2024, Retos, 56, 615-622

Exploring the Digital Frontier in Sports Training: Coach's Perspectives, Influential Factors, and Case Study in Indonesia

Explorando la frontera digital en el entrenamiento deportivo: perspectivas del entrenador, factores influyentes y estudio de caso en Indonesia

I Dewa Made Aryananda Wijaya Kusuma, Bayu Agung Pramono, Fifit Yeti Wulandari, Muhammad Kharis Fajar, Rachman Widohardhono, Abdul Hafidz, Muchamad Arif Al Ardha
Universitas Negeri Surabaya (Indonesia)

Abstract. This study aims to determine the perception of coaches in the entry of digitalization of sports and the effect of gender, age, region, educational background, and training experience on the perception of the entry of digitalization of sports. This research is a quantitative research with a cross-sectional survey method. The data collection instrument uses a questionnaire that has been tested for validity and reliability using the corrected item-total correlation test and the Cronbach'Alpha test. Percentage analysis was used to determine the coach's perception, while ordinal regression was used to determine the effect of the independent variable on the dependent variable. The study results found that 39.9% of coaches agreed, and 39.4% strongly agreed with digital technology in sports. Two independent variable indicators influence coaches' perception of the inclusion of digitalization in the world of sports: the level of education and training experience. This study concludes that it is essential to develop the digitalization of training programs; this is related to the convenience of coaches and athletes in monitoring the development of student-athlete training programs.
Keywords: digital, training program, coach's perception

Resumen. Este estudio tiene como objetivo determinar la percepción de los entrenadores sobre la entrada de la digitalización de los deportes y el efecto del género, la edad, la región, la formación académica y la experiencia formativa sobre la percepción de la entrada de la digitalización de los deportes. Esta investigación es una investigación cuantitativa con un método de encuesta transversal. El instrumento de recolección de datos utiliza un cuestionario cuya validez y confiabilidad se han probado mediante la prueba de correlación ítem-total corregida y la prueba Alfa de Cronbach. Se utilizó análisis porcentual para determinar la percepción del entrenador, mientras que se utilizó regresión ordinal para determinar el efecto de la variable independiente sobre la variable dependiente. Los resultados del estudio encontraron que el 39.9% de los entrenadores estaban de acuerdo y el 39.4% estaban muy de acuerdo con la tecnología digital en los deportes. Dos indicadores variables independientes influyen en la percepción de los entrenadores sobre la inclusión de la digitalización en el mundo del deporte: el nivel de educación y la experiencia formativa. Este estudio concluye que es fundamental desarrollar la digitalización de los programas formativos; esto está relacionado con la conveniencia de los entrenadores y atletas de monitorear el desarrollo de los programas de entrenamiento de estudiantes-atletas.
Palabras clave: digital, programa de formación, percepción del entrenador.

Fecha recepción: 27-02-24. Fecha de aceptación: 20-04-24
I Dewa Made Aryananda Wijaya Kusuma
dewawijaya@unesa.ac.id

Introduction

The rapid development of technology has penetrated various fields, including sports. Overall, fitness technology has the potential to have a significantly impact on public health, research, and policy (Sullivan & Lachman, 2017). Sports applications can also enhance student engagement and motivation in sports activities (Martin et al., 2015). Moreover, due to the impact of COVID-19, there is a specific demand in the world of sports for a transformation towards digitalization (Glebova et al., 2022). Numerous software and hardware solutions have been developed to facilitate fitness and sports activities more easily. Some of the most popular were created about ten years ago (e.g., Strava, Endomondo, Fitbit, Runkeeper, Runtastic, MapMyRun), and since then, have led to significant changes in workout routines (Barratt, 2017). This digitalization of physical activity allows athletes, as well as amateur athletes, to increase motivation and plan their physical activity sessions such as setting goals, measuring and recording activity, real-time monitoring, sharing data on each session, monitoring the achievements of others, earning incentives and rewards, and giving and receiving feedback (Lehra et al., 2022; Soulé et al., 2022). Digital applications have also proven to be much more accurate in measurements by Biswas et al. (2022) and Rosendahl et al. (2022), making them suitable for enhancing sports performance.

Achievement sports require a long-term process with a planned training program. The training program is a plan of stages arranged systematically to achieve the highest level of performance. It also serves as a binding guideline in writing that contains the necessary steps to achieve the set goals. The training program aims to ensure that the training runs optimally, the process becomes objective, and the focus remains on achieving performance goals. Recognizing the importance of a well-prepared training program, every coach is obliged to develop, implement, and monitor it. In the current era of digitalization, a considerable amount of software has been developed to assist coaches in preparing and evaluating exercise programs. Digital apps can also assess how exercises are performed under supervision (Cristina et al., 2022). Another advantage of digital applications is that they can reduce the risk of sports injuries (Kozina et al., 2022; Navarro et al., 2022). The application of the exercise program facilitates coaches in creating and compiling training plans (Ibrahim et al., 2021), supported by available templates and training menus. However, despite the convenience offered, competence in IT is required, which may be

an obstacle, especially since many coaches in Indonesia, particularly those in remote areas, are not familiar with such technology. Research Frevel et al. (2022) state that by 2030, sports technology will significantly impact all three user groups: athletes, consumers, and managers. Moreover, there are differing opinions regarding the usefulness of digital exercise program applications, with older individuals finding them more challenging to use (Möller et al., 2022).

Based on the background mentioned above and the varying opinions from researchers about the acceptance and benefits of digital sports applications, the study aims to determine the level of acceptance among sports coaches in Indonesia towards the digital era in sports and identify the most dominant factors in terms of gender, age, educational background, and training experience. Understanding the effectiveness of digitizing training programs is crucial for gaining insights into the needs and constraints in the field. To provide more specific data, information was collected from Eastern, Central, and Western regions of Indonesia. Eastern Indonesia, including Papua, Maluku, and East Nusa Tenggara, often faces challenges in geographic accessibility and limited infrastructure. Conversely, Western Indonesia, comprising provinces like Banten, West Java, Central Java, and East Java, has high population densities and more advanced technological infrastructure. Central Indonesia, including provinces such as Sumatra, Kalimantan, and Sulawesi, reflects diversity in geographical and demographic aspects. By considering these differences, researchers hope this study will offer a more comprehensive insight into how the acceptance and implementation of digital sports technology varies across Indonesia.

Methods

This research is quantitative, employing a cross-sectional survey method. This survey was conducted using the Google Forms platform from February 1, 2023, to January 30, 2024. In this study, the dependent variable was the perception of acceptance of sports coaches towards the digitalization era in the world of sports, while the independent variables included gender, age, education level, region, and training experience. The questionnaire was assessed using a Likert scale with five answer options: strongly agree, agree, neutral, disagree, and strongly disagree. The answers reflect the attitudes, opinions, and perceptions of the respondents.

Participant

This study involved 203 respondents, following recommendations suggested by Kennedy (2022), and the minimum number of samples with high reliability was 100. Respondents were spread across 33 provinces throughout Indonesia. Respondent characteristics are divided into five criteria: Age, Gender, area of residence, Training Experience, and Educational Background. Respondents to this study consisted of individuals who met several predetermined inclusion and exclusion criteria. Inclusion criteria include individuals who are active as sports coaches, both professionally and amateur, and have experience in the field of sports training. They must also be 18 years of age or older and have the ability to complete the questionnaire independently by providing honest and accurate responses. On the other hand, exclusion criteria include individuals who are not sports coaches, have not reached the age of 18, are unable to complete the questionnaire independently, or are not located in the territory of Indonesia.

Data collection instrument

A questionnaire of 17 questions has been prepared to explore respondents' perceptions of digitalization in sports, especially regarding the use of digital applications in training programs. These questions cover various aspects, from the acceptance of digital applications in preparing training programs to their potential benefits for coaches and athletes. Each question was designed to reveal the respondent's views on the likelihood, readiness, and benefits of using technology in the sports training context. Before being used, this instrument has undergone a validity and reliability test to ensure reliability in measuring the variables you want to study. Thus, it is hoped that this questionnaire can provide in-depth insight into how sports coaches in Indonesia respond to the digitalization phenomenon in the world of sports and its potential impact on athlete training and development.

Information Collection Procedures

The information collection procedure was conducted via a Google Forms link and distributed to respondents who met the inclusion criteria. The link is distributed through sports training education associations throughout Indonesia and sports trainer and physical trainer communities. Respondents must fill out the questionnaire independently and provide honest and accurate responses. After the data collection period ended, data was collected and analyzed to evaluate the perception of acceptance of digitalization in sports and the factors that influence it.

Statistical analysis

Quantitative data was processed to analyze descriptive statistics presented in percentages and frequencies. In addition, this study conducted a validity and reliability test to test the instrument and the validity of the data. The validity test uses the corrected item-total correlation where the result of $r < 0.3$ indicates a less valid component. The reliability test measures the questionnaire's consistency when done repeatedly. In this study, the approach used was Cronbach'Alpha (Cronbach, 1951). If the Cronbach Alpha coefficient shows 0.9, then it was considered Excellent, $0.9 > 0.8$ was considered Good, $0.8 > 0.7$ was considered Acceptable, $0.7 > 0.6$ was considered Questionable, $0.6 > 0.5$ was considered Poor, and $0.5 >$ was considered Unacceptable (Sharma, 2016). The ordinal regression test was

used to determine the influence of the independent variable on the dependent variable, which was used when the data from the independent variable has an ordinal scale. All data analysis in this study used IBM SPSS version 24 software.

Result

Table 1 above shows the data distribution based on gender, age, education level, the region where the date is located, and training experience. Age consists of ages under 20 years, 21 years to 30 years, 31 years to 40 years, 41 years to 50, and 51 years and over. Educational levels consist of bachelor of non-sports, bachelor of sports, master of non-sports, master of sports, doctor of non-sports, and doctor of sports. The data is in three regions: western, central, and eastern Indonesia. Training experience consists of 0 to 5 years, 5 to 10 years, and above 10 years.

Table 2 above presents a Cronbach's Alpha reliability value of 0.955 with 17 items, indicating a very high level of consistency in the analyzed measurement instrument or questionnaire.

Table 1.
Data Description

		N	Marginal Percentage
Gender	Man	171	84.2%
	Women	32	15.8%
Age (Year)	< 20	16	7.9%
	21 – 30	62	30.5%
	31 – 40	78	38.4%
	41 – 50	38	18.7%
	> 50	9	4.4%
Educational Background	Bachelor of Non-Sports	12	5.9%
	Bachelor of Sports	87	42.9%
	Master of Non-Sports	33	16.3%
	Master of Sports	48	23.6%
	Doctor of Non-Sport	8	3.9%
	Doctor of Sport	15	7.4%
Area of residence	West	172	84.7%
	Middle	27	13.3%
	East	4	2.0%
Training Experience (Year)	0 – 5	57	28.1%
	5 – 10	76	37.4%
	> 10	70	34.5%

Table 2.
Cronbach' Alpha value

Cronbach's Alpha	N of Items
.955	17

Table 3.
Validity and Reliability Test

Question	Corrected Item Total Correlation	Note	Cronbach's Alpha if Item Deleted	Note
What do you think if the exercise program is made through a digital application following the current 4.0 era?	.763	Valid	.952	Reliable
Do you agree that in the future, sports science will switch to digitalization?	.716	Valid	.953	Reliable
What do you think if the exercise program is equipped with training video tutorials and can be accessed online?	.778	Valid	.952	Reliable
Do you agree that having exercise videos on digital applications will make it easier for athletes to train?	.747	Valid	.952	Reliable
What do you think about training programs that can be sent to athletes and assistant coaches via digital applications?	.672	Valid	.954	Reliable
Do you agree that using digital applications can make it easier and increase the effectiveness of preparing an exercise program?	.781	Valid	.952	Reliable
Do you agree that using digital applications will facilitate the monitoring and evaluation of exercise programs?	.740	Valid	.953	Reliable
Do you agree that the digital application of the exercise program is equipped with a report from the coach?	.740	Valid	.953	Reliable
Do you agree that using digital applications will improve the quality of your workout?	.737	Valid	.952	Reliable
Do you agree that using digital applications will increase the enthusiasm of athletes in training?	.747	Valid	.952	Reliable
Do you agree that using digital applications can improve your competence as a coach?	.730	Valid	.953	Reliable
Do you agree that digital training programs can be sent online to athletes and coaching staff?	.772	Valid	.952	Reliable
Do you agree that a digital training program will make it easier and faster to communicate with athletes and coaching staff?	.766	Valid	.952	Reliable
Do you agree that digital training programs can be accessed anywhere and anytime?	.762	Valid	.952	Reliable
Do you agree that the digital application of the training program helps the coach in determining their respective training targets?	.840	Valid	.951	Reliable
Do you agree that the use of digital applications can increase the income of the coaches?	.612	Valid	.955	Reliable
Do you agree that sports science technology in Indonesia is far behind other countries, so the intervention of using technology in the coaching process is very important to be socialized and applied by coaches?	.558	Valid	.956	Reliable

Table 3 above shows the results of the validity and reliability of the question instrument. The above results indicate that 17 questions are declared valid and reliable. This is proven because the Corrected Item Total Correlation is r > 0.3. In contrast, Cronbach's Alpha, if the Item is Deleted, has a value of > 0.7, so it is considered reliable.

The data in Table 4 above shows the results of respondents' perceptions of the development of digital technology. Based on the research findings, it can be concluded that most coaches positively perceive the development of digital technology in sports. More than 79% of coaches agree or strongly agree that using digital applications in training programs can enhance preparation effectiveness, facilitate monitoring and evaluation of training programs, and improve the quality of training. Additionally, most coaches

agree that digital technology can increase athletes' enthusiasm in training, enhance their competence as coaches, and streamline communication with athletes and coaching staff. However, about 20% of coaches still feel doubtful or disagree with using digital technology in sports.

Table 4.
Data on Coach's Perceptions of Digital Technology Development

		N	Marginal Percentage
Coach's Perception of Digital Technology Development	Strongly Disagree	0	0%
	Don't agree	2	1.0%
	Doubtful	40	19.7%
	Agree	81	39.9%
	Strongly agree	80	39.4%

Table 5.
The relationship between the independent variable and the dependent variable

	Coach's Perception of Digital Technology		
	R	sig.	Person Chi-Square
Gender	-0.096	0.173	0.140
Age	0.455	0.000	0.000
Educational Background	0.564	0.000	0.000
Area of residence	0.154	0.000	0.000
Training Experience	0.428	0.000	0.000

Table 5 shows that the gender indicator does not have a relationship and affects the coach's perception of digital technology development because sig < 0.173 and chi-square value > 0.05. While the region has a relationship and correlation with the coach's perception, the correlation is very weak. From Table 2, it can be concluded that only the coach's age, education, and experience have a reasonably strong correlation and influence the coach's perception of the development of digital technology.

Table 6.
The effect of the independent variable on the dependent variable

		Estimate	Sig.
Educational Background	Bachelor of Non-Sports	-4.067	0.000
	Bachelor of Sports	-2.800	0.000
	Master of Non-Sports	-0.446	0.566
	Master of Non-Sports	0.682	0.381
	Doctor Non-Sport	1.564	0.206
	Doctor Sport	-	-
Training Experience	0 – 5	-2.437	0.000
	5 – 10	-1.074	0.048
	> 10	-	-

In Table 6. The results of statistical tests using the ordinal regression test method showed that only indicators for Bachelor of Non-sports and Bachelor of Sports education indicators and training experience of fewer than ten years have contributed to supporting the development of digital technology in sports training programs. They have value power in explaining the perception of coaches in digital technology development 65.2%.

Discussion

Based on the data analysis, two significant findings will be discussed in this study. The first finding is that most of the coach respondents in Indonesia are optimistic about digital technology in sports, and the second finding is that two indicators influence the coach's perception of digital technology in sports. The indicators are the level of education and duration of training.

Digital technology cannot be avoided in the 4.0 era, especially in Indonesia. In the international world, sports technology has been a leading trend from 2016 to 2022 (Thompson, 2015, 2016, 2017, 2018, 2019, 2022); wearable technologies include activity trackers, smart watches, heart rate monitors, GPS tracking devices, etc. According to Loland (2002), sports technology was created to facilitate human work. When directed towards achievement sports, digital technology also plays an essential role in the world of sports, and this is in line with what was conveyed by Priya et al. (2020), Liebermann et al. (2002), Luo & He (2021) that recent advances in information technology support athletes to improve performance during training and competition. Specifically, there are many advantages if technology is applied in sports. Digital applications can influence the positive behavior of athletes in training by Oyibo et al. (2018) and Sokolovskaia et al. (2022), and increase the motivation of young people to exercise Zach et al. (2016) and Muktiani et al. (2022). Furthermore, Listyarini et al. (2021) found a significant relationship between the use of digital media with physical activity and fitness. Jeong et al. (2022) also noted that digital applications are a valuable resource for providing information.

Referring to some of the research above about the positive benefits of digital sports technology, it is very natural that most coaches in Indonesia strongly agree with digital technology in sports, especially in creating exercise programs. In line with Priyambada et al. (2022), coaches positively accept the integration of digitalization in sports. According to the responses from the coaches, many stated that the use of video in digital applications is crucial to facilitate the delivery of training material. This aligns with the findings of Erawan et al. (2020), who noted that athletes understand and apply exercises more effectively after watching instructional videos. Conroy et al. (2014) observed that instructional and demonstration forms are prevalent in digital fitness applications. Based on some of the literature reviewed, it is imperative to develop technology swiftly in Indonesia. However, factors just as critical as the technology itself include the quality of coaches in utilizing technology, as technology is a tool that proves useful only when employed correctly (Garad et al., 2021; Hew & Cheung, 2013). Competence for coaches is paramount in enhancing the quality of training (Stodter & Cushion, 2017). Supporting this, Hsu et al. (2012) and Souza Júnior et al. (2022) argued that pedagogical and instructional strategies are essential in the use of technology, with pedagogical design being a key factor in the successful delivery of material. It is necessary to avoid perceiving technical ability as a panacea (Casey et al., 2017).

Coaches skilled in the digital domain of sports are essential. This is consistent with findings on the correlation between coaches' perceptions and their educational attainment. Coaches, particularly those with sports-related degrees, support the inclusion of digital technology in sports. Education is a key indicator for coaches to develop effective

training programs (Leite et al., 2011). A well-educated coach is crucial for fostering a successful sports training process, and those with higher education levels tend to provide more effective feedback during the coaching process (Mason et al., 2020; Woods et al., 2021). Education serves as a vital conduit for adapting to and mastering new technologies (Lleras-Muney & Lichtenberg, 2002), and educated individuals are often seen as more productive at work than their less-educated counterparts (Kampelmann et al., 2018).

The Education Group significantly influences an individual's willingness to embrace technology in their work. Educators play a role in this, as the educational process familiarizes students with technology (Chimo, 2012). Undergraduate students are taught that increasing competence is intrinsically linked to their ability to utilize technology. Moreover, the demands of modern employment necessitate adaptability and proficiency in technology (Beer & Mulder, 2020). Beyond educational level, the duration of training experience is also a factor. Coaches with extensive training experience are likely to continually seek ways to enhance their training quality. According to Costa et al. (2021), ample experience heightens coaches' awareness of developing new models and training methods. Additionally, prolonged coaching experience fosters positive communication between coaches and athletes (Erickson & Jean, 2016). Surveys have also revealed a preference among coaches for online-accessible training programs. Online platforms enable training to be accessed from any location at any time, unimpeded by distance. This aligns with Nurtjahjanti et al. (2021) and Suhandiah et al. (2022) who found that online media has significantly benefited education, especially in light of the COVID-19 pandemic's impact. Since the onset of COVID-19, the shift towards online learning and training has been pronounced (Haryati et al., 2021).

Research on technology in sports within Indonesia has room for growth, presenting an opportunity for sports academics to begin developing digital applications in the field, particularly in Indonesia. Stoszkowski et al. (2017) noted that technology usage is a key factor in enhancing the appeal of coaching. Competencies in digital technology are increasingly sought after in today's digital age, notably in administrative services, digital-based fitness assessments, and media coverage (Ermakov et al., 2022). Furthermore, sports technology can be developed cost-effectively (Marcenko & Nikiforova, 2021).

Conclusion

This study lays the groundwork for advancing digital sports technology in Indonesia, recognizing its pivotal role in elevating athletic performance. However, it is equally important to enhance coaching competencies to fully leverage technological advancements. Future research should delve into the application of digital technology within specific sports training scenarios and further investigate the determinants shaping coaches' attitudes towards such technology. Pursuing these inquiries will contribute to the formulation of more inventive and efficacious training methodologies, thereby bolstering athletes' accomplishments and augmenting coaches' proficiency in the application of digital technology.

Conflict of Interest

Authors do not receive endorsement from any organization for submitted work. The author has no relevant financial or non-financial interest to disclose

References

Barratt, P. (2017). Healthy competition: A qualitative study investigating persuasive technologies and the gamification of cycling. Health & Place, 46, 328–336. https://doi.org/10.1016/j.healthplace.2016.09.009

Beer, P., & Mulder, R. H. (2020). The effects of technological developments on work and their implications for continuous vocational education and training: A systematic review. Frontiers in Psychology, 11(May). https://doi.org/10.3389/fpsyg.2020.00918

Biswas, S., Guha, S., & Bhattacharya, R. (2022). Validity and Reliability of Polar V800 Smart Watch to Measure Cricket-Specific Movements. Physical Education Theory and Methodology, 22(3), 316–322. https://doi.org/10.17309/tmfv.2022.3.03

Casey, A., Goodyear, V. A., & Armour, K. M. (2017). Rethinking the relationship between pedagogy, technology and learning in health and physical education. Sport, Education and Society, 22(2), 288–304. https://doi.org/10.1080/13573322.2016.1226792

Chimo, D. M. (2012). Effects of Web 2.0 technology on student learning in science. Professional Paper, MOntana State University, 20(July), 1–56.

Conroy, D. E., Yang, C.-H., & Maher, J. P. (2014). Behavior Change Techniques in Top-Ranked Mobile Apps for Physical Activity. American Journal of Preventive Medicine, 46(6), 649–652. https://doi.org/10.1016/j.amepre.2014.01.010

Costa, M. J., Marinho, D. A., Santos, C. C., Quinta-Nova, L., Costa, A. M., Silva, A. J., & Barbosa, T. M. (2021). The Coaches' Perceptions and Experience Implementing a Long-Term Athletic Development Model in Competitive Swimming. Frontiers in Psychology, 12(May), 1–6. https://doi.org/10.3389/fpsyg.2021.685584

CRISTINA, N. I., ELENA, R., GEANINA, T., & ŞTEFAN, T. (2022). Using Visual Health Information Software to re-educate balance in older adults. Journal of Physical Education & Sport, 22(7). https://doi.org/10.7752/jpes.2022.07208

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16(3), 297–334.

Erawan, B., Paramitha, S. T., Mulyana, D., & Ramadhan, M. G. (2020). The Digitalization of Wrestling Basic Techniques for Learning. 4th International Conference on Sport Science, Health, and Physical Education (ICSSHPE 2019), 178–182. https://doi.org/10.2991/ahsr.k.200214.048

Erickson, K., & Jean, C. (2016). A Season-long examination of the Intervention tone of coach-athlete interactions and athlete development in youth sport. Psychology of Sport & Exercise, 22, 264–272. https://doi.org/10.1016/j.psychsport.2015.08.006

Ermakov, A. V, Skarzhynskaya, E. N., & Novoselov, M. A. (2022). Digital transformation of professions in physical education and sport sector. Theory and Practice of Physical Culture, 3, 7–9.

Frevel, N., Beiderbeck, D., & Schmidt, S. L. (2022). The impact of technology on sports – A prospective study. Technological Forecasting and Social Change, 182, 121838. https://doi.org/10.1016/j.techfore.2022.121838

Garad, A., Al-Ansi, A. M., & Qamari, I. N. (2021). THE ROLE OF E-LEARNING INFRASTRUCTURE AND COGNITIVE COMPETENCE IN DISTANCE LEARNING EFFECTIVENESS DURING THE COVID-19 PANDEMIC. Jurnal Cakrawala Pendidikan; Vol 40, No 1 (2021): Cakrawala Pendidikan (February 2021). https://doi.org/10.21831/cp.v40i1.33474

Glebova, E., Zare, F., Desbordes, M., & Géczi, G. (2022). COVID-19 Sport Transformation: New Challenges and New Opportunities. Physical Culture and Sport, 95(1), 54–67. https://doi.org/10.2478/pcssr-2022-0011

Haryati, S., Sukarno, S., & Purwanto, S. (2021). Implementation of online education during the global Covid-19 pandemic: Prospects and challenges. Cakrawala Pendidikan, 40(3), 604–612. https://doi.org/10.21831/cp.v40i3.42646

Hew, K. F., & Cheung, W. S. (2013). Use of Web 2.0 technologies in K-12 and higher education: The search for evidence-based practice. Educational Research Review, 9, 47–64. https://doi.org/10.1016/j.edurev.2012.08.001

Hsu, Y.-C., Ho, H. N. J., Tsai, C.-C., Hwang, G.-J., Chu, H.-C., Wang, C.-Y., & Chen, N.-S. (2012). Research trends in technology-based learning from 2000 to 2009: A content analysis of publications in selected journals. Journal of Educational Technology & Society, 15(2), 354–370.

Ibrahim, Mesnan, & Manik, S. (2021). Development of Exercise Program Application. Journal of Physics: Conference Series, 1811, 12119. https://doi.org/10.1088/1742-6596/1811/1/012119

JEONG, S.-H., JI-YOUNG, C., & KOREA, S. (2022). Integrated technology acceptance model (TAM) of sports team smartphone application (STSA) in the stimulus organism response (SOR) framework. Journal of Physical Education & Sport, 22(9). https://doi.org/10.7752/jpes.2022.09275

Kampelmann, S., Rycx, F., Saks, Y., & Tojerow, I. (2018). Does education raise productivity and wages equally? The moderating role of age and gender. IZA Journal of Labor Economics, 7(1), 1–37. https://doi.org/10.1186/s40172-017-0061-4

Kennedy, I. (2022). Sample size determination in test-retest and Cronbach alpha reliability estimates. British Journal of Contemporary Education, 2(1), 17–29. https://doi.org/10.52589/BJCEFY266HK9

KOZINA, Z., KOZIN, S., BEJTKA, M., ZAWADKA-KUNIKOWSKA, M., YAKUSHKO, N., KOROBEINIK, V., RYEPKO, O., CHUPRYNA, O., & CIEŚLICKA, M. (2022). Influence of injury prevention complex technology on the knowledge level of medical and biological subjects and the injury risk of future specialists in physical education and sports. Journal of Physical Education & Sport, 22(4). https://doi.org/10.7752/jpes.2022.04110

Priya, M. K., Srinivasan, R., Harshitha, G., Zingade, S., Jeena, N., Daim, T. U., & Meissner, D. (2020). Impact of Technology in the Future of Sports. In Innovation Management in the Intelligent World (pp. 45–53). Springer. https://doi.org/10.1007/978-3-030-58301-9_3

Lehra, C., Omalekb, O., Osborne, S., Warren, Z., Saucier, D., Ball, J., & Chanderd, H. (2022). Wearable Applications in Rugby for Performance Quantification and Player Health Assessment: A Brief Review. International Journal of Kinesiology and Sports Science, 10(2), 1–10. https://doi.org/10.7575/aiac.ijkss.v.10n.2p.1

Leite, N., Coelho, E., & Sampaio, J. (2011). Assessing the importance given by basketball coaches to training contents. Journal of Human Kinetics, 30(1), 123–133. https://doi.org/10.2478/v10078-011-0080-3

Liebermann, D. G., Katz, L., Hughes, M. D., Bartlett, R. M., McClements, J., & Franks, I. M. (2002). Advances in the application of information technology to sport performance. Journal of Sports Sciences, 20(10), 755–769. https://doi.org/10.1080/026404102320675611

Listyarini, A., Alim, A., Oktaviani, A., Putro, K., Kristiyanto, A., Margono, A., & Pratama, K. (2021). The Relations of Using Digital Media and Physical Activity with the Physical Fitness of 4th and 5th Grade Primary School Students. Physical Education Theory and Methodology, 21(3 SE-Original Scientific Articles). https://doi.org/10.17309/tmfv.2021.3.12

Lleras-Muney, A., & Lichtenberg, F. (2002). The Effect of Education on Medical Technology Adoption: Are the More Educated More Likely to Use New Drugs. Working Paper 9185.

Loland, S. (2002). Technology in sport: Three ideal-typical views and their implications. European Journal of Sport Science, 2(1), 1–11. https://doi.org/10.1080/17461390200072105

Luo, W., & He, Y. (2021). Influence of sports applications

on college students' exercise behaviors and habits: A thematic analysis. Alexandria Engineering Journal, 60(6), 5095–5104. https://doi.org/10.1016/j.aej.2021.03.059

Marcenko, I., & Nikiforova, A. (2021). Digitalization in sports to connect child's sport clubs, parents and kids: simple solution for tackling social and psychological issues. International Conference on Research Challenges in Information Science, 595–601. https://doi.org/10.1007/978-3-030-75018-3_41

Martin, M. R., Melnyk, J., & Zimmerman, R. (2015). Fitness Apps: Motivating Students to Move. Journal of Physical Education, Recreation & Dance, 86(6), 50–54. https://doi.org/10.1080/07303084.2015.1054214

Mason, R. J., Farrow, D., & Hattie, J. A. C. (2020). Sports Coaches' Knowledge and Beliefs About the Provision, Reception, and Evaluation of Verbal Feedback. Frontiers in Psychology, 11(September), 1–10. https://doi.org/10.3389/fpsyg.2020.571552

Möller, J., Bevilacqua, R., Browne, R., Shinada, T., Dacunha, S., Palmier, C., Stara, V., Maranesi, E., Margaritini, A., Takano, E., Kondo, I., Watanabe, S., Ahmadi, M., Wieching, R., & Ogawa, T. (2022). User Perceptions and Needs Analysis of a Virtual Coach for Active and Healthy Ageing—An International Qualitative Study. International Journal of Environmental Research and Public Health, 19(16), 10341. https://doi.org/10.3390/IJERPH191610341/S1

Muktiani, N. R., Soegiyanto, S., Siswantoyo, S., Rahayu, S., & Hermawan, H. A. (2022). Augmented reality mobile app-based multimedia learning of pencak silat to enhance the junior high school students' learning outcomes. Jurnal Cakrawala Pendidikan, 41(2), 553–568. https://doi.org/10.21831/cp.v41i2.49217

Navarro, L., Dandrieux, P.-E., Hollander, K., & Edouard, P. (2022). Digitalization in Professional Football: An Opportunity to Estimate Injury Risk. Working Conference on Virtual Enterprises, 366–375. https://doi.org/10.1007/978-3-031-14844-6_30

Nurtjahjanti, H., Prasetyo, A. R., & Ardhiani, L. N. (2021). The role of resilience and readiness for change on students' interest in learning: e-learning implementation during COVID-19. Cakrawala Pendidikan, 40(3), 750–761. https://doi.org/10.21831/cp.v40i3.39080

Oyibo, K., Adaji, I., Orji, R., Olabenjo, B., Azizi, M., & Vassileva, J. (2018). Perceived persuasive effect of behavior model design in fitness apps. Proceedings of the 26th Conference on User Modeling, Adaptation and Personalization, 219–228. https://doi.org/https://doi.org/10.1145/3209219.3209240

Priyambada, G., Prayoga, A. S., Utomo, A. W. B., Saputro, D. P., & Hartono, R. (2022). Sports App: Digitalization of Sports Basic Movement. https://doi.org/10.13189/saj.2022.100112

ROSENDAHL, P., KLEIN, M., & WAGNER, I. (2022). Immersive training for movement sequences: The use of 360 video technology to provide poomsae training in Taekwondo. Journal of Physical Education and Sport, 22(10), 2318–2325. https://doi.org/10.7752/jpes.2022.10295

Sharma, B. (2016). A focus on reliability in developmental research through Cronbach's Alpha among medical, dental and paramedical professionals. Asian Pacific Journal of Health Sciences, 3(4), 271–278. https://doi.org/10.21276/apjhs.2016.3.4.43

SOKOLOVSKAIA, S., NEZHKINA, N., ORLOVA, E., KARPYCHEVA, M., Bocharin, I., Kolokoltsev, M., Limarenko, O., Romanova, E., & Martusevich, A. (2022). Pedagogical Online Technology to Increase the Level of Students' Conscious Attitude to Physical and Mental Health. Journal of Physical Education and Sport, 22(10), 2380–2385. https://doi.org/10.7752/jpes.2022.10303

Soulé, B., Marchant, G., & Verchère, R. (2022). Sport and fitness app uses: a review of humanities and social science perspectives. European Journal for Sport and Society, 19(2), 170–189. https://doi.org/10.1080/16138171.2021.1918896

Souza Júnior, A. F. de, Oliveira, M. R. R. de, & Carvalho de Araújo, A. (2022). El debate de la tecnología digital en la formación continua del profesorado de Educación Física: usos y conceptos para la enseñanza y el aprendizaje (The debate of digital technology in the continuing Physical Education teacher education: uses and concepts for teaching and learning). Retos, 46(SE-Experiencias didácticas desarrollas e investigadas con trabajo empírico), 694–704. https://doi.org/10.47197/retos.v46.94484

Stodter, A., & Cushion, C. J. (2017). What works in coach learning, how, and for whom? A grounded process of soccer coaches' professional learning. Qualitative Research in Sport, Exercise and Health, 9(3), 321–338. https://doi.org/10.1080/2159676X.2017.1283358

Stoszkowski, J., Collins, D., & Olsson, C. (2017). Using shared online blogs to structure and support informal coach learning. Part 2: the participants' view and implications for coach education. Sport, Education and Society, 22(3), 407–425. https://doi.org/10.1080/13573322.2015.1030382

Suhandiah, S., Suhariadi, F., Yulianti, P., Wardani, R., & Muliatie, Y. E. (2022). Online learning satisfaction in higher education: what are the determining factors? Jurnal Cakrawala Pendidikan; Vol 41, No 2 (2022): Cakrawala Pendidikan (June 2022). https://doi.org/10.21831/cp.v41i2.35724

Sullivan, A. N., & Lachman, M. E. (2017). Behavior change with fitness technology in sedentary adults: A review of the evidence for increasing physical activity. Frontiers in Public Health, 4(JAN), 289. https://doi.org/10.3389/FPUBH.2016.00289/BIBTEX

Thompson, W. R. (2015). WORLDWIDE SURVEY OF FITNESS TRENDS FOR 2016: 10th Anniversary Edition. ACSM's Health & Fitness Journal, 19(6). https://journals.lww.com/acsm-healthfitness/Fulltext/2015/11000/WORLDWIDE_SURVEY_OF_FITNESS_TRENDS_FOR_2016__10th.5.aspx

Thompson, W. R. (2016). WORLDWIDE SURVEY OF FITNESS TRENDS FOR 2017. ACSM's Health & Fitness Journal, 20(6). https://journals.lww.com/acsm-healthfitness/Fulltext/2016/11000/WORLDWIDE_SURVEY_OF_FITNESS_TRENDS_FOR_2017.6.aspx

Thompson, W. R. (2017). WORLDWIDE SURVEY OF FITNESS TRENDS FOR 2018: The CREP Edition. ACSM's Health & Fitness Journal, 21(6). https://journals.lww.com/acsm-healthfitness/Fulltext/2017/11000/WORLDWIDE_SURVEY_OF_FITNESS_TRENDS_FOR_2018__The.6.aspx

Thompson, W. R. (2018). WORLDWIDE SURVEY OF FITNESS TRENDS FOR 2019. ACSM's Health & Fitness Journal, 22(6). https://journals.lww.com/acsm-healthfitness/Fulltext/2018/11000/WORLDWIDE_SURVEY_OF_FITNESS_TRENDS_FOR_2019.6.aspx

Thompson, W. R. (2019). WORLDWIDE SURVEY OF FITNESS TRENDS FOR 2020. ACSM's Health & Fitness Journal, 23(6). https://journals.lww.com/acsm-healthfitness/Fulltext/2019/11000/WORLDWIDE_SURVEY_OF_FITNESS_TRENDS_FOR_2020.6.aspx

Thompson, W. R. (2022). Worldwide Survey of Fitness Trends for 2022. ACSM's Health & Fitness Journal, 26(1). https://journals.lww.com/acsm-healthfitness/Fulltext/2022/01000/Worldwide_Survey_of_Fitness_Trends_for_2022.6.aspx

Woods, C. T., Rothwell, M., Rudd, J., Robertson, S., & Davids, K. (2021). Representative co-design: Utilising a source of experiential knowledge for athlete development and performance preparation. Psychology of Sport and Exercise, 52, 101804. https://doi.org/10.1016/j.psychsport.2020.101804

Zach, S., Raviv, T., & Meckel, Y. (2016). Using information communication technologies (ICTs) for motivating female adolescents to exercise/run in their leisure time. Computers in Human Behavior, 60, 593–601. https://doi.org/10.1016/j.chb.2016.02.096

Datos de los/as autores/as y traductor/a:

I Dewa Made Aryananda Wijaya Kusuma	dewawijaya@unesa.ac.id	Autor/a
Bayu Agung Pramono	bayupramono@unesa.ac.id	Autor/a
Fifit Yeti Wulandari	fifityeti@unesa.ac.id	Autor/a
Muhammad Kharis Fajar	Kharisfajar@unesa.ac.id	Autor/a
Rachman Widohardhono	rachmanwidohardhono@unesa.ac.id	Autor/a
Abdul Hafidz	abdulhafidz@unesa.ac.id	Autor/a
Muchamad Arif Al Ardha	muchamadalardha@unesa.ac.id	Autor/a
Rahmatya Ikhwanurrosida	lingolinkpro@gmail.com	Traductor/a