale (BBS) and Functional Ambulation Category (FAC), ($P < 0.05$). Lokomat and Walkbot groups showed significantly enhanced BBS.

According to [10] use of Kinect and Arneo Spring systems especially in stroke patients recovered functional level in self-care, upper limb motor ability and decreased the level of anxiety. Functional independence did not show meaningful differences in scores between technologies ($p > 0.05$), though abilities of self-care were significantly higher after Kinect-based training ($p < 0.05$).

Another robotic device that takes place in medical field is the wearable exoskeleton (WE). WE-assisted gait training and Lokomat are both very productive on the performance of locomotion including distance, speed, namely and function [4]. In the case of wearable EAW, the 6-min walk test (6-MWT) distance [-1.39 (95% CI = $-2.01, -0.77$)] and the timed up and go (TUG) test significantly increased [(1.19 (95% CI = $0.74, 1.64$)]], but no significant difference was found in the walking index for spinal cord injury.

Also, WE may improve mobility and independence in non-ambulatory people [11] and may reduce secondary health conditions related to sedentariness, with all the advantages that this entails.

On the other hand, in their study [12] show that there is insufficient evidence to conclusively advocate in favor or against use of Lokomat to improve balance control in stroke patients. However, favorable results for recovery of balance in stroke survivors treated with Lokomat were shown using Timed Up and Go (pooled mean difference = -3.40 , 95% CI -4.35 to -2.44 ; $p < 0.00$).

In the study of [13] they analyzed the trunk movements during Lokomat walking with and without the FreeD module and during treadmill walking. The FreeD did have an influence on hip and trunk kinematics in the frontal plane. The reduction of relative lateral chest movement corresponds to a decrease in compensatory trunk movements and has its origin in allowing weight shifting through the FreeD module. Can virtual reality games and mobile apps help in the rehabilitation process?

According to [14] casual games obtained the best clinical outcomes in terms of significance (6 of 8, 75%, attained significant results) and when speaking about SG (game strategy) development strategies, custom-made titles are able to attain better, significant clinical outcomes compared with COTS games since they are designed with therapy-specific movements in mind, therefore not opening the doors to cheating or being perceived as a form of entertainment or a toy. COTS games did not appear to result in any significant clinical improvements among the participants, although they are often perceived as fun by the users.

4

[15] in a video article showed a greater improvement after treatment with the mobile game-based VR upper extremity rehabilitation program than with conventional therapy. The effect was maintained until the one-month follow-up. This means MoU-Rehab was not inferior to the conventional therapy that is delivered one-on-one by an occupational therapist.

[16] in this study showed promising results in functionality, balance, and activities of daily living when adding virtual reality with Nintendo Wii to conventional physical therapy. Regarding TUG (time up and go), POMA (Tinetti Performance-Oriented Mobility Assessment) and BBS, the analysis of variance showed significant differences for time, group and time interaction.

4 Discussion

4.1 Robotics use in rehabilitation

Living in the time of digitalization has brought many big changes in different fields and one of these fields is the medical one. There are already some problems related to the perception and acceptance of robotics as an aid in the rehabilitation of the patient [8] showed that more than 2/3 of the participants could show a positive reaction in the acceptance of Lokomat tech devices. Despite the benefits of the Lokomat, which is an assistive technology, the results showed that the need for social and cognitive support is also essential for the clinicians and the patients. The use of these devices is also accompanied by obstacles that must be overcome through a preliminary presentation of the patient with the robotic device.

Also, [7] the use of RAGT especially combined with physical therapy and bodyweight support is a great help for gait recovery in stroke patients. But, there is a lack of research in combining other devices like exoskeletons to target balance. This conclusion is also supported from [11] who stresses that wearable exoskeletons may improve mobility and independence in non-ambulatory people, and may reduce secondary health conditions related to sedentariness, with all the advantages that this entails. But, evidence supporting their benefits is still limited to short-intervention trials with few participants and diversity among their clinical protocols. Wearable lower-limb exoskeletons for gait rehabilitation are still in their early stages of development.

On the other hand, unlike [7] and [11], [5] showed that not only Lokomat (static exoskeleton), but also walkbot robotic gait training (a type of exoskeleton) combined with conventional physiotherapy are quite effective in gait improvement and balance due to the BBS outcome measures, from 5 (2.75–24.25) and 15 (4–26.5) to 15 (4–26.5) and 22 (12–40), respectively ($P < .05$). There are also other authors that support similar findings related to exoskeletons [4] who conclude that wearable exoskeleton -assisted gait training and Lokomat are both very productive on the performance of locomotion including distance, speed, namely and function. It should

5

be taken into account the fact that these non-static devices should be not too heavy,

compact and portable to be a promising training approach in the future.

Like [7], [12] showed that there is insufficient evidence to conclusively advocate in favor or against use of Lokomat to improve balance control in stroke patients.

However, the findings of most studies from this review suggest that Lokomat R increasing therapy dosage, intensity, number of repetitions, execution of task-oriented exercises, and combining top-down and bottom-up approaches can represent a useful tool for the physiotherapist to promote plasticity and functional recovery.

Another study that supports the effectiveness of Lokomat is [13] where this study analyzed the trunk movements during Lokomat walking with and without the FreeD module and during treadmill walking. Furthermore, it compared the sEMG patterns of hip and trunk muscles while walking in the Lokomat with and without FreeD to those of walking on the treadmill and over ground. The FreeD did have an influence on hip and trunk kinematics in the frontal plane. The reduction of relative lateral chest movement corresponds to a decrease in compensatory trunk movements and has its origin in allowing weight shifting through the FreeD module.

These technological innovations are very promising in improving rehabilitation for the benefit of the patient but also of the therapist as it affects the acceleration of positive results.

Virtual reality games as an effective approach in the rehabilitation process.

In addition to the use of technological equipment which are necessary for clinics or hospital conditions, there are other approaches whose importance increased even more after the period of Covid-19 where the isolation lasted for a long time. The impossibility to follow the rehabilitation sessions from the rehabilitation facilities increased the need for telerehabilitation as one of the best possible forms under such conditions. These technological approaches are related to the use of phone applications and virtual games as an effective rehabilitation form. Immersive VR is only becoming something rather ordinary now, while non-immersive VR video games have already been around (commercially) for decades [14]. Game-based therapy can be a good option for stroke rehabilitation and in the reduction of pain, anxiety and time of thinking about pain or health conditions [17]. Many patients complain that conventional occupational therapy (OT) for upper limb function recovery is boring and monotonous. A more interesting and motivating tool for the therapy is, therefore, necessary to promote patients' engagement in rehabilitation training [15]. Apps are another approach that are now widely accepted, but many apps are missing the opportunity to offer key features that could promote exercise adherence and encourage self-management in muscular rehabilitation [18]. It is important to consider the difficulty in using the games, as patients may have different levels of IT. In the study of [15], MoU-Rehab was not inferior to the conventional therapy that is delivered one-on-one by an occupational therapist and patients were really satisfied, even though participants had various levels of IT (Computer, tablet, PC, and smartphone). Using virtual reality with the Nintendo Wii platform added to

6

conventional physical therapy, induces promising results in functionality, balance, and activities of daily living. These results are also supported in the study of [17].

Cognitive improvements due to augmented reality can also be seen. In the study of [19] the NW group also exhibited a significant difference in the mental health domain. Decreased anxiety level was also found after virtual reality therapy ($p < 0.05$) [10], besides physical movement improvements of the upper arm. The results of [19] indicate that both approaches improved the patients' performance in a similar manner. Also, a significant difference was found between both groups before and after treatment in terms of the following Fugl-Meyer scale items: passive movement and pain, motor function of the upper limbs (ULs), and balance [20]. The conventional physical therapy group also showed a significant difference with regard to their UL and lower limb (LL) coordination.

The use of apps as a new rehabilitation approach can be a good option as they are lightweight, small size, portable and easy to use, regardless of a person's location. So, these can be used even at home, but it might be a big need for the supervision of the therapist via video calling for the best results.

5 Conclusion

Since technology is progressing with galloping steps and showing effectiveness in all fields, it is important for therapists to understand that technological approaches can be a great help in the rehabilitation of the patient. They can help speed up the patient's recovery by increasing the effectiveness of conventional physical therapy. However, it is important not to have doubts that the technology could achieve the rehabilitation of the patient without the help of conventional therapy, since the physiotherapist is a necessity in compiling the rehabilitation plan and following the progress of this treatment. Technological applications, virtual reality and robotics are the best collaborators for physiotherapists to achieve very good results in the fastest time. Furthermore, it is necessary to conduct studies with a large number of participants, especially for mobile applications, to understand if they enable effectiveness in rehabilitation.

References

1. Kent Lisa, Cleland I, Saunders C, Ennis A, Finney L & Kerr C. (2021). A Systematic Multidisciplinary Process for User Engagement and Sensor Evaluation: Development of a Digital Toolkit for Assessment of Movement in Children with Cerebral Palsy. *Frontiers in Digital Health*. doi: 10.3389/fdgth.2021.692112
2. Saposnik, G., Mamdani, M., Bayley, M., Thorpe, K. E., Hall, J., Cohen, L. G., Teasell, R., EVREST Steering Committee, & EVREST Study Group for the Stroke Outcome Research Canada Working Group. (2010). Effectiveness of Virtual Reality Exercises in Stroke Rehabilitation (EVREST): rationale, design, and protocol of a pilot randomized

7

clinical trial assessing the Wii gaming system. *International journal of stroke: official journal of the International Stroke Society*, 5(1), 47–51. doi.org/10.1111/j.1747-4949.2009.00404.x

3. Saposnik, G, Teasell R, Mamdani M, Hall J, McIlroy W, Cheung D, Thorpe KE, Cohen LG, Bayley M & for the Stroke Outcome Research Canada (SORCan) Working Groupe.

- (2010). Effectiveness of virtual reality using Wii gaming technology in stroke rehabilitation: a pilot randomized clinical trial and proof of principle. *Stroke*, 41 (7), 1477-1484. doi.org/10.1161/STROKEAHA.110.584979
4. Zhang L, Lin F & Chen Ch. (2022). Comparison of Efficacy of Lokomat and Wearable Exoskeleton-Assisted Gait Training in People with Spinal Cord Injury: A Systematic Review and Network Meta-Analysis. *Frontiers in Neurology*, 13:772660. doi: 10.3389/fneur.2022.772660
5. Lee HY, Park JH & Kim TW. (2020). Comparisons between Lokomat and Walkbot robotic gait training regarding balance and lower extremity function among non-ambulatory chronic acquired brain injury survivors. *Medicine*, 100:18(e25125). doi.org/10.1097/MD.00000000000025125
6. Naum KY, Kim HJ, Kwon BS, Park JW, Lee HJ, Yoo A. (2017). Robot-assisted gait training (Loko-mat) improves walking function and activity in people with spinal cord injury: a systematic re-view. *J Neuroeng Rehabilitation*, 14(1):24. doi: 10.1186/s12984-017-0232-3
7. Moicheboeuf G, Griffier R, Gasq D, Glize B, Bouyer L, Dehail P & Cassouesalle H. (2020). Effects of robotic gait training after stroke: A meta-analysis. Elsevier. doi.org/10.1016/j.rehab.2020.02.008
8. Raigoso D, Cespedes N, Cifuentes CA, del Ama AJ & Múner M. (2021). A Survey on Socially Assistive Robotics: Clinicians' and Patients' Perception of a Social Robot NAO within Gait Rehabilitation Therapies. *Brain Science*, 11:738. doi.org/10.3390/brainsci11060738
9. Ferche OM, Moldoveanu A, Moldoveanu F, Asavei V, Voinea A & Ionut N. (2015). Challenges and Issues for successfully applying virtual reality in medical rehabilitation. Vol (1). doi.org/10.12753/2066-026X-15-073
10. Adomavi`ciene` A, Daunoravi`ciene` K, Kubilus Raimondas, Varžaityte L & Raisten-skis J. (2019). Influence of New Technologies on Post-Stroke Rehabilitation: A Comparison of Armeo Spring to the Kinect System. *Medicina*, 55, 98. doi:10.3390/medicina55040098
11. Rodríguez-Fernández A, Lobo-Prat J & Font Lagunes JM. (2021). Systematic review on wearable lower-limb exoskeletons for gait training in neuromuscular impairments. *J NeuroEngineering Rehabilitation*, 18:22. doi.org/10.1186/s12984-021-00815-5
12. Baronchelli F. (2021). The Effect of Robotic Assisted Gait Training with Lokomat on Balance Control After Stroke: Systematic Review and Meta-Analysis. *Frontiers in Neurology*, 12:661815. doi: 10.3389/fneur.2021.661815.
13. Aurich-Schuler T, Gut A & Labruyère R. (2019). The FreeD module for the Lokomat facilitates a physiological movement pattern in healthy people - a proof of concept study. *Journal of Neuroeng Rehabilitation*, 16(1):26. doi: 10.1186/s12984-019-0496-x
14. Vieira C, da Silva Pais-Viera CF, Novais J & Perrota A. (2021). Serious Game Design and Clinical Improvement in Physical Rehabilitation: Systematic Review. *JMIR serious games*, vol. 9(3): e20066. doi: 10.2196/20066
15. Choi YH & Paik NJ. (2018). Mobile Game-based Virtual Reality Program for Upper Extremity Stroke Rehabilitation. *Journal of Visualized Experiments*, (133), e56241.

doi:10.3791/56241

8

16. Marques-Sule E et al., (2021). Effectiveness of Nintendo Wii and Physical Therapy in Functionality, Balance, and Daily Activities in Chronic Stroke Patients. *Journal-of-the-American-Medical-Directors-Association*, 22(5). doi.org/10.1016/j.jamda.2021.01.076
17. Li A, Montañó Z, Chen VJ & Gol d JI. (2011). Virtual reality and pain management: current trends and future directions. (2011). *Pain Manag*, 1(2):147-157. doi:10.2217/pmt.10.15
18. Ryan Sh, Chasaide NN, O' Hanrahan Sh, Corcoran D, Caulfield B & Argent R. (2022). mHealth Apps for Musculoskeletal Rehabilitation: Systematic Search in App Stores and Content Analysis. *JMIR rehabilitation and assistive technologies*, 9(3): e34355. doi: 10.2196/34355
19. da Fonseca EP Ribeiro da Silva NM & Pinto EB, (2017). Therapeutic Effect of Virtual Reality on Post-Stroke Patients: Randomized Clinical Trial. *Journal of Stroke and Cerebrovascular Diseases*, Vol 26: (1). doi.org/10.1016/j.jstrokecerebrovasdis.2016.08.035
20. Cano-Mañas MJ, Collado-Vázquez S, Rodríguez Hernández J, Muñoz Villena AJ & Cano-de-la-Cuerda R. (2020). Effects of Video-Game Based Therapy on Balance, Postural Control, Functionality, and Quality of Life of Patients with Subacute Stroke: A Randomized Controlled Trial. *J Healthc Eng*. doi: 10.1155/2020/5480315.

Health Outcomes of Food Advertisements in Digital Games: A Systematic Study

Pelin Avcı¹[0000-0002-9185-4954] Akan Bayrakdar²[0000-0002-3217-0253] Işık Bayraktar³[0000-0003-1001-5348] Agron Thaqi⁴[0000-0001-7306-0088]

¹Gazi University, Institute of Education Sciences, Türkiye

^{2,3}Alanya Alaaddin Keykubat University, Sport Science Faculty, Alanya, Türkiye

⁴UBT College, Faculty of Sport and Movement Science, Prishtine, Kosovo

Abstract

This systematic study was conducted to evaluate the health outcomes of food advertisements placed in digital games. In particular, it is noted that childhood obesity has doubled in the last 30 years. In parallel, spending on food advertising is increasing. One of the factors affecting childhood obesity is shown as advertisements for foods containing poor micro-nutrients and high-energy nutrients. Most effective food and beverage advertisements include snacks with high salt, fat, sugar, and low nutritional value. Considering all these factors, our focus is to examine the literature regarding how food advertisements placed in digital games affect human health. Accordingly, English-language articles published in PubMed, Web of Science, Google Scholar, and Sports DISCUS databases that were published between 2010 and 2022 were investigated. In total, 947 articles were studied. 13 of the articles reviewed by experts have been evaluated for use in the study. Researchers note that food ads placed in digital games trigger the consumption of fast food and, in particular, carbonated drinks. It is also noted that exposure to such advertising affects the nutritional behavior of individuals of all ages. As a result, it is thought that food ads in digital games directly affect individuals. It should also be noted that the researchers' conclusions that people who are exposed to advertisements of unhealthy food for a short time have an increased intake of nutrients.

Keywords: Digital Gaming, Nutrition, Advertising, Health.

1. Introduction

The proliferation of digital food and beverage marketing has led to great concerns over the health of children, especially given cognitive and developmental weaknesses (Health Organization Regional Office for Europe, 2016). In the world, one-third of Internet users are children. They are online for an average of 15 hours a week, usually through portable devices such as laptops, tablets, and smartphones (Boyland et al., 2020). While the ubiquitous internet connection provides a great opportunity to combat obesity, there is a need to understand how children spend digital time and what messages they receive about nutrition. Despite the fact that many social media platforms set the minor age requirement at 13, the findings show that many younger people

have profiles and are active on these sites with or without parental consent (Douglas Evans et al., 2010).

In addition to social media, games are one of the most addictive digital activities, especially for children. Parents can often give digital devices to children's hands uncontrollably to perform actions such as calming their children, making them eat, and relaxing. Children may be exposed to various advertisements while playing games or watching content on some social media platforms. Food ads are the leading ads among them. The child may have to click on these ads to continue the game or watch the content. For example; "Unlock to play" digital games, in which such modern advertising techniques are evident, leave children vulnerable to food advertising (Meyer et al., 2019). In short, exposure to the marketing of unhealthy foods and beverages is a widely recognized risk factor for childhood obesity and development of noncontagious diseases. Food marketing includes the use of numerous persuasive techniques to influence children's nutritional behavior, preferences, and consumption (Smith et al., 2019).

This study was conducted with the intention of filling the gap in the literature. This systematic review serves three purposes. (i) to provide a general opinion about food and beverage advertisements in digital games; (ii) to determine the effectiveness of food advertisements in digital games about evaluated results; (iii) and to examine food advertisements in digital games based on the review of existing findings and to guide future studies.

2. Methodology

2.2 Study Strategy and Eligibility Criteria

A systematic literature review was conducted in 2022 using Web of Science, Pubmed, Google Scholar and Sport Discus databases. In addition, articles published in English are included in the review. The primary search was based on title, abstract, and keywords, using Boolean logic for the combination of search terms. The search terms were determined based on previous reviews and agreements between authors. These are concepts such as intelligent telephone, digital game, and food advertisements. Some limitations have been imposed on the study of comprehensive literature. In addition, the searches in the databases were carried out in the following order (digital game and food advertisements*, social media and food advertisements*, marketing and digital game*, digital game, and nutrition*, digital game, and food and beverage*).

The components of the PICOS question, including population, intervention, comparators, outcomes, and study design, were answered to define eligibility criteria. The study covers only articles published between 2015 and 2022 in English-language peer-reviewed journals.

Table 1. Study Selection Criteria

PICOS	Eligibility Criteria
Population	Children and adults
Interventions	Any physical activity conducted in nature
Comparators	Comparison group not determined
Outcomes	Physiological consequences: changes due to stimulus response
Study Designs	No limitations with the study design

2. Scanning and Study Selection

The reference results of the database search were transferred to the Mendeley reference program. The studies were scanned in terms of inclusion criteria according to the title in the first stage, followed by abstract and full text scans. The scanning process was conducted independently by the authors. The authors discussed the results and the full texts were included in the analysis based on mutual agreement. About the included articles; authors, year, country, participants and sample group, objectives and hypotheses, findings, and results are included in the analysis table.

The "Effective Public Health Practice Project" (EPHPP) was used to evaluate the bias risk of the included studies (Thomas et al., 2004). EPHPP is used for observational, cross-sectional, cohort, and randomized controlled trial designs (Armijo-Olivo et al., 2012). The EPHPP tool has six equiponderant categories that are included in an overall rating to assess the quality of work. These are selection bias, study design, confounders, blinding, data collection practices, and withdrawal. The category of withdrawals and dropouts was also applied to cross-sectional studies since it contains information about the percentage of participants who completed the study. Each category received a strong (1), medium (2), or weak (3) rating, which is the basis for the overall rating of the work. In addition, systematic reviews and meta-analysis studies were not included in the study.

3. Conclusion

The study selection process is given in Figure 1. A total of 947 articles were determined from four databases. After the copies were removed, 214 articles remained for scanning. At the end of the process, 13 studies were identified that met the inclusion criteria.

Figure 1. Flow chart of the study selection process

Table 2 presents a summary of the included studies.

Serious evidence has been found on the nutritional behavior of children exposed to food advertisements through digital games. With the increase of games played with digital devices, it is stated that advertising awareness is insufficient to protect children and children remain vulnerable. In particular, award-winning video advertising has quite negative effects on children's eating behavior (Smith et al., 2020). In a study, exposure to food or beverage advertising at least once a week has been associated with a high rate of unhealthy food and beverage consumption. It is also reported that young people with parents with a low level of education are more exposed to advertisements for sugar-sweetened drinks, increasing their use (Gascoyne et al., 2021). Being constantly exposed to food ads in digital games increases the desire for the brand. But the desire on the product is not affected (Agante & Pascoal, 2019). It has been noted that children tend to choose more unhealthy foods after being exposed to unhealthy food advertisements. Another study found that popular social media promoting vegetables had no effect on vegetable consumption (Folkvord & de Bruijne, 2020).

Table 2. Properties of the included works

	Author, Year and Country	Characteristics of the participants	Type of Intervention	Conclusion

1	(Smith et al., 2020)Australia	<ul style="list-style-type: none"> - Between the ages of 7 and 12 -N=156 -The participants are divided into four groups. 	The children were asked to play a 4-minute online game, fill out some questionnaires, and then choose a snack to consume.	The effects of exposure to food marketing through digital games on children's eating behaviors have been found. In the age of increasing use of digital and mobile games, it shows that advertising awareness is insufficient to protect children and children remain vulnerable to the effects of advertising. Award-winning video advertising has been observed to have negative effects on children's eating behavior.
2	(Chagas et al., 2018)Brasil	<ul style="list-style-type: none"> -N=168 - Between the ages of 14 and 16 (who constantly plays games) 	With Rango Cards, a digital game specially developed for the study, it is presented the concept of an adequate and healthy diet using simple information in a fun environment.	As a result, this study will contribute to the development of special materials for strategies focused on children and adolescents, given that there is a shortage of materials for children. Therefore, the study can be considered a theoretical and methodological benchmark for other educational initiatives based on the use of digital tools to promote adequate and healthy nutrition.
3	(Gascoyne et al., 2021)Australia	<ul style="list-style-type: none"> - Between the ages of 12 and 17 -N=8708 	<ul style="list-style-type: none"> The children reported how often they saw food or beverage ads on social media, whether they “liked” or “shared” food and beverage ads, and the food and beverages they consumed. -The relationship between exposure to food marketing and interaction with them on social media and digital media and a high intake of unhealthy foods and beverages has been evaluated. 	More than half of the children stated that they see a food and beverage advertisement on social media at least once a week. Exposure to food or beverage advertising at least once has been associated with a high rate of unhealthy food and beverage consumption. As the frequency of participation in this type of marketing increases, the likelihood of high consumption of unhealthy foods and beverages has also increased.
4	(Kumar et al., 2015)USA	<ul style="list-style-type: none"> - Between the ages 	Interpreting participant self-reported frequency by multivariate regression, to	It was found that between 42% and 54% of the

		of 12 and 17 -N=847	examine the relationships between the frequency of exposure to sugar-sweetened advertisements and sociodemographic variables.	young people participating in the study saw advertisements for sugar-sweetened beverages more than once a day. Children aged 14-15 years have a higher frequency of seeing carbonated, sports, and energy beverage ads compared to the 16-17 age group. It has been identified that young people with low educational levels parents are more exposed to advertisements for sugar-sweetened beverages.
5	(Agante & Pascoal, 2019)	-Between the ages of 6 and 9 -N=104	-The study was designed as one control group and two experimental groups. The control group only answered questionnaires, but the experimental groups played digital games. In addition, the children in the first experimental group answered a second questionnaire a week later. The children in the second experimental group played digital games for five days and answered the second questionnaire. -The reactions of the experimental groups were evaluated at the end of a one-week time period.	-Exposure to food advertisements in digital games affects the child's desire for the product and brand. -Constant exposure to food ads in digital games increases the desire for the brand. But it does not affect the desire for the product too much.
6	(Esmaeilpour et al., 2018) Iran	-Between the ages of 6 and 11 -N=330	-The food type variable has been manipulated in digital game ads. Two versions of the same advertisement have been designed. (i) unhealthy foods and (ii) healthy foods. Both versions of the game are designed using the same combinations. They were asked to choose one type of healthy or unhealthy food to level up in the games.	It has been noted that children tend to choose more unhealthy foods after being exposed to unhealthy food advertisements. In addition, it was concluded that healthy food ads placed in digital games help children choose healthy foods.

7	(Folkvord et al., 2015)Netherlands	-Age mean 8.4 -N=92	-Children's eye movements and reaction times were studied with food and non-food advertising to assess attentional bias during play time using eye-tracking methods. -Also, they were able to eat freely after the game.	It has been stated that advertisements in digital games increase the total energy intake. In addition, children who had a high time of looking at food ads that appeared during digital play ate more of the advertised food. Children who had a prolonged time looking at food ads ate more of the advertised snacks.
8	(Folkvord et al., 2017)Netherlands	- Between the ages of 6 and 12 -N=597	-It has been studied if adding a protective message to an advertising game that promotes snacks that are high in calories reduces children's snack intake or not.	It has been stated that playing advertising games that promote snacks that are high in calories increases calorie intake. In addition, an increase in calorie intake is indicated regardless of whether the protective message is present or not.
9	(Folkvord & de Bruijne, 2020)Netherlands	-Between the ages of 13 and 16 -N=132	-It has been studied if vegetable advertisements shown on social media have an effect on vegetable consumption in adolescents or not. The subjects were randomly divided into three groups. The subjects were exposed to vegetable advertising on Instagram, which is quite popular.	Popular social media promoting vegetables has been found to have no effect on vegetable consumption.
10	(Coates, Hardman, et al., 2019) England	-Between the ages of 9 and 11 -N=176	The participants were divided into three groups (healthy food marketing, unhealthy food marketing, and non-food marketing control). Two social media influencers were selected for the study. The children viewed the Instagram profile of both influencers for 1 minute. The children were told to pay close attention to the profiles, as they would be asked later in the questionnaire. The participants were then given four snacks. And	The promotion of food through popular social media affects children's food consumption. It has been noted that the marketing of unhealthy foods by influencers increases the immediate food consumption of children. Besides, equivalent marketing of healthy foods has not been found to have any effect. Increasing the promotion of healthy foods on social media can be an effective strategy to

			they were given 10 minutes to eat as much as they wanted.	encourage children's healthy eating behaviors.
11	(Putnam et al., 2018)USA	-The ages of 4-5 -N=132	The children played a bowling game on an iPad with ads for healthy and unhealthy snacks. After that, the children chose and consumed healthy or unhealthy snacks.	It shows that young children will choose and consume healthier products when they are aware that a popular character in an app is associated with snacks, potentially leading to healthier eating habits.
12	(Coates, Charlotte, et al., 2019)England	-Between the ages of 9 and 11 -N=151	It has been studied whether exposure to a YouTube video featuring influencer marketing of an unhealthy snack affects children's ad libitum snack consumption and how placing an advertisement affects this effect. The participants' ad libitum consumption of the marketed snack and an alternative brand from the same snack were studied.	Children exposed to food marketing consumed more calories from the marketed snack compared to the alternative. Children exposed to food marketing consumed more of their marketed snacks compared to the control group. Influencer marketing instantly increases children's consumption of promotional snacks compared to an alternative brand.
13	(Folkvord et al., 2016)Netherlands	-Age mean 11.13 -N=218	The height, weight, and body mass index (BMI) measurements of the children who had previously taken part in an experiment studying the effect of the advertising game on food consumption were re-measured. In due course, a design was used to test the relationships between food choices and BMI. In the previous experiment, the children played an advertising game that promoted energy-dense snacks, fruit and non-food products. After playing the game, the free consumption of energy-dense snacks and fruits was studied.	Children who ate more apples after playing an advertising game promoting high-energy dense snacks had a lower BMI two years later. No relationship was found in the BMI levels of children who consumed more snacks after playing an advertising game that promoted energy-dense snacks.

It has been stated that advertisements in digital games increase the total energy intake. In addition, it is stated that children who have a high time of looking at food ads that appear

during digital play tend to consume more of the advertised food (Folkvord et al., 2015). It has been stated that playing advertising games that promote snacks that are high in calories increases calorie intake. In addition, an increase in calorie intake is indicated regardless of whether the protective message is present or not (Folkvord et al., 2017).

The BMI level of children who ate more apples after playing an advertising game that promotes high-energy dense snacks is normal (Folkvord et al., 2016). Children exposed to healthy eating advertisements with gaming cards are thought to be healthier (Chagas et al., 2018). Moreover, it has been found that if the snacks of a popular character and influencer in an application are healthy foods, children also eat healthily (Coates, Charlotte, et al., 2019; Putnam et al., 2018). The promotion of food through popular social media affects children's food consumption. It has been noted that the marketing of unhealthy foods by influencers increases the immediate food consumption of children. It is stated that increasing the promotion of healthy foods on social media can be an effective strategy to promote healthy eating behaviors in children (Coates, Hardman, et al., 2019).

Last but not least, although the current studies are limited and the risk of bias is high, this study provides consistent evidence that marketing unhealthy foods and beverages through digital games affect children's disruptive behaviors, food choices, and food consumption.

References

1. Agante, L., & Pascoal, A. (2019). How much is “too much” for a brand to use an advergame with children? *Journal of Product and Brand Management*, 28(2), 287–299. <https://doi.org/10.1108/JPBM-08-2017-1554>
2. Armijo-Olivo, S., Stiles, C. R., Hagen, N. A., Biondo, P. D., & Cummings, G. G. (2012). Assessment of study quality for systematic reviews: A comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: Methodological research. *Journal of Evaluation in Clinical Practice*, 18(1), 12–18. <https://doi.org/10.1111/j.1365-2753.2010.01516.x>
3. Boyland, E., Thivel, D., Mazur, A., Ring-Dimitriou, S., Frelut, M. L., & Weghuber, D. (2020). Digital Food Marketing to Young People: A Substantial Public Health Challenge. In *Annals of Nutrition and Metabolism* (Vol. 76, Issue 1, pp. 6–9). S. Karger AG. <https://doi.org/10.1159/000506413>
4. Chagas, C. M. D. S., Pontes E Silva, T. B., Reffatti, L. M., Botelho, R. B. A., & Toral, N. (2018). Rango Cards, a digital game designed to promote a healthy diet: A randomized study protocol. *BMC Public Health*, 18(1). <https://doi.org/10.1186/s12889-018-5848-0>
5. Coates, A. E., Charlotte, J., Hardman, A., Christian, J., Halford, G., Christiansen, P., & Boyland, E. J. (2019). The effect of influencer marketing of food and a “protective” advertising disclosure on children’s food intake. <https://doi.org/10.1111/ijpo.12540>
6. Coates, A. E., Hardman, C. A., Halford, J. C. G., Christiansen, P., & Boyland, E. J. (2019). Social media influencer marketing and children’s food intake: A randomized trial. *Pediatrics*, 143(4). <https://doi.org/10.1542/peds.2018-2554>
7. Douglas Evans, W., Christoffel, K. K., Necheles, J. W., & Becker, A. B. (2010). Social Marketing as a Childhood Obesity Prevention Strategy. <https://doi.org/10.1038/oby.2009.428>
8. Esmaeilpour, F., Heidarzadeh Hanzaee, K., Mansourian, Y., & Khounsiavash, M. (2018). Children’s Food Choice: Advertised Food Type, Health Knowledge and Entertainment. <https://doi.org/10.1080/10454446.2017.1315843>
9. Folkvord, F., Anshütz, D. J., & Buijzen, M. (2016). The association between BMI development among young children and (un)healthy food choices in response to food advertisements: A longitudinal study. *International Journal of Behavioral Nutrition and Physical Activity*, 13(1). <https://doi.org/10.1186/s12966-016-0340-7>

10. Folkvord, F., Anschutz, D. J., Wiers, R. W., & Buijzen, M. (2015). The role of attentional bias in the effect of food advertising on actual food intake among children. *Appetite*, 84, 251–258. <https://doi.org/10.1016/j.appet.2014.10.016>
11. Folkvord, F., & de Bruijne, M. (2020). The Effect of the Promotion of Vegetables by a Social Influencer on Adolescents' Subsequent Vegetable Intake: A Pilot Study. *Int. J. Environ. Res. Public Health*, 17(7). <https://doi.org/10.3390/ijerph17072243>
12. Folkvord, F., Lupiáñez-Villanueva, F., Codagnone, C., Bogliacino, F., Veltri, G., & Gaskell, G. (2017). Does a 'protective' message reduce the impact of an advergame promoting unhealthy foods to children? An experimental study in Spain and The Netherlands. *Appetite*, 112, 117–123. <https://doi.org/10.1016/J.APPET.2017.01.026>
13. Gascoyne, C., Scully, M., Wakefield, M., & Morley, B. (2021). Food and drink marketing on social media and dietary intake in Australian adolescents: Findings from a cross-sectional survey. *Appetite*, 166. <https://doi.org/10.1016/J.APPET.2021.105431>
14. Health Organization Regional Office for Europe, W. (2016). Tackling food marketing to children in a digital world: trans-disciplinary perspectives Children's rights, evidence of impact, methodological challenges, regulatory options and policy implications for the WHO European Region. <http://www.euro.who.int/pubrequest>
15. Kumar, G., Onufrak, S., Zytneck, D., Kingsley, B., & Park, S. (2014). Self-reported advertising exposure to sugar-sweetened beverages among US youth. *Public Health Nutrition*, 18(7). <https://doi.org/10.1017/S1368980014001785>
16. Meyer, M., Adkins, V., Yuan, N., Weeks, H. M., Chang, Y.-J., & Radesky, J. (2019). Advertising in Young Children's Apps: A Content Analysis. *Journal of Developmental & Behavioral Pediatrics*, 40(1), 32–39. www.jdbp.org
17. Putnam, M. M., Cotto, C. E., & Calvert, S. L. (2018). Character Apps for Children's Snacks: Effects of Character Awareness on Snack Selection and Consumption Patterns. *Games for Health Journal*, 7(2), 116–120. <https://doi.org/10.1089/g4h.2017.0097>
18. Smith, R., Kelly, B., Yeatman, H., & Boyland, E. (2019). Preferences and Consumption: A Systematic Critical Review. *Nutrients*, 11(4). <https://doi.org/10.3390/nu11040875>
19. Smith, R., Kelly, B., Yeatman, H., Moore, C., Baur, L., King, L., Boyland, E., Chapman, K., Hughes, C., & Bauman, A. (2020). Advertising Placement in Digital Game Design Influences Children's Choices of Advertised Snacks: A Randomized Trial. *Journal of the Academy of Nutrition and Dietetics*, 120(3), 404–413. <https://doi.org/10.1016/J.JAND.2019.07.017>
20. Thomas, B. H., Ciliska, D., Dobbins, M., & Micucci, S. (2004). A Process for Systematically Reviewing the Literature: Providing the Research Evidence for Public Health Nursing Interventions. In *Worldviews on Evidence-Based Nursing* (Vol. 1, Issue 3).

Evaluation of Balance Performance of Children with Intellectual Disability

Mehmet DİNÇ¹[0000-0002-6093-2155], Ayşe Funda KESER²[0000-0001-6788-9914], Yaren
ATMACA²[0000-0003-2243-9930] and Sibel NALBANT³[0000-0002-9930-376X]

¹ Alanya Alaaddin Keykubat University, Sport Sciences Faculty, Graduate Student/
Alanya, ANTALYA

² Physical Education and Sport Teacher/ Alanya, ANTALYA

³ Alanya Alaaddin Keykubat University, Sport Sciences Faculty, Associate Professor/
Alanya, ANTALYA

lncs@springer.com

Abstract. The aim of the study is to evaluate the functional balance in daily living activities of individuals with special needs with mild intellectual disability (ID). The research was carried out on a total of 100 students, 35 females and 65 males, who were studying at Alanya Special Education Vocational School in the 2021-2022 academic year, with an average age of 16.9. In the study, “Pediatric Balance Scale (PBS)” and “Special Needs and Family Information Questionnaire Form” were used. Statistical analysis was performed to determine whether the functional balance levels of the participants made a difference according to the variables of age, gender and physical activity level and participation status. As a result, physical activity (PA) Participation Status variable; They were examined in two groups as those who regularly participated in PA and those who did not participate in PA. It was determined that there was no statistically significant difference in terms of functional balance scores between those who participated in PA and those who did not, but the mean functional balance scores of those who participated in PA (\bar{x} =50.13) were higher than those who did not participate in PA (\bar{x} =48.09). Based on these results, it is recommended to test balance skills by participating in long-term and regular physical activity and to use measurement tools whose validity and reliability have been tested in the evaluation of PA in studies that will examine balance skills in children with mild ID.

Keywords: intellectual disability, balance, performance

1. Introduction

Being disabled is not one's own choices. Individuals with normal development (ND) may also encounter deficiencies at any time (Ertürk, 2003). Insufficiency refers to the situation in which the losses observed in functions occur partially or completely with the effect of mental, physical, behavioral or sensory organs (Ataman, 2003). All individuals with intellectual disability (ID) have limitations in their psychomotor skills due to the effects on brain development (Cleaver, Hunter, & Ouelette, 2009). Individuals with ID generally lead a more sedentary life than their peers (Fernhall, 2001). In individuals with ID, participation in exercise programs is primarily applied to adapt to society and to create a sense of self-sufficiency. Sports activities greatly affect the daily living activities of individuals with disabilities. For this reason, knowing the effects on functional balance, coordination and flexibility skills in individuals with EY may be necessary for them to provide daily living activities more easily, to gain hand-eye coordination in learning life and to design exercise programs for skills they can do on their own (Wallae, 2004). Buruninks and Chvat (1990) state that individuals with ID show a great loss in coordination and functional balance skills (Özer, 1999). However, it has been observed that individuals with ID can be greatly improved after various interventions (Horvat, 1999). Functional balance element is a prerequisite skill in locomotor and manipulative skills both in individuals with ID and in individuals with ND. It is impossible for a child who has not yet achieved his/her functional balance to start walking. Functional balance ability, which cannot be developed and used, can have very rapid and negative effects on total body coordination (Hatipoğlu, 2005). The ability to balance is a competency associated with almost all movement skills for all individuals (Sherill, 2004; Fotiadou et al., 2017). Functional balance element is a prerequisite skill in the self-care skills that ensure the independence of children with ID. It is known that the balance performance of individuals with ID is lower than their peers with ND (Enkelaar et al., 2012; Kong et al., 2019). In this context, studies to evaluate and develop the functional balance factor of individuals with ID are important. The aim of the study is to evaluate the functional balance in daily living activities of individuals with special needs with mild ID.

2. Method

2.1. Participants:

The population of the study consisted of high school students with mild ID. The sample of the study consisted of 100 individuals with mild ID who were studying at high school in Alanya district. Necessary permissions were obtained from the families of the children with ID for the tests and measurements.

2.2. Research Model:

In the research, survey model, which is one of the quantitative research methods, and purposive sampling were used to determine the participants. All of the participants studying at the vocational high school in Alanya were included in the study with the typical case sampling method, one of the purposive sampling methods. The sample was limited to 100 participants due to its special needs and being a difficult group to reach with the experimental method.

2.3. Data Collection Tools:

In the study, the "Special Needs and Family Information Questionnaire Form with Mild ID" and the "Pediatric Balance Scale (PBS)" were used. PBS is a 14-item test protocol that includes balance skills. The maximum score that can be obtained from the test is 56 (Erden et al., 2021).

2.4. Data collection process:

Functional balance assessment was performed by watching video recordings after testing interobserver reliability as suggested in the literature (Hale et al., 2007). The Information Questionnaire on the Special Needs and Family with Mild ID was administered by the researchers through face-to-face interviews with the parents of the participants. The test was administered to the participants through written, verbal, visual and physical instructions. A second chance to try was given to children who could not perform the skill at once. Each balance criterion was evaluated with a score between 0 and 4 (0: could not, 1: low, 2: normal, 3: good, 4: very good). Several items require the participant to maintain his position for a certain period of time. Gradually, if the participants received help from a place or a tester, the score was reduced on that criterion. It was stated to the participants that they needed to maintain their balance in order to carry out the instruction. Participants were allowed to choose any side for standing and lying down.

2.5. Analysis of the data:

The measurement results of the participants were analyzed with the Statistical Package for the Social Sciences (SPSS) 25 program. The mean and standard deviation values were tabulated according to gender, BMI and level of participation in physical activity, and homogeneity, kurtosis and skewness analyzes of the variables were made and information on the distributions was obtained. T-test and ANOVA tests from parametric tests were used for data analysis. Data were tested with a significance level of $p < 0.05$.

3. Results

Table 1. Pediatric Balance Scale Skewness Kurtosis Values

According to the values given in Table 1, since the Skewness and Kurtosis values of the total score of the scale ranged from -1 to +1, it was assumed that the variables were normally distrib-

	Gender	N	\bar{x}	ss	sd
Pediatric Balance Scale	Male	65	48,56	5,68	,705
	Female	35	48,08	4,50	,760

uted (Hair et al., 2013).

Table 2. Descriptive Statistics of the Sample

Factor	Variable	N	%
Gender	Male	65	65
	Female	35	35
Doing sports	Doing Sports	19	19
	Doesn't Do Sports	76	76
	Receiving Physical Therapy	5	5
BMI	Weak	47	47
	Normal	46	46
	Overweight	7	7

65% of the participants are men and 35% are women, with an average age of 16.9.

Table 3. Functional Balance Scores by Gender Variable

	N	Min	Max.	\bar{x}	Ss	Skew	Kurt
Pediatric Balance Scale	100	31,00	56,00	48,40	5,28	-,999	,447

In the table, the number of participants and the average of the measurement scores according to the gender variable of the research group are given.

Table 4. Comparison of Functional Balance Scores by Gender Variable

	F	Shallow.	T	df	P	\bar{x} differ- ence	sd differ- ence
Pediatric Balance Scale	1,935	,167	,435	98	,665	,483	1.111

According to the findings, no statistically significant difference was found between the functional balance scores of women and men ($0.665 > 0.05$).

Table 5. Functional Balance Scores by BMI Variable

	N	\bar{x}	ss	Sd	min.	max.
Weak	47	48,29	6,06	,884	31.00	56,00
Normal	46	48,63	4,39	,648	39.00	55.00
Overweight	7	47,57	5,68	2.14	37.00	53.00
Total	100	48,40	5,28	,528	31.00	56,00

In the table, the number of participants and the average of the measurement scores according to the BMI variable of the research group are given. Arithmetic mean of weak participants $\bar{x}=48.29$; arithmetic mean of normal participants $\bar{x}=48.63$; arithmetic mean of overweight participants $\bar{x}=47.56$. It is seen that the arithmetic means of the groups are close to each other.

Table 6. Comparison of Balance Scores by BMI Variable

(I) bmi	(J) bmi	\bar{x} difference	sd	p
Weak	Normal	-.332	1.10	1,000
	Overweight	,726	2,15	1,000
Normal	Weak	,332	1.10	1,000
	Overweight	1,059	2,16	1,000
Overweight	Weak	-.726	2,15	1,000
	Normal	-1.059	2,16	1,000

In the comparison of the scores according to the BMI variable, the Bonferroni test, one of the ANOVA tests, was used because the variances were homogeneous and the sample was not equal. According to the results, no statistically significant difference was found between the Underweight, Normal and Overweight groups ($1,000 > 0.05$).

Table 7. Balance Scores According to the Variable of Doing Sports

	Category	N	\bar{x}	Ss	sd avg.
Pediatric Balance Scale	Non-Sports	85	48,09	5,377	,583
	Doing Sport	15	50,13	4.470	1,154

In the table, the number of participants and the average of the measurement scores are given according to the variable of Sporting Status of the research group.

Table 8. Comparison of Balance Scores According to the Variable of Doing Sports

	F	Shallow.	t	Df	p	\bar{x} diff.	sd
Pediatric Balance Scale	1,761	,188	-1,385	98	,169	-2.039	1.472

The t-test was used to compare the scores according to the Sportsman Variable and it was tested at the $p < 0.05$ significance level. According to the findings, there was no statistically significant difference between the children who did and did not do sports ($0.169 < 0.05$).

4. Conclusion

It was understood that the gender variable did not affect the balance performance of children with mild intellectual disability. When the BMI variable was examined, it was seen that there were no children at the obesity level in the sample. When the scores were compared, it was seen that the balance performances of the Underweight (< 18.5), Normal (18.5-24.99) and Overweight (25-29.99) (WHO) children did not differ, and therefore, the BMI variable did not affect the balance performance in the present sample. Sporting Status variable: It was examined in two groups as those who do sports and those who do not, and although the average of balance performance between those who do sports and those who do not do sports is higher, it is not statistically significant. From this point of view, it is seen that the state of doing sports in the present sample does not affect the balance performance.

5. Argument

In the study, the balance performances of those with mild EY were examined according to the variables of "gender", "BMI" and "Sporting Status".

Similar to the literature, there was no significant difference in terms of gender variable in the study; It was determined that the balance scores of the male participants were higher than the female participants. Aksel et al. (2013) 1050 students participated in the study in which the physical and motoric characteristics of 7-9 age group male and female students were examined according to gender. According to the results of the study; It was stated that gender did not differ significantly in terms of motoric characteristics. However, boys give better results than girls in motor performance, flexibility and balance (Ergun, 2017).

Akın and Yüksel (2016) concluded that the average balance performance of children who do sports regularly is higher than those who do not. In the study, the participants who did and did not do sports for more than 3 months in the last 3 years were compared. It is known that the participants in our study did not do sports regularly and mostly had sports experiences in the past

years. Although the participants did not do regular and active sports, it was concluded that although the balance scores were higher, similar to the study of Akin and Yüksel (2016), it was not at a level to create a statistically significant difference. This result shows that the level of regular exercise of the participants can make a statistical difference, and that their past sports experiences can also be effective on their balance performance.

6. Suggestions

Ensuring that children with EY participate in regular physical activity can be an effective method to improve balance performance. It is recommended that studies in the field be carried out in larger samples. It is thought that making BMI values in samples of children participating in more diverse and regular physical activity will contribute to the literature. In the study, the status of participation in physical activity was obtained with the statements of the participants. The difference between the two variables may have been affected by this limitation. In future studies, more detailed and reliable results can be obtained by performing physical activity situations with validated measurement tools.

7. References

1. Akin, S. & Yüksel, O. (2016). Evaluation of Dynamic Balance Levels of Mentally Handicapped Children Who Play and Do Not Do Sports. *Sporty Perspective: Journal of Sport and Educational Sciences*, 3 (1), 33-40. Retrieved from <https://dergipark.org.tr/tr/pub/sbsebd/issue/31661/347127>
2. Aksel, Celik, Gunay, Erkan and Aksu, Funda (2013). Evaluation of physical and motoric characteristics of primary school students aged 7-9. *Journal of DEU Faculty of Medicine*, 27(1), 7-13.
3. Ataman, A. (2003). *Children with Special Needs and Introduction to Special Education*. Ankara: Gündüz Education Publishing.
4. Cleaver S., D. Hunter, and H. Ouellette-Kuntz. "Physical mobility limitations in adults with intellectual disabilities: a systematic review." *Journal of Intellectual Disability Research* 53.2, 2009: 93-105.
5. Enkelaar, L.; Smulders, E.; Geurts, A.C.; Weerdesteyn, V. A review of balance and gait capacities in relation to falls in persons with intellectual disability. *Res. Dev. Disabil.* 2012, 33, 291–306.
6. Erden, A., Arslan, E. A., Dündar, B., Topbaş, M., & Cavlak, U. Reliability and validity of Turkish version of pediatric balance scale. *Acta Neurol Belg.* 2021 Jun;121(3):669-675. doi: 10.1007/s13760-020-01302-9
7. Ertürk, B. (2003). İşitme engelli çocukların ailelerine öneriler. *Ankara, Başbakanlık Özürlüler İdaresi Başkanlığı*.
8. Fotiadou, E. G., Neofotistou, K. H., Giagazoglou, P. F., & Tsimaras, V. K. (2017). The effect of a psychomotor education program on the static balance of children with intellectual disability. *The Journal of Strength & Conditioning Research*, 31(6), 1702-1708.
9. Fernhall , B. "Limitations to physical work capacity in individuals with mental retardation." *Clin Exerc Phys* 3, 2001:176-185.
10. Hair, JF, Black, WC, Babin, BJ, Anderson, RE, & Tatham, RL (2013). *Multivariate Data Analysis*: Pearson Education Limited.

11. Hale, L., Bray, A., & Littmann, A. (2007). Assessing the balance capabilities of people with profound intellectual disabilities who have experienced a fall. *Journal of Intellectual Disability Research*, 51(4), 260-268.
12. Hatipoglu, A. (2005). The Effect of Functional Balance Exercises on Functional Balance Skills in Normal and Hearing-Impaired Children. Unpublished Master Thesis. Marmara University, Institute of Educational Sciences, Department of Physical Education and Sports Teaching.
13. Horvat Michael, et al. "Comparison of isokinetic peak force and work parameters in youth with and without mental retardation." *Medicine & Science in Sports & Exercise* 31.8, 1999: 1190-1195.
14. Kong, Z., Sze, T.-M., Yu, J., Loprinzi, P., Xiao, T., Yeung, A., Li, C., et al. (2019). Tai Chi as an Alternative Exercise to Improve Physical Fitness for Children and Adolescents with Intellectual Disability. *International Journal of Environmental Research and Public Health*, 16(7), 1152. MDPI AG. Retrieved from <http://dx.doi.org/10.3390/ijerph16071152>
15. Ozer, D. (1999). An Investigation of the Motor Competencies of Educable Mentally Handicapped Children by Comparing them with their Normally Developing Peers, *Gazi University Journal of Physical Education and Sport Sciences*. A: 4, P:3-14. Ankara
16. Sherrill C. *Adapted Physical Activity, Recreation and Sport. Crossdisciplinary and Lifespan*. Boston, MA: WCB/McGraw-Hill, 2004.
17. Wallae Ted. "The developmental skill-learning gap hypothesis: Implications for children with movement difficulties." *Adapted physical activity quarterly* 21.3, 2004: 197-218.
18. World Health Organization. *Intellectual Disability A Manual for CBR Workers*. New Delhi: 2007; p: 15. www.searo.who.int .

Anxiety of Individuals Who Are Member of Different Sports Centres To Be Caught with Coronavirus

Yasemin YALÇIN¹[0000-0002-1484-3477] and **Fatma TURAN**²[0000-0003-1741-3170]

¹**Alanya Alaaddin Keykubat University Faculty of Sports Sciences, Alanya, Antalya, TURKEY**

²**Alanya Alaaddin Keykubat University Faculty of Sports Sciences, Alanya, Antalya, TURKEY**
yasemin.yalcin@alanya.edu.tr

Abstract

In this study, it is aimed to examine the concerns of catching coronavirus of individuals who are members of different sports centers and to determine the differences between the concerns of catching the corona virus according to the independent variables obtained from the personal information of the individuals participating in the research. The study group of the research consisted of individuals who are members of sports centers in Alanya. In order to examine the anxiety of individuals who are members of different sports centers about catching coronavirus, the “Athlete’s Anxiety to Catch the Novel Coronavirus (Covid-19) Scale (AACNCS)” developed by Demir and Cicioğlu and İlhan (2020) was used in the research. It was decided whether the data met the prerequisites of the parametric tests by examining the Skewness and Kurtosis (normal distribution of the data) values and the Levene (equality of variance) test results. In this direction, t-test and ANOVA tests were applied to evaluate the levels of AACNCS according to the various demographic characteristics of the participants. As a result of the research, it was determined that there was no significant difference in the anxiety of catching coronavirus of individuals in different sports centers according to the type of sports center (pilates studio and fitness center) variable. Although the effect of the pandemic on people has started to decrease in recent times, institutions or organizations should pay attention to the hygiene of sports facilities and sports equipment and should not allow factors that will cause any anxiety in individuals who do sports.

Keywords: Coronavirus anxiety, sports, members of the sports center.

1. INTRODUCTION

For centuries, human communities on a country basis have been exposed to viruses that have affected all continents, from one end of the world to the other. No matter how many vaccines, drugs and treatments these viruses have, they have caused millions of deaths. Since time immemorial, there have been many viruses that have appeared in every moment of our lives. One of them is Covid-19. It has been found to occur in the last few months of 2019.

Coronavirus is a family of macro viruses that are seen as the cause of disease in all living things. Coronavirus is a viral respiratory disease and nasopharyngitis is zoonotic of viral origin, etc. It is known that diseases cause respiratory tract infections (T.C. Sağlık Bakanlığı, WHO, 2020a: 2). The recently discovered Covid-19 (Coronavirus) pandemic was first detected in individuals in the seafood market in the city of Wuhan in Hubei province of China, which was documented at the end of December 2019 (Henwood, 2020: 1-3).

In 2020, it affected the whole world and started to spread. Some of the medical symptoms of the disease are cough, fatigue, fever, nasal congestion and other upper respiratory tract infectious diseases. Due to the fact that their surfaces are covered with crown-like rod-like appendages, this virus family has been named coronavirus (crown virus) because of the Latin word 'corona' meaning 'crown' (McIntosh, et al., 1967: 933-940).

In some patients, headache, redness of the skin, decreased sense of smell and taste, difficulty breathing, pain in the whole body, diarrhea, discoloration of the hands and fingers have been observed (WHO, 2020a: 2).

According to researches; It has been stated that 80% of the patients can recover without the need for medical intervention, but individuals with severe disease can change the course of the disease and turn into pneumonia and artificial respiration techniques are needed. Plenty of rest and fluid supplementation are recommended for those who have a comfortable illness. Patients with chronic diseases such as diabetes, blood pressure, heart and lung are in the risk group. Not only the elderly, but also children and young people have cases of infection and spread. These age groups are among the cases with severe disease (Budak & Korkmaz, 2020: 65-66).

The virus, which spread rapidly from its starting point, has threatened the life of humanity, and the life of all humanity on earth has changed rapidly. After the first case in Wuhan, China, it took the whole world under its influence in a short period of three months (WHO, 2020b: 52).

When cases were first seen, the coronavirus was thought to be a normal epidemic. As the rate of spread to the world increased, the measures in the pandemic process began to be increased. It has had sudden and unexpected effects on our individual and social lives. Many measures have been taken, such as the social distance rule, the street ban. These measures had a negative impact on people's lives. The measures taken to eliminate the spread of the coronavirus have been taken in the fields of socio-economic and education, as well as in the fields of sports. At first, sports activities were postponed to later dates, but as the number of cases and deaths began to increase, they were completely canceled (Koçak & Kaya, 2020).

The Ministry of Youth and Sports canceled more than 80 domestic and international events that were not intended for quota competitions in 2020. In this context, youth activities, travels of young people abroad, work of young people coming from abroad regarding the camps, other organizations, and activities related to these activities in March and April were postponed for two months. In order to reduce the spread of the epidemic, special studies were carried out for sports

centers, sports facilities, pools, stadiums and sports centers, athletes and citizens were made aware, and it was decided to disinfect each area with antiseptics (T.C. Gençlik ve Spor Bakanlığı, 2020a; Erdem, 2020: 383).

In addition to the large sports organizations and sports fields that are contrary to the rules of contact and social distance, the measures taken in the public areas where sedentary individuals benefit from sports, have negatively affected individuals psychologically and made them stay away from sports. Due to the uncertain and difficult nature of the epidemic, sedentary individuals, as well as athletes, have seen a decrease in motivation and an increase in anxiety. In this regard, it was found that the performance of athletes decreased. It has been tried to increase the motivation of athletes to regain their performance and sedentary individuals to maintain their sports habits with activities that encourage them to do sports at home. In order for athletes to regain their success in this regard, the effects of Covid-19 on metabolism or new exercise approaches have been applied according to these effects (Kaya, 2021: 135).

With the quarantine measures brought in pursuit of the coronavirus epidemic, it has actually increased the awareness of individuals about the correct use of time. The inability to do sports due to the measures taken in indoor and outdoor environments has led to new ideas in the sports sector. The pandemic period has affected many areas, as well as forced the sports industry to digital life (Türkmen & Özsarı, 2020).

With the exercises performed during the pandemic period, stress reduction in individuals, positive effects in terms of physical and mental health, and even continuing sports as a habit and adapting to a healthy life were expected. As a result of some analytical studies, it was found that those who play sports encourage the people around them in the pandemic, acquire sports awareness, and after the pandemic, interest in sports and sports expertise will increase to a high degree (Akyol, et al., 2020: 202).

With the advent of the pandemic, the public was advised to stay at home to reduce the epidemic. There has been a restriction of activities in the social environment, changes in routine exercise and activities (Chen, et al., 2020: 104).

It is the difference between the skill of the individual and the situation requested from him in the case of anxiety in which the emotional state of the person undergoes personal, physical and emotional changes during a stimulus. This incompatibility between an individual's skills and expectations prevents the person from revealing his/her skills (Akca, 2020: 17).

The concept of anxiety, which is also discussed by scientists following Freud in his psychoanalysis, which is accepted as the founder of Freud, has been handled not only as a mental state that people experience, but also in different ways in the process. The concept of anxiety can generally be expressed as a state of uneasiness or fear experienced by people. The concept of anxiety and fear are different from each other in terms of their source; while the source of fear is obvious, the source of anxiety is unclear (Budak, 2000: 437).

Although the Covid-19 process has slowly started to come off the agenda of people, it is unlikely that the effects of this process on people will disappear in an instant. Emotions such as fear and anxiety experienced by people due to the pandemic will not disappear in an instant. Therefore, it is clear that exercise and physical activities are needed to cope with these negative emotional states in people (Gaillard, 2020: 3-13).

One of the important elements of human history during their lifetime has been physical appearance (Yüceant, 2013: 60). In the past and present, achieving a fit and strong appearance and being liked by other people has been the most important source of motivation for people who

play sports. For individuals, the concept of beauty is evaluated positively, and the concept of ugliness is evaluated negatively. The media also supports this position that we have come to. So much so that the ideal body design introduced has enabled people's feelings and thoughts to change, and has also affected bodily perception (Yaman, et al., 2014: 3).

Nowadays, physical appearance is one of the most important issues for all people, especially young people, regardless of age. Social anxiety is evaluated based on the concerns of individuals' performance in society, especially on the thoughts of people they have not met before or who have only seen them (Gautreau et al., 2015: 125-130).

The fact that physical activity cannot be controlled for a long time due to the pandemic negatively affects physical and mental health has turned our quality of life upside down. Obesity has led to the emergence of diabetes, cardiovascular problems, chronic diseases and diseases of psychological origin. Therefore, with the social isolation and quarantine process, there was a decrease in the level of exercise and physical activity of individuals. This situation has prepared the ground for individuals to drift into a sedentary life (Gaillard, 2020: 3-13).

As a result of the research, it has been determined that there are positive improvements in the exemption system and cells with the exercises performed. In this case, it is stated that it is important to increase the immune function that will protect the body against germs with appropriate exercises for the body (Nieman & Wentz, 2019; 201-217).

In this study; It is aimed to examine the concerns of individuals who are members of different gyms of catching coronavirus and to determine the differences between the concerns of catching the corona virus according to the independent variables obtained from the personal information of the individuals participating in the research. In the researches in the literature, mostly sports organizations and competitions are mentioned. Comparing the concerns of individuals about catching the corona virus in terms of the quality of sports center (pilates studio, fitness center) and the fact that no study has been done before in this respect increases the importance of this research.

2. METHOD

2.1. Model of the Research

The descriptive method was used to examine the concerns of individuals who are members of different sports centers to catch the novel coronavirus (Covid-19). Descriptive scanning is research conducted on large groups, in which the opinions and attitudes of the individuals in the group about a phenomenon and event are taken, and the phenomenon and events are tried to be described (Karakaya, 2012: 59). In the first step of the study, the literature on the subject was scanned, the results of the previous research were examined, and a detailed theoretical framework was prepared in terms of the variables to be examined with the information obtained. In the second step, the "Athlete's Anxiety to Catch the Novel Coronavirus (Covid-19) Scale (AACNCS)" was used to determine the concerns of the members of different gyms about catching coronavirus and compared them. In addition, the demographic information of the individuals was determined with the personal information form and the differences between the concerns of catching the coronavirus were examined in terms of personal variables.

2.2. Participant Group

The study group of the research consisted of individuals who were members of sports centers in Alanya, which were determined by convenience sampling method, which is one of the non-probability sampling methods (Bishop, 2017). When determining the sample size in the literature, it is recommended that the number of participants be 5 to 10 times the number of items in the scale (Bryman & Cramer, 2001; Pett, Lackey & Sullivan, 2003). Since there were 16 expressions in the scale used in the study, it was aimed to carry out the research with a total of 160 individuals.

2.3. Data Collection Tools

In the first part of the current study, questions containing the personal information of the participants were included. In the other part; In order to examine the concerns of individuals who are members of different sports centers of contracting coronavirus, the "Athlete's Anxiety to Catch the Novel Coronavirus (Covid-19) Scale (AACNCS)" developed by Demir, Cicioğlu and İlhan (2020) was used. There are a total of 16 items in the scale; The first 11 items constitute Individual Anxiety (IA), and the 12th, 13th, 14th, 15th and 16th items constitute Socialization Anxiety (SA). The scale, which consists of 16 items, is in the five-point Likert type. In this context, the items were listed as "I strongly disagree", "I do not agree", "I am undecided", "I agree", "I completely agree"; It is rated 1, 2, 3, 4 and 5. Reverse items should be coded as 5, 4, 3, 2 and 1. Since only item 2 in the scale contains negative statements, it should be reverse coded.

2.4. Data Collection

In order to carry out the research, the "Ethics Committee Report" dated 27/04/2022 and decision number 2022/12 was obtained from the Social and Human Sciences Scientific Research and Publication Ethics Committee of Alanya Alaaddin Keykubat University. After obtaining the approval of the ethics committee, the volunteers in the research group were contacted, and the purpose and content of the study were explained. Data were collected from the participants in March and April 2022 through face-to-face forms. The average response time for the relevant scale is approximately 10 minutes. Individuals who volunteered to participate in the study filled in the relevant scales under the supervision of the researchers.

2.5. Analysis of Data

The data obtained in the research were analyzed with the help of the IBM SPSS 25.0 statistical package program. In the analysis of the data obtained in the study, the Cronbach Alpha reliability coefficient was calculated to examine the internal-consistency of the measurement tool. T-test and ANOVA tests were applied to evaluate the levels of AACNCS according to the various demographic characteristics of the participants. Whether the data met the prerequisites of the parametric tests was decided by examining the Skewness and Kurtosis (normal distribution of the data) values and the Levene (variance equality) test results.

Within the framework of the aims of the research, answers to the following questions were sought:

- Is there a significant difference between the levels of anxiety to catch the novel coronavirus (Covid-19) among individuals who are members of fitness centers and those who are members of pilates studios?

- Are there any significant differences in the anxiety to catch the novel coronavirus (Covid-19) among individuals who are members of fitness centers and those who are members of pilates studios, according to their personal information?

3. FINDINGS

In this section, firstly, the table showing the frequency distribution according to the demographic characteristics of the research group is given. Then, the table showing the distribution of the scores of the scales, respectively, and the results tables showing the difference between the averages of the anxiety to catch the novel coronavirus (Covid-19) and the demographic variables (gender, age, marital status, education status, type of sports center, sports year, situation of catching coronavirus, and vaccination status) are included.

Table 1. Frequency Distribution of the Research Group According to Demographic Characteristics

Variables	Subgroup	N	%	Total
Gender	Female	117	58.5	200
	Male	83	41.5	
Age	18-22 years	49	24.5	200
	23-27 years	66	33.0	
	28-32 years	39	19.5	
	33 years or older	46	23.0	
Marital status	Married	66	33.0	200
	Single	134	67.0	
Education Status	High school	52	26.0	200
	University	134	67.0	
	Graduate	14	7.0	
Type of sports center	Pilates Studio	100	50.0	200
	Fitness Center	100	50.0	
Sports year	2 years or less	140	70.0	200
	3 years or more	60	30.0	
Situation of catching coronavirus	Yes	85	42.5	200
	No	115	57.5	
Vaccination status	Yes	171	85.5	200
	No	29	14.5	

58.5% of the individuals participating in the research were women, 33.0% were in the 23-27 age group, 67.0% were single, 67.0% had university education, 50.0% attended a pilates studio, 70.0% were members of sports centers for 2 years or less, 57.5% were not infected with the coronavirus, and 85.5% were vaccinated (Table 1).

Table 2. Distribution of AACNCS scores

Scale	Item	Mean	Sd	Skewness	Kurtosis	C.Alpha
Individual anxiety	11	3.26	0.896	-0.530	-0.406	0.91
Socialization anxiety	5	2.69	1.064	0.059	-0.781	0.93
AACNCS total	16	3.08	0.840	-0.444	-0.311	0.92

In Table 2, it is seen that the average score of AACNCS of the individuals included in the research is 3.08. The Cronbach Alpha internal consistency coefficient was calculated as 0.92 for AACNCS. It is seen that the average score of the AACNCS Individual anxiety subscale, which is included in the research, is 3.26, and the average score of the Socialization anxiety subscale is 2.69. While the Cronbach Alpha internal consistency coefficient for the individual anxiety subscale was 0.91, the Cronbach Alpha internal consistency coefficient for the socialization anxiety subscale was calculated as 0.93. According to Kılıç (2016), the criterion values regarding the reliability coefficient are; “not reliable” when $0.00 < \alpha < 0.40$, “low reliability” when $0.41 < \alpha < 0.60$, “moderately reliable” when $0.61 < \alpha < 0.80$, and “highly reliable” when $0.81 < \alpha < 1.00$. In the light of these criteria regarding the reliability coefficient, it can be said that the internal consistency coefficients of the current study have a high level of reliability.

When the skewness and kurtosis values are examined, it is observed that the data fulfill the normality assumption. According to Tabachnick and Fidell (2007), skewness and kurtosis values are within the range of ± 1.50 , and according to George and Mallery (2010) ± 2 is an acceptable condition for normality. From this point of view, it was decided to apply parametric statistical techniques for the analysis processes for the determination of relationship and difference.

Table 3. Results of t-test analysis according to gender variable

Scale	Gender	N	Mean	Sd	t	p
Individual anxiety	Female	117	3.39	0.929	2.477	0.014*
	Male	83	3.08	0.818		
Socialization anxiety	Female	117	2.78	1.118	1.377	0.170
	Male	83	2.57	0.977		
AACNCS total	Female	117	3.20	0.870	2.364	0.019*
	Male	83	2.92	0.771		

* $p < 0.05$

The results of the analysis in Table 3 show that there is a statistically significant difference in the mean score of the research group's AACNCS and the mean score of the individual anxiety subscale according to the "gender" variable ($t=2.364$, $p < 0.05$ / $t=2.477$, $p < 0.05$). According to the same table, it is seen that there is no statistically significant difference in the mean score of the socialization anxiety subscale according to the “gender” variable ($t=1.377$, $p > 0.05$).

Table 4. Results of ANOVA analysis according to age variable

Scale	Age	N	Mean	Sd	F	p
Individual anxiety	18-22 years old	49	3.14	0.758	0.947	0.419

	23-27 years old	66	3.22	0.903		
	28-32 years old	39	3.45	0.859		
	Age 33 or over	46	3.28	1.042		
Socialization anxiety	18-22 years old	49	2.67	0.896	0.137	0.938
	23-27 years old	66	2.64	1.061		
	28-32 years old	39	2.75	1.089		
	Age 33 or over	46	2.73	1.231		
AACNCS total	18-22 years old	49	2.99	0.730	0.690	0.559
	23-27 years old	66	3.04	0.826		
	28-32 years old	39	3.23	0.845		
	Age 33 or over	46	3.11	0.965		

* p<0.05

The results of the ANOVA test were statistically significant in the mean score of the study group's AACNCS, the mean scores of individual anxiety and socialization anxiety subscales (F=0.690, p>0.05 / F=0.947, p>0.05 / F=0.137, p>0.05) according to the "age" variable. shows that there is no significant difference (Table 4).

Table 5. Results of t-test analysis according to marital status variable

Scale	Marital status	N	Mean	Sd	t	p
Individual anxiety	Married	66	3.32	0.978	0.648	0.517
	Single	134	3.23	0.855		
Socialization anxiety	Married	66	2.83	1.178	1.320	0.188
	Single	134	2.62	1.001		
AACNCS total	Married	66	3.17	0.898	0.998	0.319
	Single	134	3.04	0.810		

* p<0.05

The results of the analysis show that there is no statistically significant difference in the mean score of AACNCS, individual anxiety and socialization anxiety subscale mean scores of the research group compared to the "marital status" variable (t=0.998, p>0.05/t=0.648, p>0.05/t=1.320, p>0.05).

Table 6. The results of ANOVA analysis according to the educational status variable

Scale	Education status	N	Mean	Sd	F	p
Individual anxiety	High school	52	3.41	0.910	1.655	0.194
	University	134	3.23	0.865		

	Graduate	14	2.95	1.091		
	High school	52	2.98	1.064		
Socialization anxiety	University	134	2.60	1.035	0.072	0.072
	Graduate	14	2.50	1.220		
	High school	52	3.28	0.881		
AACNCS total	University	134	3.03	0.798	2.367	0.096
	Graduate	14	2.81	0.992		

* p<0.05

The results of the ANOVA test, the average score of the research group ytkyko the individual anxiety and social anxiety sub-scores in the average size (F=2.367, p>0.05 / F=1.655, p>0.05 / F=0.072, p>0.05) of "education status" shows that there is a statistically significant difference according to the variable (Table 6).

Table 7. Results of the t-test analysis according to the sports center type variable

Scale	Type of sports centers	N	Mean	Sd	t	p
Individual anxiety	Pilates Studio	100	3.27	0.920	0.136	0.892
	Fitness Center	100	3.25	0.876		
Socialization anxiety	Pilates Studio	100	2.65	1.106	-0.517	0.606
	Fitness Center	100	2.73	1.026		
AACNCS total	Pilates Studio	100	3.08	0.862	-0.105	0.917
	Fitness Center	100	3.09	0.822		

* p<0.05

The results of the analysis show that there is no statistically significant difference in the mean score of AACNCS, individual anxiety and socialization anxiety subscale mean scores of the research group, according to the "sports center type" variable (t=-0.105, p>0.05 / t=0.136, p>0.05/t). =-0.517, p>0.05).

Table 8. Results of t-test analysis according to sports year variable

Scale	Sports Year	N	Mean	Sd	t	p
Individual anxiety	2 years or less	140	3.23	0.866	-0.762	0.447
	3 years or more	60	3.33	0.966		
Socialization anxiety	2 years or less	140	2.73	1.011	0.744	0.458
	3 years or more	60	2.60	1.185		
AACNCS total	2 years or less	140	3.07	0.792	0.263	0.792
	3 years or more	60	3.11	0.949		

* p<0.05

The results of the analysis show that there is no statistically significant difference in the mean score of AACNCS, individual anxiety and socialization anxiety subscale scores of the research group compared to the "sports year" variable ($t=-0.263$, $p>0.05$ / $t=-0.762$, $p>0.05$ / $t=0.744$, $p>0.05$).

Table 9. The results of t-test analysis according to the variable of catching coronavirus

Scale	Situation of catching coronavirus	N	Mean	Sd	t	p
Individual anxiety	Yes	85	3.30	0.944	0.512	0.609
	No	115	3.23	0.862		
Socialization anxiety	Yes	85	2.81	1.183	1.406	0.161
	No	115	2.60	0.963		
AACNCS total	Yes	85	3.15	0.897	0.931	0.353
	No	115	3.03	0.796		

* $p<0.05$

The results of the analysis show that there is no statistically significant difference in the average score of the research group, in the average scores of the individual anxiety and socialization anxiety subscale according to the "situation of catching coronavirus" variable ($t=0.931$, $p>0.05$ / $t=0.512$, $p>0.05$ / $t=1.406$, $p>0.05$).

Table 10. Results of t-test analysis according to the variance of vaccination status

Scale	Vaccination status	N	Mean	Sd	t	p
Individual anxiety	Yes	171	3.25	0.932	-0.329	0.742
	No	29	3.31	0.660		
Socialization anxiety	Yes	171	2.73	1.109	1.243	0.215
	No	29	2.46	0.717		
AACNCS total	Yes	171	3.09	0.876	0.249	0.804
	No	29	3.05	0.591		

* $p<0.05$

The results of the analysis show that there is no statistically significant difference in the mean score of AACNCS, individual anxiety and socialization anxiety subscale mean scores of the research group, according to the "vaccination status" variable ($t=0.249$, $p>0.05$ / $t=-0.329$, $p>0.05$ / $t=1.243$, $p>0.05$).

4. DISCUSSION

This research was carried out in order to examine the concerns of catching coronavirus of individuals who are members of different gyms and to determine the differences between the concerns of catching the corona virus according to the independent variables obtained from the personal information of the individuals participating in the research. 200 individuals who are members of pilates studio and fitness centers in Alanya participated in the research. Of the participants, 117 (58.5%) were female and 83 (41.5%) were male.

The results of the analysis made according to the gender variable show that there is a statistically significant difference in the mean score of the research group's AACNCS and the mean score of the individual anxiety subscale. According to the same table, it is seen that there is no statistically significant difference in the average score of the socialization anxiety subscale according to the "gender" variable. Accordingly, it is understood that the anxiety to catch the novel coronavirus (Covid-19) among female members is higher than that of male members. It can be thought that the reason for this is that women have more responsibilities in social and family duties. In some studies in the literature, it is stated that the anxiety levels of female athletes about contracting COVID-19 are higher than male athletes (Gümüřgöl, Ersoy & Gümüřgöl, 2020; Türkteviz ve ark, 2020). It has been reported in many studies that women's general anxiety levels are higher than men (Çölgeçen & Çölgeçen, 2020; Göksu & Kumcağız, 2020). The study is in parallel with many studies in the literature. However, as a result of the research conducted by Güreter et al. (2014), it was determined that male athletes had higher anxiety than female athletes.

In the results of the analysis conducted according to the age variable, it is observed that there is no statistically significant difference in the average score of the research group in the average score of the individual anxiety and the subscale of socialization anxiety. Çifçi and Demir's (2020) study with professional football players shows similarities with the current study. It was determined that there was no statistically significant difference between the anxiety levels of the football players according to the age variable. Contrary to the research conducted, according to the research results of Ateş et al. (2018), it was determined that the anxiety levels of athletes aged 21 and over were higher than younger athletes.

According to the results of the analysis made according to the marital status variable, it is seen that there is no statistically significant difference in the average score of the research group's AACNCS, the mean scores of the individual anxiety and socialization anxiety subscales. According to the results of Wang et al.'s (2020) study on the normal population, no significant difference was found in terms of moods of single and handicapped individuals during the Covid-19 pandemic period. This study supports the study. On the other hand, in some studies in the literature, in terms of marital status variable, it was determined that single family physicians had higher anxiety levels than married family physicians and single patients had higher anxiety levels than married patients (Karaođlu, et al., 2009: 121; Arslan et al., 2017: 19).

According to the results of the analysis made according to the educational status variable, it is seen that there is no statistically significant difference in the average score of the research group's AACNCS, the average scores of the individual anxiety and socialization anxiety subscales. When the literature was examined, in a study on athletes, no statistically significant difference was found between the total score averages and subscales of AACNCS according to the variable of educational status. Considering the results of the research, it can be thought that the educational status of individuals does not have an effect on the anxiety of catching covid-19 (Özgün, Türkmen & Ayhan, 2021). Contrary to the current study, in the research conducted by

Bulut and Duman (2021) on the employees of the Provincial Directorate of Youth and Sports during the pandemic period, they found that the state anxiety levels of the employees with a bachelor's degree were significantly higher than those of high school graduates. According to this result, it can be stated that the anxiety levels of undergraduate graduates are higher than their instantaneous emotional states.

In the results of the analysis conducted according to the sports center type variable, it is observed that there is no statistically significant difference in the average score of the research group's AACNCS, the average scores of the individual anxiety and the socialization anxiety subscale. In the literature, there has not been a study in which the anxiety of contracting coronavirus was examined with the sports center type variable. But in the study conducted by Agduman (2021) in order to study the anxiety levels of individuals engaged in sports about contracting COVID-19 during the pandemic period, the variable of the place where sports are held (open area- closed area) was used. The results of the analysis showed that the individual anxiety and total anxiety levels of those who play sports indoors against COVID-19 are higher than those of athletes who play sports outdoors. There are reports indicating that there are many individuals participating in outdoor activities that have a lower risk of infection compared to activities performed indoors (akt. Kim, Cho, & Park, 2020). Since individuals spend more time indoors due to the reasons brought by the pandemic process, the possibility of experiencing mental problems increases, and the fact that they prefer activities such as mountain hiking and camping in open spaces confirms the ideas of athletes who feel the anxiety of catching coronavirus indoors at a higher level (Kang & Ban, 2020). Due to the fact that there is less risk of transmission of the virus in open spaces (Khosronejad ve ark., 2020), the fact that the anxiety level of contracting COVID-19 is lower among those who perform outdoor activities, is in line with the data obtained.

In the results of the analysis made according to the sports year variable, it is observed that there is no statistically significant difference in the average score of the research group's AACNCS, the average scores of the individual anxiety and the socialization anxiety subscale. There are studies in the literature that support the current study. In studies conducted with active athletes, it has been found that the sports year does not affect the anxiety of contracting COVID-19 (Ozgun, Turkmen & Ayhan, 2021; Cihangir, et al., 2022). It can be said that the sports year is not a situation that will cause anxiety on athletes.

In the results of the analysis made according to the variable of catching the coronavirus, it is seen that there is no statistically significant difference in the average score of AACNCS, the individual anxiety and socialization anxiety subscales of the research group. When the studies in the literature were examined, in the study conducted by Özgün et al. (2021) on athletes, no significant difference was observed in the individual anxiety and socialization subscales according to the status of the athletes catching the coronavirus, while a significant difference was observed among the athletes in the total average of AACNCS. It can be said that athletes who do not catch the coronavirus are more anxious. When we look at the results of Öztekin et al.'s (2021) study, a difference was observed in the anxiety levels between individuals who had the disease and those who did not. But here it has been found that individuals infected with coronavirus are more anxious. It can be said that individuals infected with coronavirus have a higher level of anxiety as a result of both physical and mental destruction brought about by the disease.

According to the results of the analysis made according to the variable of being vaccinated, it is seen that there is no statistically significant difference in the mean score of the research group's

AACNCS, the mean scores of the individual anxiety and socialization anxiety subscales. The study carried out by Ayhan et al. (2022) on athletes supports the current study. According to the variable of being vaccinated against the coronavirus of the athletes participating in the study, no significant difference was found in the values of anxiety and attitude towards the coronavirus vaccine.

5. CONCLUSION and RECOMMENDATIONS

As a result, anxiety, which can lead to more serious mental problems and whose social reflection can occur in the form of violence, is a factor that should never be ignored. In this respect, it should be taken into account that the cost of neglecting psychological and social health, as well as the physical health problems experienced during the Covid-19 pandemic process, will be painful and heavy. Sports is one of the factors that will eliminate or minimize anxiety. The importance of sports, which has always been known to be important for human life, has been understood more in the pandemic process. In addition to the physical benefits it offers to the body, sports also contribute to mental development. In order to minimize the effects of the epidemic during and after the COVID-19 pandemic, to return the sportive activities to the state they were in before the epidemic, to carry out the sporting activities safely and to ensure my participation in sports at all levels, the Republic of Turkey Ministry of Youth and Sports, sports organizations, sports federations, sports organizations, especially individuals, clubs and gyms have responsibilities. In the new normal order after Covid-19, both gyms, trainers and sports fans have to follow some rules to protect their health and exercise more safely. In addition to the mandatory rules announced by the Ministry of Health, primarily individuals should pay attention to their personal hygiene. Attention should be paid to the hygiene of institutions and organizations, sports facilities, sports equipment and should not allow factors that will cause any anxiety in individuals who do sports. In this regard, many precautionary policies have been implemented around the world. Anxiety was tried to be eliminated by giving awareness-raising seminars to individuals. It has been seen that the effect of the pandemic on humans has begun to decrease in the last days. According to the results of the data analysis, it can be said that the pandemic has lost its effect and the anxiety levels of individuals have decreased.

REFERENCES

- Akca, E. (2020). *Üstün zekalı tanısı için başvuran ebeveynlerde mükemmeliyetçilik ve kaygı düzeyinin incelenmesi*. Yüksek Lisans Tezi. Çağ Üniversitesi, Sosyal Bilimler Enstitüsü, Mersin.
- Akyol L, G., Başkan, A. H. & Başkan, A. H. (2020). Yeni tip koronavirüs (Covid-19) döneminde spor bilimleri fakültesi öğrencilerinin karantina zamanlarında yaptıkları etkinlikler ve sedanter bireylere önerileri. *Avrasya Sosyal ve Ekonomi Araştırmaları Dergisi*, 7(5), 190-203.
- Arslan, S., Taylan, S. ve Deniz, S. (2017). Nöroşirürji hastalarının ameliyat öncesi anksiyete düzeyleri. *Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi*, 20(1): 17-21. <https://doi.org/10.26559/mersinsbd.288773>
- Ateş, Y., Özgül, F., Güçlü, M., & Buyrukoğlu, E. (2016). *Beden eğitimi ve spor yüksekokulu öğrencilerinin sürekli kaygı düzeylerinin incelenmesi*. 9. Uluslararası Spor Bilimleri Öğrenci Kongresi, 12 – 14 Mayıs.
- Ayhan, S., Tizar, E., Kalaycı, M. C., & Gözaçık, Y. (2022). Atletlerin yeni tip koronavirüs'e (covid-19) yakalanma kaygısı ve covid-19 aşısına yönelik tutumlarının incelenmesi. *Spor, Sağlık ve Eğitim Araştırmaları Dergisi*, 1(2), 1-15.

- Bishop, P. A. (2017). *Measurement and evaluation in physical activity applications*. Exercise Science, Physical Education, Coaching, Athletic Training & Health: Routledge
- Bryman, A. ve Cramer, D. (2001). *Quantitative Data Analysis With SPSS Release 10 For Windows*. London: Routledge Press.
- Budak, F. & Korkmaz, Ş. (2020). COVID-19 pandemi sürecine yönelik genel bir değerlendirme: Türkiye örneği. *Sosyal Araştırmalar ve Yönetim Dergisi*, (1), 65-66.
- Budak, S. (2000). *Psikoloji Sözlüğü*. (Birinci basım). Ankara: Bilim ve Sanat Yayınları.
- Bulut, Ç., & Duman, S. (2021). Covid-19 pandemi sürecinde gençlik ve spor il müdürlükleri çalışanlarının iş motivasyonları ve kaygı düzeylerinin incelenmesi. *Gaziantep Üniversitesi Spor Bilimleri Dergisi*, 6(2), 178-195.
- Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE., & Li F. Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. *J Sport Health Sci*. 2020; 9 (2): 104.
- Chevance, A., Gourion, D., Hoertel, N., Llorca, P. M., Thomas, P., Bocher, R., ... & Gaillard, R. (2020). Assurer les soins aux patients souffrant de troubles psychiques en France pendant l'épidémie à SARS-CoV-2. *L'Encéphale*, 46(3), 3-13.
- Cihangir, H. N., Özgider, C., Olcaş, F., & Güneşli, E. (2022). Amatör sporcuların yeni tip koronavirüse (covid-19) yakalanma kaygılarının incelenmesi (Çanakkale İli Örneği). *Çanakkale Onsekiz Mart Üniversitesi Spor Bilimleri Dergisi*, 5(2), 29-39.
- Çifçi, F. & Demir, A. (2020). Covid-19 pandemisinde Türk profesyonel futbolcuların Covid-19 korkusu ve kaygı düzeylerinin incelenmesi. *Spor ve Rekreasyon Araştırmaları Dergisi*, 2(ÖS1), 26-38.
- Çölgeçen, Y. ve Çölgeçen, H. (2020). Covid-19 Pandemisine Bağlı Yaşanan Kaygı Düzeylerinin Değerlendirilmesi: Türkiye Örneği. *Elektronik Türkçe Çalışmaları*, 15 (4).
- Demir, G. T., Cicioğlu, H. İ. & İlhan, E. L. (2020). Anxiety of catching the Novel Coronavirus (Covid-19) Scale (ACNCS): Validity and reliability study. *Journal of Human Sciences*, 17(2), 458-468.
- Erdem, İ. (2020). Koronavirüse (Covid-19) karşı Türkiye'nin karantina ve tedbir politikaları. *Electronic Turkish Studies*, 15(4), 377-388.
- Gautreau, M.C., Simon, B, Mushquash, R. A. & Sherry, S. H. (2015). Is self-critical perfectionism an antecedent of or a consequence of social anxiety, or both? A 12-month, three wave longitudinal study. *Personality and Individual Differences*, 82, 125–130.
- George. D. ve Mallery, M. (2010). *SPSS for Windows Step By Step: A Simple Guide and Reference*. (10. Baskı.) Boston: Pearson.
- Göksu, Ö. & Kumcağız, H. (2020). Covid-19 Salgınında personelde Algılanan Stres Düzeyi ve Kaygı Düzleri. *Elektronik Türkçe Çalışmaları*, 15 (4), 463-479.
- Gümüşgöl, C., Ersoy, A., & Gümüşgöl, O. (2020). Amatör ve profesyonel sporcuların yeni tip koronavirüse (covid-19) yakalanma kaygılarının incelenmesi-yönetmelik karar boyutu. *Sportif Bakış: Spor ve Eğitim Bilimleri Dergisi*, 7(2), 26-37.
- Gürer, B., Tiryaki, K. & Güzel, P. (2014). Farklı üniversitelerden düzenli olarak spor yapan öğrencilerin kaygı durumları üzerine bir araştırma. *Pamukkale Spor Bilimleri Dergisi*, 5 (3), 35-43.
- Henwood, A. F. (2020). Coronavirus disinfection in histopathology. *Journal of Histotechnology* March, 1-3, (Erişim Tarihi: 19.03.2022). <https://doi.org/10.1080/01478885.2020.1734718>

Kang, S., and Ban, J. (2020). [Daily Life Changes Due to COVID-19] Hiking Alone or in Twos. Maeil Economy. Available online at: <https://www.mk.co.kr/news/economy/view/2020/04/403067/> (Erişim tarihi 25.05.2022).

Karakaya, İ. (2012). Bilimsel araştırma yöntemleri. A. Tanrıoğen (Edt.) *Bilimsel araştırma yöntemleri*. Ankara: Anı.

Karaoğlu, N., Bulut, S., Baydar, A. ve Carelli, F. (2009). Aile hekimlerinde durumluk ve sürekli anksiyete düzeyi: Bir vaka kontrol çalışması. *Türk Aile Hek Derg*, 13(3): 119-126. <https://doi.org/10.2399/tahd.09.119>.

Kaya, M. (2021) Covid-19 (Pandemi) sürecinde sporcu etkilenimi. *Sivas Cumhuriyet Üniversitesi Spor Bilimleri Dergisi*, 2(3), 133-142.

Khosronejad, A., Santoni, C., Flora, K., Zhang, Z., Kang, S., Payabvash, S., & Sotiropoulos, F. (2020). Fluid dynamics simulations show that facial masks can suppress the spread of COVID-19 in indoor environments. *AIP Advances*, 10(12), 125109.

Kim, Y.-J., Cho, J.-H., & Park, Y.-J. (2020). Leisure sports participants' engagement in preventive health behaviors and their experience of constraints on performing leisure activities during the covid-19 pandemic. *Frontiers in Psychology*, 11, 3392.

Koçak, U. Z. & Kaya, D. Ö. (2020). Covid-19 pandemisi, spor, sporcu üçgeni: etkilenimler ve öneriler. *İzmir Kâtip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*, 5(2): 129-134.

McIntosh, K., Dees, J. H., Becker, W. B., Kapikian, A. Z., & Chanock, R. M. (1967). Recovery in tracheal organ cultures of novel viruses from patients with respiratory disease. *Proceedings of the National Academy of Sciences of the United States of America*, 57(4), 933-940.

Nieman, & Wentz. The compelling link between physical activity and the body's defense system. *J Sport Health Sci*. 2019; 8(3): 201-217.

Nieman, & Wentz. The compelling link between physical activity and the body's defense system. *J Sport Health Sci*. 2019; 8(3): 201-217.

Özgül, A., Türkmen, M., & Ayhan, B. (2021). Sporcuların Covid-19'a yakalanma kaygısı ve spora bağlılık durumları arasındaki ilişkinin incelenmesi. *Uluslararası Güncel Eğitim Araştırmaları Dergisi*, 7(1), 298-315.

Öztekin, A., Keskin, E., Açıl, H., Durak, S., Dündar, M., & Yılmaz, İ. (2021). Evaluation of anxiety levels linked to experienced coronavirus epidemic: the example of Turkey. *EVALUATION*, 28, 07.

Pett, M. A., Lackey, N. R. ve Sullivan, J. J. (2003). *Making Sense of Factor Analysis: The Use of Factor Analysis For instrument Development in Health Care Research*. CA: Sage.

T.C. Gençlik ve Spor Bakanlığı. (2020a). <https://www.gsb.gov.tr/HaberDetaylari/1/1/184694/kamuoyuna-duyuru.aspx> (Erişim Tarihi: 20.03.2022).

T.C. Sağlık Bakanlığı. (2020a). COVID-19 (SARS-CoV-2 Enfeksiyonu) Rehberi. https://covid19bilgi.saglik.gov.tr/depo/rehberler/COVID-19_Rehberi.pdf (Erişim Tarihi: 20.03.2022).

Tabachnick, B. G. ve Fidell, L. S. (2013). *Using Multivariate Statistics* (6th Ed.). Boston.

Türkmen, M. & Özsarı, A. (2020). Covid-19 salgını ve spor sektörüne etkileri. *International Journal of Sport Culture and Science*, 8(2), 55-67.

Türkemiz, H., Bayraktar, I., Çobanoğlu, H. O., & Nalbant, Ö. (2020). Spor salonlarında egzersiz yapan sporcuların yeni tip koronavirüse (covid-19) yakalanma kaygılarının incelenmesi. III. In *International Conference On Covid-19 Studies* (pp. 116-124).

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International journal of environmental research and public health*, 17(5), 1729. <https://doi.org/10.3390/ijerph17051729>.

WHO. (2020a). Q&A on coronaviruses (COVID-19). <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/q-a-coronaviruses> (Erişim Tarihi:10.03.2022).

WHO. (2020b). Coronavirus disease 2019 (COVID-19) *Situation Report – 52*. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200312-sitrep52-covid-19.pdf?sfvrsn=e2bfc9c0_4 (Erişim Tarih:10.03.2022).

Yaman, C., Koşu, S., Tel, M., Teşneli, Ö., Yalvaracı, N. & Gelen, N. (2008). Elit seviyedeki değişik spor branşlarının fiziksel benlik algısı üzerine etkisi. *Uluslararası İnsan Bilimleri Dergisi*, 5(2), 1-17.

Yüceant, M. (2013). *Beden eğitimi öğretmeni adaylarının sosyal görünüş kaygı düzeylerinin farklı değişkenler açısından incelenmesi*. Yüksek Lisans Tezi. Aksaray Üniversitesi, Sosyal Bilimler Enstitüsü, Aksaray.

796/799 (496.51) (062)

Proceedings International Conference : proceedings of the 11th UBT Annual International Conference : international Conference on Sport / edited by Edmond Hajrizi. - Prishtinë : UBT, 2022. - 68 f. : ilustr. ; 30 cm.

1. Hajrizi, Edmond

ISBN 978-9951-550-93-2

CHAPTERS:

- Computer Science and Communication Engineering
- Management, Business and Economics
- Mechatronics, System Engineering and Robotics
- Energy Efficiency Engineering
- Information Systems and Security
- Architecture – Spatial Planning
- Civil Engineering, Infrastructure and Environment
- Law
- Political Science
- Journalism, Media and Communication
- Food Science and Technology
- Pharmaceutical and Natural Sciences
- Design
- Psychology
- Education and Development
- Fashion
- Music
- Art and Digital Media
- Dentistry
- Medicine & Nursing

Lagjja Kalabria p.n KS - 10000, Prishtinë

+383 38 541 400

+383 38 542 138



www.ubt-uni.net
conferences@ubt-uni.net