



Examining the relationship between cognitive flexibility and attitudes towards artificial intelligence technologies among students studying sports sciences

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Abstract

Attitudes towards cognitive flexibility and artificial intelligence technologies may be an indicator of how much educators working in the field of sports can improve sports performance by revealing their potential to use these technologies effectively. This study aimed to examine the relationship between the attitudes of students studying in the field of sports sciences towards artificial intelligence and their cognitive flexibility. Additionally, cognitive flexibility and attitudes towards artificial intelligence technologies were examined by focusing on socio-demographic variables. Descriptive statistics method was applied. According to the research results, the attitudes towards artificial intelligence and cognitive flexibility levels of students who use technological devices more frequently during exercise and male students who exercise regularly were found to be high. Additionally, a statistically significant relationship was found between cognitive flexibility and attitude towards artificial intelligence. Positive attitudes towards artificial intelligence and levels of cognitive flexibility enable better acceptance of technological developments in the field of sports, cooperation with technological developments and the use of these technologies more effectively. Therefore, our research; It is important to be willing to invest in innovations and investments related to artificial intelligence and cognitive flexibility in the sports industry. Research results encourage applications in education, sports and technology.

Keywords: Artificial Intelligence, Cognitive Flexibility, Sports Industry, Sports Sciences

Spor bilimlerinde okuyan öğrencilerin bilişsel esneklikleri ile yapay zekâ teknolojilerine yönelik tutumları arasındaki ilişkinin incelenmesi

Öz

Bilişsel esneklik ve yapay zekâ teknolojilerine yönelik tutumlar, spor alanında çalışan eğitimcilerin bu teknolojileri etkin kullanma potansiyellerini ortaya koyarak spor performansını ne kadar geliştirebileceklerinin bir göstergesi olabilir. Bu çalışma, spor bilimleri alanında öğrenim gören öğrencilerin yapay zekâya yönelik tutumları ile bilişsel esneklikleri arasındaki ilişkiyi incelemeyi amaçlamıştır. Ayrıca sosyo-demografik değişkenlere de odaklanarak bilişsel esneklik ve yapay zekâ teknolojilerine yönelik tutum incelenmiştir. Betimsel istatistik yöntemi uygulanmıştır. Araştırma sonuçlarına göre, egzersiz sırasında teknolojik cihazları daha sık kullanan öğrencilerin ve düzenli egzersiz yapan erkek öğrencilerin yapay zekâya yönelik tutumları ve bilişsel esneklik düzeyleri yüksek bulunmuştur. Ayrıca bilişsel esneklik ile yapay zekâ tutumu arasında istatistiksel olarak anlamlı bir ilişki bulunmuştur. Yapay zekâya yönelik olumlu tutum ve bilişsel esneklik düzeyleri spor alanında teknolojik gelişmelerin daha iyi kabul edilebilmesi, teknolojik gelişmelerle iş birliği ve bu teknolojilerin daha etkin bir şekilde kullanılabilmesini sağlamaktadır. Bu nedenle araştırmamız; spor endüstrisinde yapay zekâ ile bilişsel esneklikle ilgili inovasyonlara ve yatırımlara istekli konusunda önem taşımaktadır. Araştırma sonuçları eğitim, spor ve teknoloji alanlarındaki uygulamaları teşvik etmektedir.

Anahtar Kelimeler: Yapay Zekâ, Bilişsel Esneklik, Spor Endüstrisi, Spor Bilimleri

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INTRODUCTION

The development of technology is an important factor influencing living standards in today's world. These advancements manifest themselves in various dimensions across different scientific fields and emerge as responses to the needs of our time. The interaction between scientific disciplines and sectors, as well as the reflections of technology and industrial innovations, can be observed. Consequently, industrial markets are formed in conjunction with the outcomes brought about by the supply and demand situation, with a significant portion of these markets encompassing the sports industry. The aim of this study in this field is to reveal the integrated progress of sports disciplines and the sports technologies used today over time and to highlight their tangible outcomes. Technological advancements in sports have led to significant innovation and change in fields and sports products. Smart stadiums, various systematic visuals, and sensor transmissions reflect the rapid development of sports technology. Additionally, wearable sports products and coach tracking systems have become crucial elements that distinguish sports success from mere chance. Technological advancements also aim to enhance the satisfaction of sports spectators. Real-time scores, fast network communications, and sharing platforms have emphasized the importance of simultaneously following sports activities. Currently, the integration of state-of-the-art technology with sports is observed in sports fields, coaches, athletes, and fans, and it is anticipated that this integration will continue to undergo transformation with every scientific advancement. In this manner, technological advancements in the sports industry have brought about numerous innovations to enhance the sports experience. In the future, it is expected that further technological developments and adaptations will be observed in sports fields, training processes, and fan interactions (Şentürk & Özer, 2022). Industry 5.0, which incorporates Artificial Intelligence technologies, represents the digital transformation of industries. This approach presents a model that foresees the use of digital technologies in production processes. It aims to enhance efficiency in production processes by utilizing high-tech solutions such as wireless technologies, sensors, cloud computing, and smart systems. The application of Industry 5.0 in the sports domain requires the utilization of various technologies to improve athlete performance. These technologies encompass diverse areas, ranging from data collection and analysis through sensors to monitoring athlete physiology and training programs. Implementing Industry 5.0 in the sports sector involves utilizing numerous technologies that can enhance the effectiveness of training programs and improve athlete performance. Industry 5.0 aims to enhance the diversity and efficiency of technologies used in the sports sector, providing

innovative solutions (Özsoy & Karakuş, 2023). In sports, artificial intelligence applications consist of software developed for the interpretation, analysis, and extraction of meaningful conclusions from physical, physiological, and behavioral data. Artificial intelligence, which has been continuously advancing in sports science in recent years, is utilized for individual and team sports performance prediction, determining the risk of sports injuries and injuries, talent selection and specialization, predicting match scores, and analyzing opponents (Nadikattu, 2020).

This approach can bring forth the cognitive flexibility and innovative thinking potential of sports science students. By effectively utilizing artificial intelligence technologies associated with Industry 5.0, sports science students can generate alternative solutions to improve athlete performance. Furthermore, the application of Industry 5.0 in the sports field emphasizes the necessity of cognitive flexibility in processes such as collecting and analyzing athlete data and optimizing training programs. In this context, cognitive flexibility emerges as a crucial competency for the successful implementation of Industry 5.0 in the sports sector.

Cognitive flexibility can be defined as the ability to approach tasks with a different perspective or the capacity to change one's existing thought patterns (Cox, 1980; Asıcı & İkiz, 2015; Dennis & Wal, 2010). Cognitive flexibility enables individuals to recognize that they have different options when faced with situations in life, evaluate these options, modify their initial thoughts if necessary, and act in accordance with the chosen alternative. Cognitive flexibility is commonly associated with cognitive behavioral therapies and supports more effective coping with difficult situations (Arslan & Türk, 2022).

According to Stevens (2009), cognitive flexibility is defined as the potential of an individual to adapt to specific conditions, transition from one thought to another, and approach a problem with various methods. This definition emphasizes the individual's ability to adapt to different situations, exhibit cognitive flexibility, and utilize diverse approaches when faced with a problem. Martin and Anderson (1998) state that cognitive flexibility encompasses three fundamental elements. These elements include the individual's awareness of alternative paths and options, willingness to be flexible and adapt to situations, and self-efficacy or belief in the ability to be flexible. On the other hand, Dennis and Wal (2010) describe cognitive flexibility as the ability of an individual to modify their thoughts according to changing environmental conditions.

Cognitive flexibility can be defined as the ability of an individual to change their approach or thinking method towards a task or situation. Individuals with high cognitive flexibility can easily and spontaneously adapt to changes, while those with low cognitive flexibility may struggle to cope with changes (Cox, 1980). An individual with cognitive flexibility can evaluate options with awareness, effectively cope with new and challenging situations, generate alternative thoughts and ideas, and demonstrate competence in adapting to new circumstances. Cognitive flexibility encompasses important attributes such as being mentally open, having the ability to adapt to change, and the capacity to generate innovative solutions (Altunkol, 2011; Bilgin, 2009; Martin & Rubin, 1995; Stahl & Pry, 2005). In today's world, meeting customer expectations and needs is a crucial concern. Organizations must keep up with technological advancements and develop innovative products and services in the sports industry that can meet customer demands in the market. Digitalization, in conjunction with technological developments, has led to changes in customer expectations and needs for products and services (Karaçuha & Pado, 2018). Sports consumption is evolving significantly due to the impact of digital innovations on sports viewing and other fan-related behaviors. These digital innovations are seamlessly integrated into various touchpoints throughout the sports customer journey, bridging the gap between matches and seasons and influencing multiple stakeholders, including teams, players, broadcasters, and business partners. In summary, digital innovations are revolutionizing the sports industry, connecting various stakeholders and enhancing the overall sports experience for fans and participants alike (Inversini et al., 2016).

This study aims to investigate the relationship between cognitive flexibility and attitudes towards artificial intelligence (AI) among undergraduate students in sports sciences. Students studying sports sciences are future professionals who will actively participate in the sports industry. Their cognitive flexibility and attitudes towards AI can significantly influence their future careers. AI technologies play a significant role in areas such as analyzing sports performance, optimizing training programs, and developing team strategies. Therefore, the cognitive flexibility levels and attitudes towards AI of sports science students can reflect their ability to effectively use these technologies and their tendency to accept them. Innovation and competitive advantage: Cognitive flexibility entails the ability to think innovatively and approach problems from different perspectives. AI technologies are rapidly advancing in the sports industry, requiring professionals who think innovatively. Sports science students with high cognitive flexibility can effectively utilize AI technologies, generate alternative solutions, and gain a competitive advantage. Hence, exploring the relationship between cognitive

flexibility and attitudes towards AI is crucial for understanding the innovation potential and competitive advantages of sports science students. The integration of digitalization and artificial intelligence technologies into the sports experience can potentially alter the experiences of sports consumers. Considering that cognitive flexibility might be a significant concept in understanding sports consumers' adaptation processes to new technologies and digitalization, this research aims to examine the relationship between attitudes towards artificial intelligence and cognitive flexibility in sports consumers. Furthermore, to identify the factors influencing sports consumers' attitudes towards artificial intelligence and cognitive flexibility, the effects of exposure to digitalization and exercise frequency were examined. The study investigated whether there were any differences in attitudes towards artificial intelligence technologies and cognitive flexibility based on the frequency of using technological devices during sports activities, gender, e-sports consumer status, and exercise frequency. Cognitive flexibility is closely related to the ability to think innovatively. Innovation in the development and application processes of artificial intelligence technologies can accelerate the progress of these technologies. Cognitive flexibility is critical in terms of generating new ideas and implementing them. This research can contribute to identifying the deficiencies in sports science students in terms of artificial intelligence and cognitive flexibility and help develop educational programs to address these deficiencies. This, in turn, helps students enter the future job market more prepared and equipped. Furthermore, it enables sports science students to better understand how they can use artificial intelligence technologies to enhance sports performance, offering valuable contributions to the sports industry. The research findings can facilitate the commencement of a significant transformation in sports science education.

METHOD

Research group (population-sample)

Within the Marmara region, a sample consisting of 111 female and 294 male undergraduate students studying sports sciences in Istanbul Province was selected using convenience sampling method Marmara University from public universities were included in the research sample.

Convenience sampling is a sampling technique in which easily accessible individuals are used to collect data. In this method, individuals who are readily available and easily accessible are selected without using probability-based sampling. Data is collected from individuals who are convenient to reach for the purpose of data collection (Coşkun et al., 2017).

Data collection tools

In order to determine the attitudes of sports consumers towards artificial intelligence, The scale developed by Schepman and Rodway (2020), the Turkish translated version of the 'General Attitude towards Artificial Intelligence Scale' adapted by Kaya et al. (2022), which has been validated and demonstrated reliability. The attitude scale towards artificial intelligence consists of two subscales: "positive attitudes towards artificial intelligence" and 'negative attitudes towards artificial intelligence". Positive attitudes towards artificial intelligence are obtained by summing the items 1 to 12. Negative attitudes towards artificial intelligence are obtained by reverse-scoring and summing the items 13 to 20. The scale consists of 20 items in total. It is a 5-point Likert type scale.

The scale developed by Dennis and Wal (2010) The "Cognitive Flexibility Inventory (CFI)" adapted to Turkish by Sapmaz and Doğan (2013) were administered. The cognitive flexibility inventory consists of two subscales: "Alternatives" and "Control." On scale; 1.,3.,5.,6.,8.,10.,12.,13.,14.,16.,18.,19.,20. items, alternatives dimension, 2.,4.,7.,9.,11.,15.,17. The items constitute the control group. It is a 5-point Likert type scale. High scores indicate higher levels of cognitive flexibility. Individuals with high cognitive flexibility tend to possess characteristics such as high self-efficacy, the ability to make decisions independently, the capability to consider events from different perspectives, internal locus of control, lower levels of depression, and a more optimistic outlook.

Data collection/processing method

The data was collected from university students through an online link (Google Forms). I The data were collected online after obtaining approval from the ethics committee. n the data collection process, an informed consent form was added to the questionnaire description. Participants were informed that, in order to achieve the objectives of the study, they are expected to respond to all questions accurately and sincerely, without any pressure or coercion from others, and that their personal information will be kept confidential. The forms were tested by researchers before being distributed to participants. The online form consists of three different pages. It was clearly stated in the form accessed through the participation link that the data would be used solely for scientific purposes. Access to the existing data was obtained through the voluntary participation of university students.

Data analysis

The obtained data were analyzed using SPSS 29.0.1.0 (171) program. The participants' demographic information was evaluated using descriptive statistical methods. Reliability analyses were conducted by examining the Cronbach's Alpha coefficient values for the Attitude Scale towards Artificial Intelligence and Cognitive Flexibility Inventory. According to the results obtained in the research, it has been determined that the Cronbach's Alpha coefficient for the Attitude Scale towards Artificial Intelligence is 0.852 and for the Cognitive Flexibility Inventory, it is 0.888, indicating satisfactory internal consistency.

Skewness and Kurtosis values were checked for normality test. It was observed that the skewness value varied between -1.106 and 0.126, and the Kurtosis value varied between 0.485 and 0.242. It is considered a normal distribution when the Kurtosis and Skewness values are -1.5 to +1.5 (Tabachnick and Fidell, 2013). Based on these findings, it is stated that the scales are valid and reliable measurement tools within the scope of the study. Afterwards, a normality test was applied. Non-parametric test techniques were used to test measurements that did not satisfy the assumption of normal distribution. In the study, Independent Samples Mann-Whitney U Test, Kruskal Wallis Test and Pearson Correlation Test were applied, and the findings were interpreted. The research hypotheses are as follows:

H₁: There is a significant difference in attitudes towards artificial intelligence based on the gender of students studying sports sciences.

H₂: There is a significant difference in cognitive flexibility among students studying sports sciences based on their gender.

H₃: There is a significant difference in the attitudes towards artificial intelligence based on the frequency of using technological devices during sports among sports science students.

H₄: There is a significant difference in cognitive flexibility based on the frequency of using technological devices during sports among sports science students.

H₅: There is a significant difference in the attitudes towards artificial intelligence among students studying sports sciences based on being e-sports consumers.

H₆: There is a significant difference in cognitive flexibility among students studying sports sciences based on being e-sports consumers.

H₇: There is a significant difference in attitudes towards artificial intelligence among students studying sports sciences based on exercise frequency.

H₈: There is a significant difference in cognitive flexibility among students studying sports sciences based on exercise frequency.

H₉: There is a relationship between attitudes towards artificial intelligence and cognitive flexibility.

FINDINGS

Table 1. The analysis of hypotheses based on gender

	AI Mean	CF Mean
Mann-Whitney U	11734.000	11734.000
Wilcoxon W	17950.000	17950.000
Z	-4376	-4.376
Asymp. Sig. (2-tailed)	0.000	0.000

*=p<0.05

The research hypothesis, “There is a significant difference in attitudes towards artificial intelligence based on the gender of students studying sports sciences” was accepted (p<0.05). The Mann-Whitney U Test results indicated that males had higher attitude scores towards artificial intelligence compared to females and the other research hypothesis, “There is a significant difference in cognitive flexibility among students studying sports sciences based on their gender,” was accepted. The results of the Mann-Whitney U Test indicated that males had higher cognitive flexibility scores compared to females (p<0.05). According to the averages where the difference arises, the difference in the gender variable is observed in the mean scores, where men have an average score of 218.59, while women have an average score of 161.71. H₁ and H₂ were accepted.

Table 2. The analysis of hypotheses based on frequency of using technological devices while doing sports

	AI Mean	CF Mean
Chi-Square	43.774	43.774
df	2	2
Asymp. Sig.	0.000	0.000
Asymp. Sig. (2-tailed)	0.000	0.000

*=p<0.05

The hypotheses of the study, “There is a significant difference in the attitudes towards artificial intelligence based on the frequency of using technological devices during sports among sports science students” and “There is a significant difference in cognitive flexibility based on the frequency of using technological devices during sports among sports science students” were accepted. The results of the Kruskal-Wallis Test revealed that individuals who use technological devices during sports had higher attitudes towards artificial intelligence and cognitive flexibility scores. According to the averages where the difference arises, it shows the

different rankings of responses to the question "How often do you use technological devices while exercising? (e.g., using a smartwatch to count steps)" for the "AI Mean" and "CF Mean" groups.

For the "AI Mean" group, the respondents who answered "I don't use it" have a mean rank of 166.65, those who answered "I use it rarely" have a mean rank of 194.27, and those who answered "I use it frequently" have a mean rank of 273.27. Similarly, for the "CF Mean" group, respondents who answered "I don't use it" have a mean rank of 166.65, those who answered "I use it rarely" have a mean rank of 194.27, and those who answered "I use it frequently" have a mean rank of 273.27.

According to this data, it indicates that those who responded with "I don't use it" have a lower mean rank, indicating that they use technological devices less frequently while exercising. On the other hand, those who responded with "I use it frequently" have a higher mean rank, suggesting that they use technological devices more often while exercising. Those who answered "I use it rarely" fall in between the two groups. These results show that the frequency of using technological devices while exercising can vary among different groups, and this data can be used for further analysis to understand the differences between the groups and conduct additional research on this topic. H₃ and H₄ were accepted.

Table 3. The analysis of hypotheses based on e-sport consumer

	AI Mean	CF Mean
Mann-Whitney U	18889.500	18889.500
Wilcoxon W	34114.500	34114.500
Z	-1.039	-1.039
Asymp. Sig. (2-tailed)	0.299	0.299

*=p>0.05

The hypotheses of the research, "There is a significant difference in the attitudes towards artificial intelligence among students studying sports sciences based on being e-sports consumers" and "There is a significant difference in cognitive flexibility among students studying sports sciences based on being e-sports consumers," have been rejected (p>0.05). The Mann-Whitney U test conducted on the sample in this study revealed that there is no significant difference between being an e-sports consumer and attitudes towards artificial intelligence or cognitive flexibility. H₅ and H₆ were rejected.

Table 4. The analysis of hypotheses based on frequency of exercise

	AI Mean	CF Mean
Mann-Whitney U	10864.500	10864.500
Wilcoxon W	14780.500	14780.500
Z	-3.184	-3.184
Asymp. Sig. (2-tailed)	0.001	0.001

*= $p < 0.05$

The hypotheses of the research, "There is a significant difference in attitudes towards artificial intelligence among students studying sports sciences based on exercise frequency" and "There is a significant difference in cognitive flexibility among students studying sports sciences based on exercise frequency," have been accepted ($p < 0.05$). The Mann-Whitney U test results indicated that individuals who exercise more frequently have higher attitudes towards artificial intelligence and cognitive flexibility scores compared to those who exercise less frequently. According to the averages where the difference arises; it demonstrates the different rankings of responses to the question "How often do you exercise?" for the "AI Mean" and "CF Mean" groups. For the "AI Mean" group, those who answered "Once a day" have a mean rank of 212.73, and those who answered "Several times a week" have a mean rank of 167.96.

Similarly, for the "CF Mean" group, those who answered "Once a day" have a mean rank of 212.73, and those who answered "Several times a week" have a mean rank of 167.96.

Based on this data, it appears that there is no significant difference in terms of ranking averages between those who answered "Once a day" and those who answered "Several times a week" regarding the question about "Exercise Frequency. In conclusion, based on this data, it can be said that the two response options for "Exercise Frequency" were similarly ranked within both the "AI Mean" and "CF Mean" groups. Both groups show similar tendencies in terms of exercise frequency. H_7 and H_8 were accepted.

Table 5. Results of the correlation test between attitudes towards artificial intelligence and cognitive flexibility

	Correlations	AI Mean	CF Mean
AI MEAN	Pearson Correlation	1	1.000***
	Sig. (2-tailed)		0.000
	N	405	405
CF MEAN	Pearson Correlation	1.000***	1
	Sig. (2-tailed)	0.000	
	N	405	405

**, Correlation is significant at the 0.01 level (2-tailed).

*= $p < 0.01$

There is a strong positive correlation between AI Mean and CF Mean, with a Pearson correlation coefficient of 1.000 ($p < 0.01$). This indicates a perfect positive relationship between the two variables. The correlation is statistically significant at the 0.01 level (2-tailed).

These findings suggest that individuals with higher attitudes towards artificial intelligence also tend to exhibit higher levels of cognitive flexibility. It indicates that as attitudes towards artificial intelligence increase, cognitive flexibility also increases. This result supports the hypothesis that there is a significant positive relationship between attitudes towards artificial intelligence and cognitive flexibility. The research hypothesis stating that "H₉: There is a relationship between attitudes towards artificial intelligence and cognitive flexibility" has been accepted. Overall, this study provides evidence of an association between attitudes towards artificial intelligence and cognitive flexibility among the participants in the study.

DISCUSSION AND CONCLUSION

The widespread use and adoption of technological applications in today's world significantly contribute to the development of the sports industry (McCarthy, 2007). Sports consumption is undergoing a significant transformation due to the influence of digital innovations, which are shaping sports viewing and other fan-related behaviors. These digital innovations are seamlessly integrated into various stages of the sports customer journey, bridging the gap between matches and seasons, and impacting a wide range of stakeholders, including teams, players, broadcasters, and business partners. In summary, digital innovations play a pivotal role in connecting and influencing various entities within the sports industry, thereby enhancing the overall sports experience for fans and stakeholders alike (Tosun Tunç & Sevilmiş, 2019). The rise of artificial intelligence in everyday life promises various opportunities (Hamet & Tremblay, 2017). In addition to these opportunities, there are also prejudices or negative attitudes towards these technologies (Sánchez Nicolás, 2019; Cellan-Jones, 2014; Gibbs, 2014). In recent years, significant advancements have been made in artificial intelligence (AI) technologies. While many people welcome the increasing use of AI products in their daily lives and appreciate the advantages they offer, some individuals express skepticism and concerns about the emerging impact of AI products. It is necessary to introduce a valid and concise measure to assess the individual variations in these attitudes. The aim of this study was to enable future research on human-AI interaction (Sindermann et al., 2021). AI-based products can assist athletes in analyzing their performance and optimizing their training. These products, such as smart sports devices and wearable technologies, help athletes identify their strengths and weaknesses, enabling them to improve their performance and achieve their

goals (Özsoy & Karakuş, 2023). However, some individuals may be skeptical or concerned about the increased presence of AI products in sports experiences. These concerns primarily revolve around the diminishing human influence and the fear of machines replacing humans. Nevertheless, when artificial intelligence technologies are used to support and empower humans, they can enrich the sports experience. AI can provide athletes and spectators with more data and information, enabling individuals to make better decisions and enhancing the enjoyment of the sports experience. Therefore, rather than completely eliminating the human factor, AI technologies can be utilized as tools that contribute to the development of sports.

Assuming that cognitive flexibility, which is the ability to coordinate and switch fluidly between different concepts or activities, is important in relation to concerns about new technologies (Dajani & Uddin, 2015). With the notion that cognitive flexibility is an ability associated with fluid intelligence, enabling the generation of different solutions in diverse situations (Çuhadaroğlu, 2013; Silver et al., 2004), it is believed to hold significance in attitudes towards emerging artificial intelligence technologies; this study examines the relationship between attitudes towards artificial intelligence and cognitive flexibility.

Firstly, positive attitudes towards artificial intelligence indicate that students are more open-minded and receptive to new ideas and technologies. This suggests that they have a greater willingness to explore and engage in different cognitive tasks and perspectives, thereby enhancing their cognitive flexibility. Secondly, attitudes towards artificial intelligence may reflect students' interest and engagement in technology-related fields. Students with a greater affinity for technology may actively seek opportunities to improve their cognitive flexibility through various activities and experiences, including interacting with artificial intelligence. Additionally, it should be considered that the relationship between attitudes towards artificial intelligence and cognitive flexibility may be bidirectional. Students with higher cognitive flexibility may have a better understanding and appreciation of the potential benefits and applications of artificial intelligence, contributing to the development of more positive attitudes. The results suggest that there is a significant difference in attitudes towards artificial intelligence and cognitive flexibility based on the gender of students studying sports sciences. Males in this study had higher attitude scores towards artificial intelligence and higher cognitive flexibility scores compared to females. Several factors may contribute to these findings. It is possible that societal norms and cultural influences shape individuals' attitudes and cognitive abilities differently based on gender. Additionally, personal interests, experiences, and exposure to technological advancements may also play a role in shaping attitudes towards

artificial intelligence and cognitive flexibility. In addition, the results suggest that there is a significant difference in attitudes towards artificial intelligence and cognitive flexibility based on the frequency of using technological devices during sports among sports science students. Individuals who reported using technological devices during sports had higher attitudes towards artificial intelligence and higher cognitive flexibility scores. Several factors may contribute to these findings. Firstly, the use of technological devices during sports may indicate a higher level of engagement and familiarity with technology, which could influence individuals' attitudes towards artificial intelligence. Those who frequently use technological devices may have more exposure to and experience with AI-related technologies, leading to more positive attitudes. Secondly, the use of technological devices during sports may also indicate a higher level of cognitive flexibility. Engaging with technology during physical activities may require individuals to multitask, adapt to new technologies, and quickly switch between different cognitive tasks. This could potentially enhance their cognitive flexibility skills. Furthermore, it is possible that individuals who use technological devices during sports are more inclined to embrace innovation and technological advancements, which can positively influence their attitudes towards artificial intelligence. Furthermore, the results indicate that there is no significant difference in attitudes towards artificial intelligence or cognitive flexibility among students studying sports sciences based on their status as e-sports consumers. There could be reasons the sample used in the study might not have included a diverse range of e-sports consumers. The participants might have had similar levels of exposure and engagement with e-sports, which could have contributed to the lack of significant differences in attitudes and cognitive flexibility. Overall, the findings support the hypothesis of a significant and positive relationship between attitudes towards artificial intelligence and cognitive flexibility. However, it is important to note that the results of this study are based on a specific sample and methodology. Therefore, further research is needed to better understand the underlying mechanisms and the generalizability of these findings in different populations and contexts.

The conducted literature review indicates that cognitive flexibility, which is an important concept in the field of mental health, has been extensively studied in relation to various other concepts in separate studies (Aslan & Türk, 2022). Furthermore, the utilization of Artificial Intelligence (AI) technology is rapidly expanding, permeating numerous domains in people's daily lives, encompassing both personal and professional spheres (Luan et al., 2020; Makridakis, 2017; Olhede & Wolfe, 2018; Stephanidis et al., 2019). Indeed, according to a study conducted by Reinhart (2018), 85% of the American population is reported to use at least

one AI-powered technology. This data indicates the widespread usage of artificial intelligence and the increasing acceptance of technology by society.

However, a single study focusing on both cognitive flexibility and attitude towards artificial intelligence, examining their similarities and differences in detail, has not been found.

People's general attitudes towards artificial intelligence (AI) play a significant role in the process of its acceptance (Schepman & Rodway, 2020). While people have hopes for artificial intelligence, they also have concerns regarding this technology (Rhee & Rhee, 2019). This finding can be associated with the concept of cognitive flexibility, highlighting the importance of adapting to artificial intelligence technologies and coping with changing conditions. Therefore, further research on the impact of cognitive flexibility abilities on hopes and concerns related to AI technologies is important. Investigating the influence of cognitive flexibility on individuals' ability to adapt to and embrace AI technologies, as well as their ability to manage and alleviate concerns, would provide valuable insights. Therefore, it is crucial to conduct more research to explore the role of cognitive flexibility in shaping attitudes and responses towards AI technologies.

In the relevant literature on this subject, the importance of technology in sports has been recognized, as the increasing needs, development, and innovation in the evolving world have also led to a growing demand for technology. It is widely acknowledged that sports science has a positive impact not only on athletes but also on individuals and societies who follow sports competitions. In this context, the aforementioned studies indicate that both development and technology in sports are of utmost importance, not only for the progress of athletes but also for the advancement of sports science and the interest of sports enthusiasts (Şentürk & Özer, 2022).

The findings of this study demonstrate a significant relationship between the attitudes towards artificial intelligence and cognitive flexibility of sports science students. Furthermore, individuals who use technological devices more frequently during exercise and engage in regular exercise have higher attitudes towards artificial intelligence and levels of cognitive flexibility. These results provide valuable insights into the potential of sports consumers to effectively utilize artificial intelligence technologies and improve their sports performance.

Recommendations

Based on these findings, the following recommendations are provided to enhance the skills and attitudes of sports science students:

- Awareness programs: Education and awareness programs should be organized to raise awareness among sports science students about the use of artificial intelligence technologies in the field of sports. These programs should emphasize the potential benefits of artificial intelligence technologies and how they can enhance sports performance.
- Cognitive flexibility training: Training programs should be developed to improve cognitive flexibility. These programs should focus on developing problem-solving skills, exploring alternative perspectives, and promoting flexible thinking strategies. This will enable sports science students to effectively utilize artificial intelligence technologies and enhance their sports performance.
- Enhancing access to technology: Opportunities for sports science students to interact with and experience artificial intelligence technologies should be increased. This can be achieved through access to laboratory environments, internship programs, or technology-focused projects.
- Promoting research and innovation: Encouraging students to engage in research and innovation activities in the field of artificial intelligence and sports is important. This will enable students to stay updated with technological advancements, generate new ideas, and develop applications, thereby enhancing their skills and knowledge.

It is important to implement these recommendations to improve the skills and attitudes of sports science students in utilizing artificial intelligence technologies, which can contribute to achieving better results in sports management and coaching.

GENİŞLETİLMİŞ ÖZET

GİRİŞ

Teknolojinin gelişimi, bugünün dünyasında yaşam standartlarını etkileyen önemli bir faktördür. Bu ilerlemeler, farklı bilimsel alanlarda çeşitli boyutlarda kendini gösterir ve zamanımızın ihtiyaçlarına cevap olarak ortaya çıkar. Bilimsel disiplinler ve sektörler arasındaki etkileşimlerin yanı sıra teknoloji ve endüstri yeniliklerinin yansımaları gözlemlenebilir. Bu bağlamda, tedarik ve talep durumuyla getirilen sonuçlarla birlikte endüstriyel pazarlar oluşur ve bu pazarların önemli bir bölümü spor endüstrisini kapsamaktadır (Şentürk & Özer, 2022). Yapay Zeka teknolojilerini içeren Endüstri 5.0, endüstrilerin dijital dönüşümünü temsil etmektedir. Bu yaklaşım, üretim süreçlerinde dijital teknolojilerin kullanımını öngören bir model sunar. Kablosuz teknolojiler, sensörler, bulut bilişim ve akıllı sistemler gibi yüksek teknoloji çözümlerini kullanarak üretim süreçlerinde verimliliği artırmayı hedefler. Endüstri 5.0'ın spor alanında uygulanması, sporcu performansını iyileştirmek için çeşitli teknolojilerin kullanılmasını gerektirir. Bu teknolojiler sporcu verilerinin toplanması ve analizinden

sporcu fizyolojisinin ve eğitim programlarının izlenmesine kadar farklı alanları kapsamaktadır. Spor sektöründe Endüstri 5.0'ın uygulanması, eğitim programlarının etkinliğini artıracak birçok teknolojinin kullanımını içerir, yenilikçi çözümler sunmaktadır (Özsoy & Karakuş, 2023). Sporda yapay zekâ uygulamaları fiziksel, fizyolojik ve davranışsal verilerin yorumlanması, analizi ve anlamlı sonuçların çıkarılması için geliştirilen yazılımları içerir. Yapay zekâ, son yıllarda spor biliminde sürekli olarak ilerlemektedir ve bireysel ve takım sporları performans tahmini, spor yaralanmalarının ve risklerinin belirlenmesi, yetenek seçimi ve uzmanlaşma, maç skorlarının tahmini ve rakiplerin analizi gibi alanlarda kullanılır (Nadikattu, 2020). Bu yaklaşım, spor bilim öğrencilerinin bilişsel esneklik ve yenilikçi düşünme potansiyelini ortaya çıkarabilir. Endüstri 5.0 ile ilişkilendirilen yapay zeka teknolojilerini etkin bir şekilde kullanarak, spor bilim öğrencileri sporcu performansını iyileştirmek için alternatif çözümler üretebilirler. Bilişsel esneklik, zihinsel olarak açık olma, değişime uyum sağlama yeteneği ve yenilikçi çözümler üretebilme kapasitesi gibi önemli özellikleri içerir (Altunkol, 2011; Bilgin, 2009; Martin & Rubin, 1995; Stahl & Pry, 2005).

Bu çalışma, spor bilimleri lisans öğrencileri arasındaki bilişsel esneklik ile yapay zeka (AI) konusundaki tutumlar arasındaki ilişkiyi incelemeyi amaçlamaktadır. Bilişsel esnekliğin, spor tüketicilerinin yeni teknolojilere ve dijitalleşmeye uyum süreçlerini anlama açısından önemli bir kavram olabileceği göz önüne alındığında, bu araştırma spor tüketicilerinin yapay zeka tutumları ile bilişsel esneklik arasındaki ilişkiyi incelemek amaçlanmıştır. Ayrıca, spor tüketicilerinin yapay zekâ teknolojilerine karşı tutumları ve bilişsel esnekliklerini etkileyen faktörleri belirlemek için dijitalleşme ve egzersiz sıklığına maruz kalmanın etkileri incelenmiştir. Çalışmada, spor etkinliklerinde teknolojik cihazları ne sıklıkta kullandıklarına, cinsiyetlerine, e-spor tüketici durumlarına ve egzersiz sıklığına göre yapay zekâ teknolojilerine karşı tutumlar ve bilişsel esneklik konusundaki farklılıkları incelenmiştir.

YÖNTEM

Spor bilimlerinde öğrenim gören toplam 405 lisans öğrencisi araştırma grubunu oluşturmuştur. Elde edilen veriler SPSS 29.0.1.0 (171) programı kullanılarak analiz edilmiştir. Katılımcıların demografik bilgileri tanımlayıcı istatistiksel yöntemler kullanılarak değerlendirilmiştir. Yapay Zekâya Yönelik Tutum Ölçeği ve Bilişsel Esneklik Envanteri için Cronbach's Alpha katsayı değerleri incelenerek güvenilirlik analizleri yapılmıştır. Çalışmada Bağımsız Örneklem Mann-Whitney U Testi, Kruskal Wallis Testi ve Pearson Korelasyon Testi uygulanmış ve bulgular yorumlanmıştır.

BULGULAR

Araştırma sonuçlarına göre, egzersiz sırasında teknolojik cihazları daha sık kullanan öğrencilerin ve düzenli egzersiz yapan erkek öğrencilerin yapay zekâya yönelik tutumları ve bilişsel esneklik düzeyleri diğer öğrencilere göre daha yüksek bulunmuştur. Ayrıca egzersiz sırasında teknolojik cihazları sıklıkla kullanan ve düzenli egzersiz yapan bireylerin yapay zekâ ve bilişsel esnekliğe yönelik tutumlarının daha yüksek olduğu görülmüştür. Ayrıca bilişsel esneklik ile yapay zekâ tutumu arasında

istatistiksel olarak anlamlı bir ilişki bulunmuştur. Elde edilen bulgular ışığında spor eğitimi alan öğrencilerin bu alanlardaki beceri ve tutumlarını geliştirmeye yönelik öneriler sunulmuştur.

TARTIŞMA VE SONUÇ

Günümüz dünyasında teknolojik uygulamaların yaygın kullanımı ve benimsenmesi, spor endüstrisinin gelişimine önemli katkılarda bulunmaktadır (McCarthy, 2007). Dijital yeniliklerin etkisi nedeniyle spor tüketimi, spor izleme ve diğer taraftarla ilgili davranışları şekillendiren dijital yeniliklerin etkisi nedeniyle önemli bir dönüşüm geçiriyor. Bu dijital yenilikler, spor müşteri yolculuğunun çeşitli aşamalarına sorunsuz bir şekilde entegre edilir, maçlar ve sezonlar arasındaki boşluğu kapatır ve takımlar, oyuncular, yayıncılar ve iş ortakları da dahil olmak üzere geniş bir paydaş yelpazesini etkiler. Özetlemek gerekirse, dijital yenilikler, spor endüstrisi içinde çeşitli unsurları birleştirme ve etkileme konusunda kilit bir rol oynar, bu da taraftarlar ve paydaşlar için genel spor deneyimini artırır (Tosun Tunç & Sevilmiş, 2019). Spor endüstrisinde yapay zeka ve bilişsel esneklikle ilgili inovasyonlara ve yatırımlara açık olma konusunun önem taşıdığı görülmektedir. Bu sonuçlar, özellikle öğrenciler arasındaki yapay zeka ilgisi ve bilişsel esneklik düzeyi konusunda farkındalık yaratma fırsatı sunmaktadır. Eğitim kurumları öğrencilere yapay zekânın önemini ve uygulamalarını daha iyi anlatmak için çeşitli eğitim programları düzenleyebilirler. Araştırma sonuçları eğitim, spor ve teknoloji alanlarında birçok olumlu uygulamayı teşvik edebilir. Bu alandaki farkındalık ve iş birliği, öğrencilerin ve toplumun genel refahını artırabilir.

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KATKI ORANI CONTRIBUTION RATE	AÇIKLAMA EXPLANATION	KATKIDA BULUNANLAR CONTRIBUTORS
Fikir ve Kavramsal Örgü <i>Idea or Notion</i>	Araştırma hipotezini veya fikrini oluşturmak <i>Form the research hypothesis or idea</i>	Damla ÖZSOY
Tasarım <i>Design</i>	Yöntem ve araştırma desenini tasarlamak <i>To design the method and research design.</i>	Damla ÖZSOY Ozan KARAKUŞ
Literatür Tarama <i>Literature Review</i>	Çalışma için gerekli literatürü taramak <i>Review the literature required for the study</i>	Damla ÖZSOY Ozan KARAKUŞ
Veri Toplama ve İşleme <i>Data Collecting and Processing</i>	Verileri toplamak, düzenlemek ve raporlaştırmak <i>Collecting, organizing and reporting data</i>	Damla ÖZSOY Ozan KARAKUŞ
Tartışma ve Yorum <i>Discussion and Commentary</i>	Elde edilen bulguların değerlendirilmesi <i>Evaluation of the obtained finding</i>	Damla ÖZSOY Ozan KARAKUŞ

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Etik Kurul Beyanı/ *Statement of Ethics Committee*

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