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Belief in building a full-fledged distance learning course in athletic training

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Abstract. The problem of developing distance learning in physical education and sports is relevant to the growing demand for flexible educational models and modern technologies. Even though distance education is developing rapidly in the context of intensive digitalisation of social processes, and physical education and sports specialists were among the first to use digital technologies, research in this area indicates a lack of structured approaches to developing distance courses that would meet modern needs. The practical orientation of activities, sometimes an increased level of danger and special requirements for logistical support create significant obstacles to education and training in a distance format, which is associated with the ambiguous practicality of distance courses in this area. *Objective:* to form the direction of development of the structure of distance learning in athletic training. *Methods:* analysis of scientific and methodological literature, survey, and modelling. *Results:* The study focused on the available types of athletic training to understand the possibilities of organising and implementing distance learning in this area. The key factors of structuring a distance course in athletic training were identified. They are presented as three main blocks: theoretical, practical and controlling. An algorithm for organising practical training in athletic training has been formed. It involves the use of e-learning tools. The possibilities of creating a full-fledged distance course in athletic training are substantiated. The survey results of 20 experts show a high level of support for the proposed structure and key elements of the distance course in athletic training. In particular, the experts mostly agreed with the logic and completeness of the course structure, the expediency of centralised content placement in the cloud environment, the optimality of the selected communication channels (email and cloud services), the clarity of the motor learning algorithm for remote performance by students, the adequacy of the proposed evaluation system and the presence of significant advantages in the use of tablets/smartphones in the educational process. In general, changes in the perception of obstacles to distance learning in physical education and sports can occur with the expansion of technological accessibility of innovative tools and modernisation of teaching methodology. *Conclusions:* Distance learning courses are a promising area for developing physical and sports education. The study was conducted to anticipate the possibilities of expanding education in this area by emphasising the issue of distance learning. Creating effective distance learning courses requires an integrated approach. This approach includes integrating modern technologies, adapting educational content to the audience's specifics, and providing proper feedback. The article provides substantiated evidence of the possibilities of creating full-fledged distance learning courses in physical education and sports training. Further research should improve distance learning methodology, develop specialised mobile applications for athletic training, and use modern tools to assess learning outcomes.

Keywords: distance learning, athletic training, teaching methodology

1. Introduction

The modern educational landscape constantly transforms due to technological progress and global challenges. This has led to a significant increase in the role of

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distance learning in all areas of education, including physical education and sports [56]. Traditional learning models based on direct presence and interaction require adaptation to new realities. Distance education is developing rapidly in the context of intensive digitalisation of social processes. It seems that one can learn anything at any time with just an internet connection. Many courses of varying complexity are offered – from advanced training to professional retraining. Moreover, their duration is much shorter than that of traditional education. The distance learning format focuses on practically acquiring relevant knowledge and skills to carry out professional activities or improve performance.

Like any learning model, the distance learning format has a number of disadvantages and special requirements for its success. They are associated with the ambiguous practicality of distance courses in several educational areas. In particular, physical education and sports specialists face significant obstacles when studying and training in a distance format [17, 30]. One of the key challenges is creating effective and "full-fledged" distance courses for disciplines that require a significant practical component, such as physical education. Physical education involves not only the acquisition of theoretical knowledge but also the development of specific motor skills, exercise techniques, monitoring of physical condition, and correction of movements by a teacher or trainer. Transforming these components into a remote format requires an in-depth analysis of the potential of modern technologies. Researchers in educational technology are actively studying the use of cloud technologies and augmented reality to improve the educational process. They can provide visualisation and interactivity, potentially helpful in demonstrating exercise techniques [55]. Other technologies, such as mobile applications and the Internet of Things (IoT), also show their potential in distance learning, particularly for collecting and analysing data that can be used to monitor student progress [54]. Physical education and sports are pedagogical disciplines in which specialists were among the first to use digital technologies actively.

Nevertheless, the total practicality of the activity, sometimes an increased level of danger, and special requirements for logistical support create seemingly insurmountable circumstances for the remote formatting of the educational process in physical education and sports. Of course, this may change with the expansion of technological accessibility of innovative tools and modernisation of teaching methodology [34]. Instead of waiting, let's try to understand what distance learning in physical education and sports can be today. To understand the possibilities of its organisation and implementation, we will focus on the available types of athletic training.

1.1. Critical analysis

Although physical education has historically been associated with personal interaction and physical presence, researchers are actively exploring the potential of technology to support and improve the educational process in this area. Let's leave aside the retrospective of the development of distance learning, noting only that its modern outlines are shaped by the so-called Web 2.0, and the surge occurred during the COVID-19 pandemic [25, 26, 55]. The latter has intensified the development and implementation of mobile e-learning resources in education. However, the successful fight against the pandemic led to a rapid return to the traditional form of education [27]. Educational losses have not been carefully considered, and conclusions about the effectiveness and potential of distance learning are still being formed [53, 70]. Modern researchers of educational technologies focus on the prospects of active learning methods within the constructivist approach [18, 38, 67]. This seems consistent with the concept of distance learning when the teacher is more likely to act as a leader rather than a source of education [23, 39]. The absence of negative feedback on distance learning is more likely related to its perception as a separate form of

education that should not be compared to the traditional format. As a consensus, the researchers focus on the hybridisation of learning – a combination of best practices from different learning formats [1, 10]. In the current work context, we should avoid the false identification of distance and online learning. The latter is associated with the attempt to implement the traditional form of education through online learning content delivery technologies [35].

Distance learning in physical education and sports involves using various technologies to transfer educational content and organise activities remotely [12, 69]. For a better understanding of the subject of the study, some key terms will be clarified in the main part of the paper. This may include synchronous (real-time) and asynchronous (at a convenient time) components, the use of online platforms for accessing resources and communication, as well as mobile devices and specialised applications for tracking activity and engaging students [8, 57]. Blending and gamified approaches offer a structured framework for organising distance physical education, including online platforms, mobile devices, and gamified elements (points, levels, rewards) [52]. Recent studies have detailed the use of cloud platforms for organising and managing learning content, the development of mobile applications for remote laboratory work (for example, micrometre measurements), the use of AR for visualisation in geometry or chemistry teaching, and the development of IoT systems for monitoring health data, as well as artificial intelligence (AI)-based tools [54, 55, 57, 64]. The potential of augmented and virtual reality (AR/VR) for forming health-saving competence of physical education teachers is also mentioned [56]. It has been demonstrated that technologies for visualisation (AR/VR), process organisation (cloud platforms), data collection (IoT) and interactive interaction (mobile applications, virtual environments) exist and are successfully used in various educational contexts. For example, using tablets and a mobile fitness app in physical education classes has been associated with significantly higher student interest and satisfaction than traditional methods [57].

Among students who used game-based learning environments with augmented reality elements in sports education, significantly higher levels of physical activity and motivation were observed [52]. Digital and web-based technologies, including accelerometers and social media, have also increased physical activity, academic performance, and motivation in secondary school physical education classes [9]. Mandatory use of a mobile application for extracurricular physical activity demonstrated high adherence and a significant number of participants who completed the study [46]. MOOCs have become an alternative to traditional education due to the flexibility of study time and the absence of economic and geographical restrictions. MOOCs allow many registered users to access educational content anywhere and anytime [54]. However, their effectiveness, specific integration methods and pedagogical challenges in teaching complex physical skills remotely remain insufficiently covered. Future physical education teachers generally perceive mobile learning positively, noting its motivational, engaging, and practical benefits and its independence from time and place [12]. Although existing research confirms the potential of technology to increase motivation for physical activity and support some elements of physical education, the question of whether it is possible to create a full-fledged distance course that would provide comprehensive training, safety, and high-quality assessment of technology remains open. It requires further analysis based on existing data and experience.

1.2. The problem

It seems that physical education and sports are the peak that supporters of distance learning will not be able to reach. This is inherent in the practical and social essence of the metered/spontaneous performance of fundamental/specialised motor actions.

Although courses, certified programs for coaches have long been presented as full-fledged distance learning programs [24]. The educational process in the distance format in physical education and sports remains in the development stage and requires real, not postulated, solutions. This process seems to focus on adapting the traditional education format to distance technologies. The copying of approaches to studying various academic disciplines during the pandemic was the leading solution to adapt physical education and sports to the conditions of distance learning. This is likely due to practitioners' ability to adapt quickly in the face of uncertainty and the availability of technology. However, distance physical education has successfully developed in some countries even before the pandemic [18, 25]. An analysis of the approaches indicates their overall success amidst the implementation difficulties. Why not focus on developing what seems to work? Distance physical education programs are primarily related to developing the knowledge component and ensuring proper physical activity of those who participate.

However, there is a lack of convincing or critical data on the effectiveness of motor learning, the formation of competencies related to developing specialised knowledge, improvement of motor function, and health maintenance. Despite the encouraging results, there are significant challenges to building a full-fledged distance learning format for physical education. The main issue is the effectiveness of assessing and correcting physical skills and exercise techniques without direct teacher supervision. Although there are applications for movement analysis and the ability to record performance video, teacher feedback indicates time and logistical difficulties with remote assessment of many students and complex movements [22, 42]. Reliability of data collection through sensors can also be a problem (e.g., sensor disconnection), requiring technical solutions and attention to application design [41]. In addition, the integration of technology into education is hampered by a lack of digital competence and potential resistance from some teachers, as well as students' tendency to use devices for entertainment rather than learning [13, 45]. Full learning in physical education often requires precise technique correction to prevent injury and optimise performance, which is traditionally achieved through direct, perhaps even tactile, feedback that can be difficult to replicate with existing remote tools fully [66].

It seems that remote physical education and sports training are projects that will not be able to become a trend in the future. Therefore, there is a problem in understanding the essence of distance learning in physical education and sports. Therefore, this paper focuses on answering the following questions:

1. *What is distance learning in the context of physical education and sports?*
2. *What technologies can be used in distance learning in physical education and sports?*
3. *Is building a full-fledged distance learning course in athletic training possible?*

The research objective is *to form the direction of development of the structure of distance learning in athletic training.*

2. Methodology

First, we searched and analysed relevant scientific sources on the research problem. It consisted of forming a query using the keywords of the study in the abstract databases PubMed, Scopus, and Web of Science. The selected databases were used based on their coverage of peer-reviewed research and the ability to access full-text documents. The purpose was not to review the practical implementation of distance learning elements in physical education and sports but to critically analyse the possibilities of building distance learning courses and define key terms. In

the second stage, pedagogical modelling was conducted, considering the essence of athletic training as a fundamental component of a person's physical health, which was considered a combination of motor activity, physicality, and motor fitness. This made it possible to determine the structural features of using digital technologies in the educational process as a key factor in building modern learning in a distance format. The developed structure of construction and organisation of a full-fledged distance course on athletic training was offered to evaluate 20 specialists in the sphere of physical education and sports (n = 20) who work in institutions of higher education (HEI) and have at least 5 years of teaching experience: representatives of the Department of Athletics (4 persons); representatives of the Department of Olympic and Professional Sports (6 persons); representatives of the Department of Informatics and Biomechanics (4 persons); representatives of two departments of physical education from different HEIs (6 persons). All participants who voluntarily volunteered to participate in the study were blinded to the purpose of the study and were not informed about each other's participation in the survey. A questionnaire containing seven questions was developed (see supplementary materials) based on approaches proposed in similar studies [5, 6, 19, 30, 59]. In the third stage, a critical analysis of the research results was carried out to outline the direction of the formation of distance courses in athletic training. This allowed us to provide a generalised answer to the key question - the feasibility of developing training courses in physical education and sports in a distance format.

3. Research results and discussion

3.1. Question 1. What is distance learning in the context of physical education and sports?

The answer to the first question requires a mechanical listing of key definitions related to the subject of the current study (table 1). In addition, comments will be provided on the specifics of using these terms in physical education and sports.

Table 1
Non-traditional learning formats.

Type	Definition
Remote	specific measures and organisation of activities aimed at providing access to education for those who are remotely located
Electronic	a set of tools based on Internet technologies, as well as audio and video media that allow to consume educational content
Online	access to educational content using a specific technology
Mobile	a service that provides the learner with educational content in electronic form at any place and time

Distance learning is often associated with distance education, which is probably right. In general terms, distance learning is understood as specific activities and organisation of activities aimed at providing access to learning for remotely distant people. Such learning involves the presence of an instructor who is physically located in a different place from the student and can provide instruction at different times. In the current study, distance learning is associated with delivering learning content and guidance using Internet technologies. Some authors consider distance learning as an umbrella term that includes, for example, online learning, e-learning, virtual learning, etc. Thus, what is common in all definitions is that a certain form of learning occurs between two parties (student and teacher); it is conducted at different times

and/or places and uses different forms of educational materials. In the case of physical education and sport, such learning can be the provision of guidance on using structured learning content to develop relevant competencies due to the acquisition of specialised knowledge and motor skills.

To modernise distance learning, let's look at the definition of e-learning. This term is often equated with the concept of online learning. In the broadest sense, e-learning is a set of tools based on Internet technologies and audio and video media to consume learning content. Obviously, it is incorrect to equate online and e-learning because learning content consumption may not occur in a streaming format. It would be more appropriate to explain that e-learning can occur online (synchronously) or offline (asynchronously) with technology. As for the current study, e-learning in physical education and sports is often accepted as distance learning. In e-learning, there is no instructor, and learning instructions can be contained in the learning tools themselves (applications, programs, objects, websites, etc.) [50]. It is worth assuming that for physical education and sports, this format may be either too incomprehensible and straightforward (especially for beginners) or overly burdened with recommendations, which will make it difficult for students to understand.

Related to the previous format, let us define "online learning". Authors have tried to distinguish between "online learning" as a separate format and online learning as a technological environment or context in which it is used (e.g., distance or e-learning). Most authors describe online learning as access to learning content through a specific technology [37]. On the contrary, some authors avoid linking online learning with distance and traditional learning formats. They define online learning as a new version of distance learning [51]. Regarding the current study, it is difficult to determine which technology could become the key to physical and sports education for online learning. This direction is only being formed and is reflected as a component of mixed forms of education in physical education and sports, mainly as an element of practical or theoretical training.

To better explain the expectations regarding the possibilities of building full-fledged distance learning courses in physical and sports education, we will define "mobile learning". The difficulty lies in the dynamism of the term, which is associated with the rapid development of mobile technologies. Generally speaking, mobile learning is a service that provides students with educational content in electronic form at any place and time. In this interpretation, mobile learning is a part of e-learning. The distinguishing aspect is that m-learning involves using portable small technological tools, while e-learning uses all learning technologies, including mobile ones. Therefore, it is necessary to specify the means of mobile learning – mobile technologies. These are accessible, personalised technological tools that transmit educational information using Internet technologies: smartphones, tablet computers, e-readers, portable audio players and game consoles, netbooks and laptops. Mobile learning technologies have such common aspects as portability, small size, interactivity, and ubiquity [62]. Regardless of the mobile technology model, they are widely used in physical education and sports, which forms a trend towards application in distance education. Let's take into account those who study remotely. The suitability of this mobile technology becomes more evident in the context of the globalisation of the world and technologies, as well as the growth of transactional distance for participants in the educational process.

Distance learning developers should consider ethical principles, such as the protection of personal data and the privacy of participants. Attention should be paid to the "digital divide", which refers to inequalities in access to digital technologies, as this can affect the ability of all students to participate, regardless of their cultural, geographical or educational background [33]. It is also important to consider the

diversity of students, including those with special educational needs, and ensure they have equal access to educational opportunities. It is necessary to consider ethical principles regarding using data obtained from online learning participants [21]. In distance learning, participants' safety includes physical safety (particularly important for sports but not covered in the references) and safety in the digital environment [31]. This includes protection against unauthorised access to private information, ensuring data security, and counteracting possible online discrimination or unacceptable behaviour [32]. Sources mention security, privacy, and protection risk assessments for virtual reality learning environments. They also mention bullying as a group process in cyber environments [40]. Obtaining students' consent before disclosing their projects, documents, emails, phone numbers, or addresses is an important component of the responsible use of digital tools in education. It is necessary to inform students about their responsibilities and potential challenges in distance learning [4]. Responsible use of digital tools is also linked to compliance with computer ethics, rules of conduct, and academic standards. The concept of Digital Social Responsibility (DSR) emphasises the responsible attitude of institutions to the use of digital technologies [48].

Distance learning in physical education and sports seems to be no different from its understanding in the general context. Despite certain limitations due to the study's specifics, it seems possible to form holistic training courses involving varying degrees of teacher involvement and student participation in learning using various devices based on Internet technologies. Online and e-learning can act as distance learning in physical education and sports or as its elements.

3.2. Question 2: What technologies can be used in distance learning in physical education and sports?

The answer to the second question was considered in the example of athletic training. The choice of this atypical category, even for physical education and sports, is related to the need for a specific generalisation of the main tasks that can be solved through specially organised, dosed physical activity. The concepts close to athletic training are "general physical training", "basic physical training", "conditioning training", and "fitness". The essence of athletic training is the selection of fundamental, simple and accessible motor actions that can satisfy the primary needs in forming and maintaining physical health: motor activity, physical form, and motor fitness. Suppose a particular type of fitness or sports activity creates specific needs and mainly develops particular motor abilities. In that case, athletic training aims to solve the problem of readiness for successful performance of various motor tasks. Athletic training involves fundamental motor actions – walking, running, throwing, jumping, and moving objects. The outlined groups of motor actions are individual in performance. They can be performed independently or in a group. The progress of those engaged and the load and control of its implementation can be determined.

The structure of education and training in athletics was considered on the example of the updated model of Bloom's classification of thinking with six cognitive levels of complexity [15]. At the same time, we tried to take into account the specifics of the taxonomy implementation, taking into account the peculiarities of the sphere of physical education and sports [16, 49] (figure 1).

According to the updated taxonomy, there are levels of thinking that make it possible to complicate an individual's athletic training. In addition to the knowledge component, athletic training is related mainly to developing motor potential, which is explained through the characteristics of an individual's performance and fitness.

At the stage of memorisation (the processes of restoring, recognising and recalling relevant knowledge from long-term memory), the student gains knowledge about individual components of athletic training (for example, load characteristics and

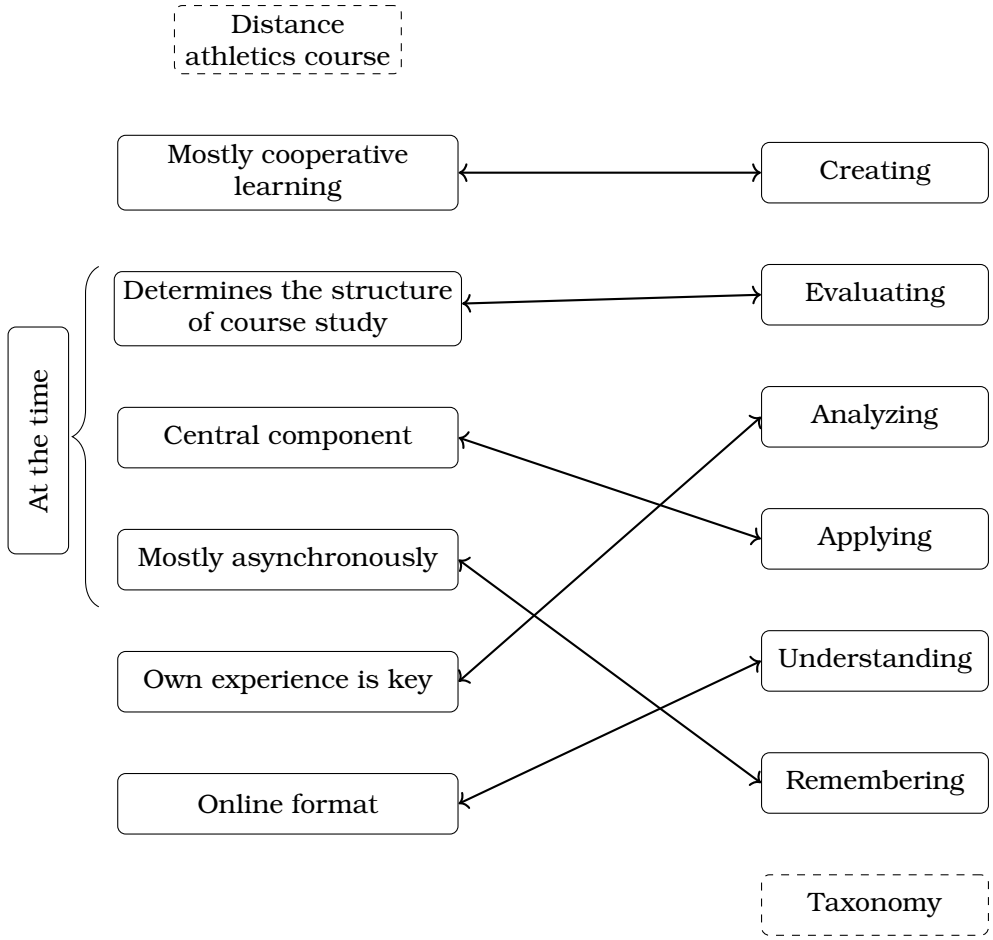

Figure 1: Updated Bloom's taxonomy in the context of e-learning in physical education.

building a training structure). The memorisation stage in distance learning can be repeated many times and does not necessarily precede other stages. This is due to the flexibility of the learning format and the need to present theoretical information and explanations for each topic separately to increase understanding of the course. The memorisation stage can be provided by presenting text, audio, and video content in a format convenient for the learners.

The stage of understanding is related to constructing the meaning of educational content through interpretation, giving examples, classification, generalisation, conclusions, comparison and explanation. In athletic training, this stage is realised through the knowledge and practical components. Here, a student may need the help of an online course instructor (especially at the initial training stage). With regard to the theory and methodology of physical education, the stage of understanding is associated with initial learning and repetition (e.g., running at different speeds or throwing a ball with one hand). At this stage, graphical explanations of motor actions (text, sound, photo, video) can be used, as well as their comparison with a certain standard, requirements for movement characteristics (e.g., correct execution, compliance with movement parameters) [58]. In this case, it is possible to use the means of studying the dynamic, kinematic parameters and structure of motor activity. Accordingly, with the complication of the motor task or learning new movements, the stage will be repeated until the moment when we should talk about the process of training, not learning.

The application stage involves the actual performance or use of motor actions to

solve a specific task (e.g., skill training, circuit training). This stage is entirely practical and, logically, follows the previous ones. However, studying simple locomotion (e.g., walking, running) can be located earlier in a distance course in athletic training. Planning and evaluation in structural units of the process of education/training for different durations (from one session of repetitions to the whole cycle of course training) is important at this stage. For this purpose, time and motion tracking technologies, photo and video recording, and complex systems for monitoring various parameters of motor actions can be used [63]. Collecting and depositing information on learning outcomes in electronic diaries, summary tables, and individual training software tools databases is important.

The next stage is the analysis, which is characterised by dividing the material into parts and determining the relationship between them and the overall structure. At this stage, an individual acquires a holistic view of the structure of athletic training based on knowledge of the essence of its components. The analytical stage can be defined as theoretical and practical when a student has knowledge and skills regarding individual motor actions and develops the ability to determine the ratio of their influence and reaction by solving motor tasks processual. In addition to the knowledge component of the studied motor actions, knowledge about the regularities of the impact of motor activity on the body is formed. It is assumed that by this stage, the student accumulates factual material on the effectiveness of his/her learning, which can be used for applied analysis. Therefore, the primary means of activity at this stage in the distance course are planning, programming and statistical processing tools.

The evaluation stage involves making judgments based on criteria and standards through verification and criticism. This stage is essentially the next stage after the analytical stage. However, in the context of a distance learning course, knowledge and skills are expected to be assessed after each completed structural element with a completed form (for example, training in jumping, endurance development block). This allows you to evaluate your progress and provides information about your readiness to continue the course or the need to repeat it / correct the learning trajectory. This seems to be quite difficult to do in the limited time frame of the course. It can also overload the course and create additional problems for the developer and the instructor. Therefore, the development of an assessment requires significant effort for the successful completion of the course. In athletic training, theoretical and movement testing can be assessed. At this stage, active interaction between the instructor and the student is important. After all, it is not enough to simply state the result of distance learning. It is necessary to consciously study the student's degree of understanding of the subject matter. At the assessment stage, it is possible to use electronic communication in synchronous and asynchronous online formats. After all, the assessment should take place in a timely manner after completing the structural unit of the course. Additionally, it is possible to use programs for motor testing, analysis of photos and videos, electronic surveys, and pivot tables [26, 38, 51].

The creation stage involves combining elements into a single or functional whole, generating ideas, planning and creating a product. This stage is undoubtedly the final stage in the structure of distance learning, including consistent monitoring and evaluation of the effectiveness of the new product production process. At this stage, there is minimal instructor involvement and maximum interaction between students in the group. It seems that it is not possible to ensure individual course completion here if cooperative learning methods are planned. Therefore, it is necessary to adapt the distance course program to present the results of its study in equivalent forms. In athletic training, the creation stage may demonstrate progress in motor learning, improvement of physical form, and fitness. Otherwise, it involves the creation of a

training program or considering the peculiarities of athletic training learned during the distance course. The tools used are testing tools (for example, when conducting movement tests) and photo and video analysis. Otherwise, it can be performance modelling programs, calculation of relationships based on statistical data between indicators of exposure and body reaction [65].

Why was Bloom's taxonomy chosen to consider technologies in distance learning in physical education? It seems that its completeness and flexibility in relation to the pedagogical process allow it to be adapted to the conditions of different learning formats. Focusing on purely pedagogical or accepted principles in physical education, sports theory, and methodology would be a limiting factor. After all, they are relevant to the traditional learning format. The construction of an original taxonomy is far beyond the scope of the current work. All the presented stages fully reflect the requirements for successful athletic training in a distance format. In traditional education, one can limit oneself to the first two or three stages, which are implemented under the close supervision of a teacher. The distance format seems to involve more time and effort from the student when studying athletic training. Instead, conditions are created for greater involvement and consciousness of knowledge and skills for students studying remotely.

We imagine that the distance learning format in physical education and sports should include various tools that allow instructor consultations and ensure student interaction online, tools for collecting and analysing information on education and training, and electronic means of transmitting and working with educational content.

3.3. Question 3: Is building a full-fledged distance learning course in athletic training possible?

Having defined the essence of various learning formats associated with distance education and tried to justify the possibility of structuring a training course considering cognitive levels of complexity, we will focus on the tools that allow for the full functioning of the athletic training course.

According to the considered taxonomy, we assume that a student in the course of athletic training should acquire knowledge and learn to perform the proposed movements; develop an understanding of the integrity of athletic training and the essence of its components; learn to analyse, evaluate and organise the educational/training process. Athletic training was proposed because it can be considered as a construct of health-preserving activity of a certain contingent, a component of professional training of specialists in physical education, and a component of training activity in the chosen sport. We will leave the details of the content of such variants of athletic training for further research. Let us focus on the possible structure of such a distance course and consider the possibilities of its technological support (figure 2). After all, the experience of application of mobile applications and web technologies in physical education shows their potential for increasing physical activity and physical fitness, which are the main goals of athletic training [9]. In addition, using technology can help increase students' motivation to study, which is an important factor in supporting health-promoting activities [28].

The first step is to decide on the media for the learning content. In a distance learning course, the teacher plays the role of an instructor; he or she does not act as a direct transmitter of educational information. Nevertheless, synchronous online demonstrations can be used for familiarisation and initial learning of motor actions. We believe that it is of utmost importance, especially for the safety of students. In this case, a distance course's essence seems lost. In other cases, electronic educational resources such as manuals, reference books containing theoretical information, and textual instructions on organising and completing the course should be considered.

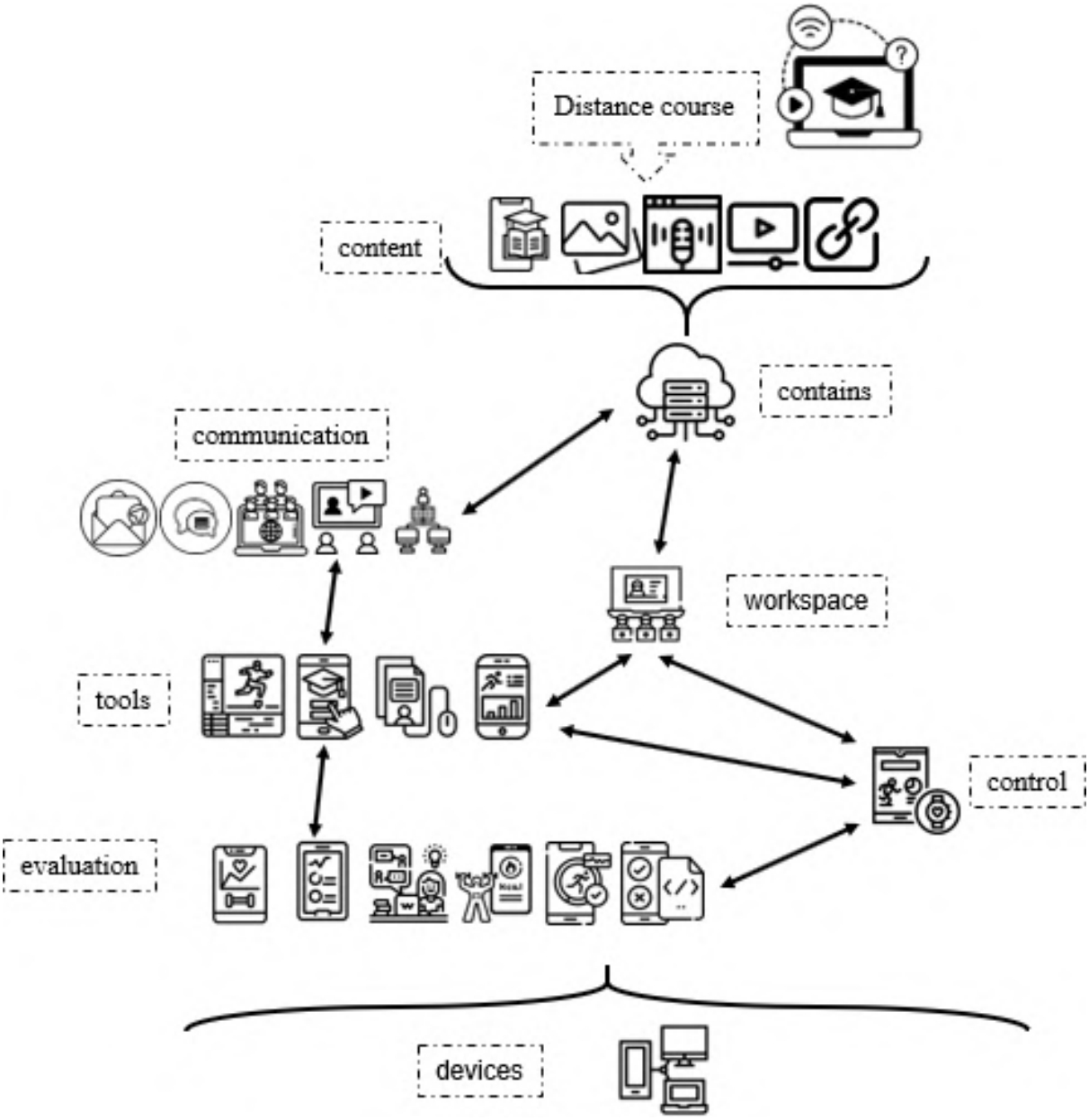

Figure 2: Structure of the distance course of athletic training.

Other learning content media may include photos, videos, and audio formats. There is no controversy about the effectiveness of using video content to demonstrate specific activities and explanations, as well as the importance of high-quality images showing different stages of motor action, with the possibility of using multigender and multiracial cartoon images or real videos of people performing exercises [47]. The training content should be centrally located in a cloud service that allows instant playback without preliminary download. We believe that references to external sources, the so-called "useful links", are inappropriate when building a distance learning course. Such a learning format should have a holistic, complete, content-filled structure that will allow for successful course completion [68]. There is a question of standardising learning content, which requires significant resource costs that may not be available to the teacher. However, interactive content development tools, such as iSpring Suite, can simplify creating educational materials by converting, for example, presentations to HTML format [41]. When selecting or creating learning content,

the main requirement is to comply with copyright, the safety of participants in the educational process, and the ability to solve learning tasks. Therefore, learning content can be a combination of different formats or placed in a specially designed application or on a learning management platform. Developing specialised mobile applications for physical education and sports is a common practice, and their successful validation confirms the possibility of creating practical learning tools [45, 47, 66].

The next step is determining the communication channels and means of transmitting the training content. It is important to understand that the course will end or not even begin without a stable Internet connection. This is a key factor in providing distance learning. Communication channels include email services, instant messengers, cloud services, internal communication channels, and chat rooms of individual programs/applications. Email services seem to be the most convenient and understandable communication channel that meets the spirit of distance learning. For example, instant messengers are designed for instant communication, which is more suitable for online learning when it is assumed that the instructor is in constant contact with students. Cloud services will be used to share learning outcomes and joint projects. Social media platforms such as Facebook can be used to share information and as a learning resource, integrating into the learning process [43]. Internal communication channels of individual programs or applications allow thematic dialogue between students. These channels can be used together to enhance feedback. However, redundancy can interfere with communication. We believe that we should focus on cloud and email services. This will ensure the centralisation and clarity of communication between participants, file sharing, and their safe and secure storage.

Next, let's look at the environments in which participants in the educational process can interact. First of all, let's highlight video communication. However, as noted, it is not mandatory in distance learning. However, it should be mentioned as one of the options for interaction between participants in the educational process. After all, full-fledged workspaces seem to be a convenient tool for the basis of an e-course. In their environment, it is convenient to post information about the organisation of courses and learning outcomes and share the achievements of participants [43]. Such environments, even with free access, allow to optimise interaction in the middle of the course and individualise the learning process with the help of tasks. Distance learning platforms (LMSs) can simplify course development by offering out-of-the-box shells. The experience of using web-based platforms such as Moodle for weightlifting education demonstrates their application in the specific field of athletic training [54]. However, the choice of interaction in a distance course should be moderated so that it is optimised, avoiding excessive complexity or inflexibility of platforms. It should be noted that e-learning platforms can simplify course development, but they are not mandatory. Using a ready-made shell to build a distance learning course may be tempting. However, such systems often require significant investment and are designed to host multiple courses. Others have few features for building a full-fledged e-learning course but are designed for training administration. In general, they may not be flexible or require additional skills from the instructor to modify them. The choice of interaction in a distance course should be made carefully to ensure optimisation.

Let's look at the tools that will be used to implement the learning process directly. A student studying athletic training needs: 1) theoretical knowledge of the patterns of motor actions and the organisation of the learning/training process; 2) practical skills in performing motor actions. This requires tools for working with symbols (text, numbers), processing photo and video files, and applications for education/training, including accounting, control, and analysis programs. Work with text and digital arrays can be done using office programs that do not require pre-installation. Digital

data can be processed using available spreadsheets. In order to determine the quality of motor actions and develop the ability to evaluate motor activity, it is necessary to analyse kinematic and dynamic characteristics. Today, programs for processing and analysing photo and video files (e.g., Dartfish), internal capabilities for capturing dynamic characteristics of movements (e.g., cyclic locomotion), as well as applications that use sensors (e.g., inertial measurement units – IMUs), accelerometers and the capabilities of devices for monitoring movement and assessing skills are available to solve these problems [22, 43, 44, 64]. The use of artificial intelligence (AI), in particular case-based reasoning (CBR) algorithms, allows for the creation of personalised virtual fitness coaches that provide individualised recommendations based on user data [47]. This can significantly individualise the training process. Control and accounting can be carried out manually or automated (functions of individual programs and applications) with subsequent automatic/routine analysis by the student. This is usually associated with the need for proper photo and video recording. This can be a difficult task requiring the student to organise the classroom or involve outside help carefully. It seems that the section on motor training is the most difficult and important when building a distance course in athletic training. Of course, finding ready-made tool-based solutions that meet different programs' requirements is not easy. This can be solved by using an algorithm in the organisation of motor training (figure 3).

The presented algorithm allows us to consider possible learning scenarios that will differ depending on the level of students' readiness. Each stage can be organised remotely, with minimal teacher involvement and the use of mobile learning tools. At the same time, we adhere to the rule of simplicity, accessibility, safety, and efficiency. It seems that this determines the set of learning opportunities in athletic training, reducing our efforts to demonstrate a certain course that is a product of the limitations of distance learning. We do not see this as a contradiction because we offer our answer to the expediency of developing distance courses in physical education and sports training. Only further testing of the proposed approach will be able to determine its effectiveness, considering the context of its application.

The effectiveness of any training is enhanced by feedback, which is provided by the proper level of three related components – control, accounting, and evaluation. They form a learning monitoring system that effectively manages a distance course. It should be noted that the frequency of control in a distance learning course will be higher than in a traditional learning format. This is due to the need to compensate for feedback, which is complicated by the transactional distance between participants in the educational process. An additional difficulty lies in the impossibility of organising safe motor testing, according to conventional wisdom, in an independent practice setting. We believe that normative limits cannot be applied to motor testing in a distance athletic training course. The monitoring system may include measuring the level of physical activity using accelerometers and specialised applications. Tracking of physical fitness indicators, such as cardiorespiratory endurance (e.g., 20 m shuttle run test), strength (arm flexion and extension), flexibility (sit and reach), explosive leg strength (counter-movement jump), abdominal muscle strength (curl-up), and speed (20 m sprint) can be performed using appropriate testing protocols adapted for self-directed or minimal assistance [43, 45, 46]. Assessment of morphological characteristics (body weight, height, girth, skin fold thickness) can also be integrated into the monitoring system [9, 52]. Its components may include: 1) personal progress in individual motor actions; 2) improvement of efficiency and economy of movements; 3) achievement of the performance specified at the beginning of the course, which can be developed during its passage.

In the first case, measurable characteristics of the effectiveness of motor actions

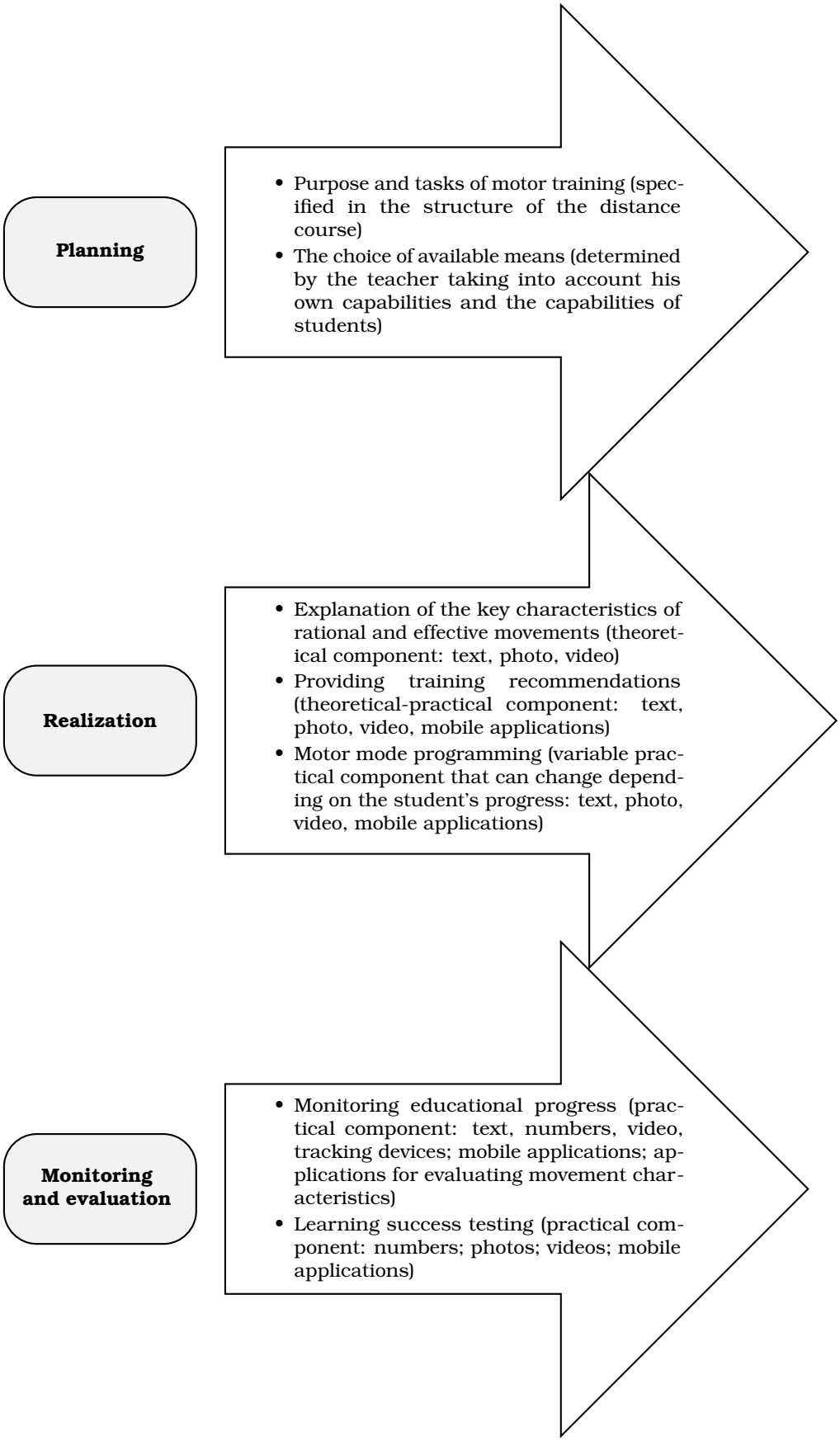

Figure 3: Algorithm of motor learning in a distance course on athletic training.

can be used, which will be recorded manually or with the help of mobile applications used for motor learning. In the second case, the results of a photo or video recording of one's movements are processed and compared (according to specific parameters) with the previous ones or a particular benchmark. For this purpose, programs and applications for analysing motor actions are used. In the third case, general or specific tasks can be achieved while studying the course but are not directly related to learning outcomes – for example, developing specific motor skills, posture correction, etc. Accordingly, the tools for determining performance will be selected in accordance with the objectives. The overall assessment is done by analysing students' acquisition of specific competencies. For this purpose, electronic services are used to conduct testing and evaluate individual works. At the same time, testing can be conducted at different intervals, which depends on the structure of the course or may determine the strategy of its completion, which will change individually (or not) after the completion of a particular topic. The introduction of gamification elements (a system of points, levels, and rewards) can be used to track and monitor students' progress, providing a clear overview of their achievements. An important aspect is the feedback from the teacher, which should be constructive, clear, and relevant [52]. However, suppose the course is not strictly deterministic. In that case, the final test may be the only way to control, including implementing a creative task (e.g., developing a training program).

The devices used for studying at the distance athletic training course should also be noted. In general, it can be any device with Internet access and the ability to work with the specified programs/applications. Tablet computers and smartphones will have an advantage. Their use is central to many studies of distance learning in physical education and sports [43, 56, 57, 66]. They allow to combine the possibilities of working with educational content, capturing photos and videos, accounting and analysing information on learning outcomes, as well as the ability to install applications and use programs online. An additional convenience is their accessibility and ease of use.

The issue of academic dishonesty is a significant ethical concern for a full-fledged online athletic training course. How do we ensure a fair assessment of physical performance and progress? It is also ethically important to ensure equal access and accommodate students' special needs, which may be more challenging to implement remotely for physical activity [7]. Physical safety is paramount in athletic training. How can a distance course adequately monitor exercise techniques to avoid injury or respond to emergencies? Studies have focused only on safety in the digital context, but not on physical safety, which is critical to this topic [3, 20]. Although mentioned, virtual environments have risks (e.g., VR sickness), and their ability to thoroughly simulate and control physical activity and equipment in the real world is not covered [29]. Physical activity data and training monitoring (through wearable devices, etc.) will require explicit, informed consent from participants regarding collecting, processing, and using this potentially sensitive data [2]. Clear rules should be established for digital tools to monitor or evaluate physical activity. Institutions are responsible for developing and managing a framework that ensures user satisfaction and smooth operation of the system.

Further testing of the proposed approach was carried out through a survey involving specialists in physical education and sports (table 2).

Cronbach's alpha coefficient was used to assess the internal consistency of the questionnaire. A high value (>0.82) indicated that the questions in the questionnaire were consistent and consistently measured a common construct (overall course quality assessment). Most experts tend to give positive ratings (4 or 5 points) for most of the questionnaire items, indicating the respondents' fairly consistent position on the distance course's proposed structure. The high mean scores and low standard deviation indicate a consensus among the experts on most issues. The data obtained

Table 2
Results of the survey of specialists on the proposed structure of the course on athletic training (n = 20).

No	Question	M	SD
1.	The proposed course structure is logical and complete	4.40	0.60
2.	Centralised content placement in a cloud service is appropriate	4.30	0.86
3.	Email and cloud services are optimal communication channels	4.30	0.57
4.	The motor learning algorithm is clear for students to implement remotely	4.10	0.45
5.	The proposed assessment system (progress, efficiency, effectiveness) is adequate	4.40	0.60
6.	The use of tablets/smartphones has advantages for this course	4.50	0.69
7.	Building a full-fledged distance learning course in athletic training is possible based on the proposed approach	4.40	0.60

confirm the theoretical feasibility and potential realism of developing a full-fledged distance course in athletic training based on the proposed structure and tools.

Thus, the approach proposed in this study, which includes the definition of the essence and goals, structure, content carriers, communication channels and interaction environments, implementation tools, motor learning algorithm and monitoring system, taking into account the relevant devices, is supported by modern research that demonstrates the potential of technology for the effective organisation of physical training in a distance format. Only further testing of the proposed approach will be able to finally determine the effectiveness of this approach, taking into account the context of its application.

4. Discussion

Discussions of current theoretical and practical research in the context of the possibility of building a full-fledged distance learning course in athletic training serve as a basis for understanding the available technological tools but do not provide a direct answer to the question of the possibility and specifics of building a full-fledged distance learning course in athletic training. For example, distance learning is not explicitly defined for physical education or sports. Distance learning in this area is an evolution of traditional approaches under the influence of digital technologies [69]. In general terms, it is defined as an educational process or the performance of certain practical tasks that take place remotely, in particular with the use of mobile technologies [17, 34, 38, 53]. In this context, distance learning can be interpreted as using technology to provide an educational process with elements of physical education (e.g., teacher competencies) or to perform practical tasks (e.g., health monitoring) without a direct presence in a traditional classroom or gym. This can be either a fully remote format or a mixed format that combines online elements with face-to-face sessions [1, 8, 23, 67]. The key aspect is the technological mediation of the process, which allows one to interact with the content and the teacher and complete tasks remotely. Such learning can also include gamification and social interaction through digital channels [43, 52, 54].

To ensure the functioning of such a distance course, a number of technologies that can be used are being identified:

- cloud technologies that provide flexible access to information and resources necessary for the theoretical part of the course: for posting educational materials,

organising interaction, managing the course, creating cloud-based learning environments, and supporting open learning [51, 55, 56];
- augmented reality (AR) and virtual reality (VR) have the potential to demonstrate the correct exercise technique, visualise anatomical characteristics, or create immersive learning resources [29, 36, 40, 52];
- mobile applications: can be used to deliver content, interactive tasks, collect activity data, and as tools for performing specific practical tasks [22, 46, 57, 69];
- the Internet of Things (IoT) and geolocation are directly related to monitoring the physical condition, loads and progress of students in athletic training and are also considered for creating a system for analysing human health data using smart gadgets (fitness trackers, smart watches) and geoinformation about the movement of an individual [5, 46, 55, 66];
- computer modelling and virtual environments can be used remotely to simulate loads, analyse the biomechanics of movements, or plan the training process [43, 44, 50, 58].

Even though the technological tools necessary for many components of a distance course already exist and are used in education, there is no direct positive or negative answer to the possibility of its creation. There is no consideration of how to remotely provide direct control of the teacher/trainer over the technique of performing complex exercises, providing individualised feedback in real-time, correction of movements, insurance, assessment of maximum physical capabilities, or work with equipment that requires presence (for example, free weights). Although quality assessment in distance education and the modification of questionnaires for this purpose are discussed separately, no specific methods for assessing physical fitness and exercise technique in a distance format have been identified [5, 42, 46].

Technologies have significant potential to support and improve many elements of athletic training in a distance format, but building a "full-fledged" course that would completely replace face-to-face training without losing quality, particularly in critical aspects, seems complicated. The arguments favour such a course are based on the positive results regarding the ability of technology to effectively increase students' motivation and engagement in physical activity [9, 52]. They allow for the delivery of instructional content (video demonstrations are preferable to images for understanding technique), setting tasks, and, importantly, tracking progress in physical activity and some measurable fitness or body composition parameters [46, 64]. Gamification and structured online programs can provide a methodological basis for the course [8]. A positive attitude towards mobile learning among future teachers is a favourable factor for implementing such courses [12]. However, the main challenges arise in the qualitative assessment and correction of exercise techniques, which are fundamental to the safety and effectiveness of athletic training. Although motion analysis applications and the ability to use video recording exist, teachers have expressed concerns about the time required to analyse and provide feedback to a large number of students in detail, as well as the logistical challenges of using sensors [22, 44]. Athletic training often requires visual monitoring, understanding of the load, coordination of movements and, in some cases, manual correction, which is almost impossible to implement entirely remotely with the available technologies described in the sources. The reliability of technical means can also hinder continuous monitoring [12, 45, 58]. The need to increase teachers' digital competence and overcome resistance to technology integration is also important practical aspects that affect the feasibility of such a course [44, 69]. In view of this, it is more realistic at this stage of technology development, according to the sources provided, to create a high-quality distance course that would cover theoretical aspects, training planning, monitoring activity and

progress, and provide visual (video) demonstrations of technique [1, 24, 26, 38, 70]. A full-fledged athletic training that includes detailed assessment and correction of technique may require a hybrid or blended approach, where distance elements are supplemented by periodic face-to-face sessions for in-depth work on technique under the direct supervision of a teacher.

An important factor in understanding the essence of a distance athletic training course is to adhere to digital social responsibility, which focuses on the use of digital practices for the benefit of society. It directly affects students' digital education and indirectly enhances it, initially by increasing the level of digital culture [11]. Ethics in e-learning refers to the principles and standards that govern moral behaviour and decision-making in online education. Ethical principles and standards for managing moral behaviour and decision-making are key in e-learning [61]. It is important to adhere to the six ethical criteria when using e-learning identified by Casas-Roma and Conesa [14]. It was found that teachers in all countries are more concerned about privacy, security and ethics than students [60]. An important ethical criterion is the digital divide and unequal access to and use of digital technologies. This has important social and political implications. The digital divide is caused by several reasons, including cultural diversity, racism, geographic diversity, and diversity in students' educational levels [7, 21, 61]. To promote diversity among students, online learning environments should be designed to allow for various learning approaches. It is crucial to consider the special needs of each student, including any disabilities. Instructors, course designers, and discussion moderators should be resourceful and compassionate.

There are risks of attacks in immersive virtual reality, privacy issues related to eye-tracking technology, and ethical aspects of realism in virtual and augmented reality [3, 20, 29]. There are also concerns about the collection and use of user data, sometimes through end-user license agreements (EULAs) that may restrict rights, including freedom of speech [2, 4, 48]. Creating educational content can be expensive due to the need to upgrade hardware constantly, and there are issues with protecting student and teacher data due to the lack of commonly accepted protocols. Thus, it can be argued that the technological basis for creating a significant part of a distance course in athletic training (theoretical part, visualisation, monitoring of indicators) is present. However, the question of the "completeness" of the course, which requires an integrated approach to the development of physical qualities and control over technique, remains open. Building a full-fledged course will likely require integrating various technologies and developing specific pedagogical approaches beyond the current research's scope.

5. Conclusions

The path of distance learning is long, but not for the field of physical education and sports. The essence of distance learning is that modern electronic tools can satisfy the demand for the creation of full-fledged distance courses. The study was motivated by the anticipation of opportunities to expand physical and sports education by emphasising the issue of distance learning. An attempt was made to substantiate the possibilities of developing distance courses in physical education and sports training. The direction of development of the structure of distance learning in athletic training is formed. The key issues concerning the peculiarities of building a distance course in athletic training are identified. The algorithm of practical training is determined, and the key blocks related to the structure of the distance course are formed. The presented structure of blocks of the training course in athletic training can be applied in practice in distance learning. Reasoned beliefs about the possibilities of creating full-fledged

distance learning courses in physical education and sports training are presented. Based on the survey data, it can be concluded that the proposed concept of a distance course in athletic training has significant potential for successful implementation, as it has received a positive assessment from experts in the field. The obtained results expand the understanding of distance courses in physical education and sports training, focusing on the problems that still need to be solved. Instead, conditions have been created to develop distance learning in physical education and sports consistently.

Of course, there are several drawbacks to this approach. They are related to the over-simplification of the structure of building a distance course and the use of available e-learning tools. Anyone interested in distance education may note the data's lack of clarity and originality. Nevertheless, it seems that for the first time, a solution to the issue of building a distance course in athletic training as a complete, complete, and flexible educational unit has been proposed. Thus, although the concept of a full-fledged distance athletic training course is ambitious, existing technologies and research demonstrate significant potential for implementing many of its components. The main challenge lies in ensuring the quality and safety of technical training without face-to-face contact, which may require either further technological breakthroughs or the integration of distance elements into a blended learning format. Further research should focus on developing and validating technologies for more accurate and efficient remote analysis of learning outcomes and providing automated or semi-automated feedback, which could reduce the teacher's workload and improve the quality of distance learning. It is also important to study the long-term impact of such distance courses on student outcomes and develop guidelines for teachers on effectively integrating technology, considering their digital competence. The experience of organising online learning during crises emphasises the relevance of developing adaptive and reliable solutions for physical education in a remote format.

Data availability statement: Additional materials are available in the open access repository at https://zenodo.org/records/15333260.

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