



ФІЗИЧНА ОСВІТА І СПОРТ

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Digital coaching platforms in women's fitness: effectiveness and methodology

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Abstract: *The purpose of this study is to systematize scientifically grounded approaches to remote coaching for women in competitive fitness and to develop conceptual foundations for online coaching tailored to the physiological and psychological characteristics of women's bodybuilding. Methods.* The study was conducted using theoretical analysis and synthesis of scientific sources, comparative analysis of the functional characteristics of digital platforms, and conceptual modeling. The study's information base consisted of works by domestic and foreign scientists in the fields of sports technologies, training physiology, and the psychology of physical activity, published between 2019 and 2026. **Results.** Based on a comparative analysis of eleven digital platforms, the functional heterogeneity of these platforms was identified, and a four-component typology was developed: specialized coaching solutions, multifunctional digital platforms for monitoring physical activity and nutrition, continuous biometric monitoring systems, and hybrid tools. It was found that no single service covers the full spectrum of pre-competition preparation tasks; however, a scientifically balanced combination of services enables the creation of comprehensive, personalized support. It has been determined that hormonal cyclicality, susceptibility to energy imbalances, and the aesthetic specifics of competitions impose heightened demands on the organization of remote coaching for women. The feasibility



*of integrating wearable devices, heart rate variability analysis, and menstrual cycle tracking into a system to dynamically adjust training load has been demonstrated. The psychological component of remote support is examined through the lens of intrinsic motivation as a determinant of an athlete's sustained commitment to the training regimen. An original theoretical model is proposed to illustrate the interdependence among the technological environment, physiological monitoring, training and nutritional planning, psychological support, and athletic performance. **Conclusions.** The effectiveness of remote coaching in women's bodybuilding depends not on the breadth of the technological arsenal, but on the degree to which the selected tools align with scientifically grounded training principles and the coach's expertise. The balanced interplay of automated analytical systems, personalization algorithms, and real-time communication between the coach and the athlete constitutes the organizational core of the modern online training model.*

Keywords: *bodybuilding, remote coaching, training individualization, wearable monitoring, behavioral support, self-determination theory, coach-athlete interaction, body composition, athletic performance.*

Цифрові платформи коучингу в жіночому фітнесі: ефективність і методологія

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Анотація: *Мета дослідження* полягає у впорядкуванні науково обґрунтованих підходів до дистанційного тренерського супроводу жінок у змагальному фітнесі та розробці концептуальних засад онлайн-коучингу, адаптованих до фізіологічних і психологічних особливостей жіночого



бодібілдингу. **Методи.** Роботу виконано із застосуванням методів теоретичного аналізу та синтезу наукових джерел, зіставного вивчення функціональних характеристик цифрових платформ і концептуального моделювання. Інформаційну базу дослідження склали праці вітчизняних і зарубіжних учених у галузі спортивних технологій, фізіології тренування та психології фізичної активності, опубліковані за 2019–2026 рр. **Результати.** На підставі зіставного вивчення одинадцяти цифрових платформ встановлено їхню функціональну неоднорідність і розроблено чотирикомпонентну типологію: спеціалізовані коучингові рішення, мультифункціональні цифрові платформи для моніторингу фізичної активності та харчування, системи безперервного біометричного контролю і гібридні інструменти. З'ясовано, що жоден окремо взятий сервіс не охоплює повного спектру завдань передзмагальної підготовки, однак їхня науково виважена комбінація дає змогу формувати повноцінний персоніфікований супровід. Визначено, що гормональна циклічність, схильність до енергетичного дисбалансу й естетична специфіка змагань формують підвищені вимоги до організації дистанційного тренерського процесу у жінок. Обґрунтовано доцільність залучення носимих пристроїв, аналізу варіабельності серцевого ритму та трекінгу менструального циклу до системи динамічного коригування тренувального навантаження. Психологічний складник дистанційного супроводу розглянуто крізь призму концепції автономної мотивації як визначальний чинник тривалої залученості спортсменки до тренувального режиму. Запропоновано авторську теоретичну модель, що унаочнює взаємозалежність між технологічним середовищем, фізіологічним контролем, тренувальним і нутритивним плануванням, психологічним супроводом та спортивною результативністю. **Висновки.** Дієвість дистанційного коучингу у жіночому бодібілдингу зумовлена не широтою технологічного арсеналу, а рівнем узгодженості обраних інструментів із науково обґрунтованими принципами тренування та фаховістю



тренера. Збалансована взаємодія автоматизованих аналітичних систем, алгоритмів персоналізації і живої комунікації між тренером та спортсменкою становить організаційне ядро сучасної моделі онлайн-підготовки.

***Ключові слова:** бодібілдинг, дистанційний супровід, індивідуалізація тренувань, wearable-моніторинг, поведінкова підтримка, теорія самодетермінації, тренерська взаємодія, склад тіла, спортивна результативність.*

Problem statement. The digitalization of the physical culture and fitness sector is becoming increasingly clear, as mobile applications, wearable devices, online platforms, and social networks have rapidly transformed from auxiliary tools into full-fledged training support channels. This trend has become especially noticeable in women's fitness, as women account for over 60% of fitness app users [1]. However, personalization of programs, body composition control, and individualized strategies in this area are not wishes but conditions for effectiveness. Women's bodybuilding and aesthetic fitness, focused on precise management of body aesthetics, require systematic methodological support, which digital platforms are theoretically able to provide. However, despite the widespread introduction of digital tools, single evidence-based approaches to remote coaching in this segment have not yet been formed. Research on the effectiveness of online coaching remains fragmented, rarely integrating physiological, behavioral, and digital dimensions, and its results are often contradictory. All this highlights the need to systematize the methodological foundations of digital coaching in female bodybuilding and scientifically substantiate the effectiveness of relevant platforms.

Analysis of recent research and publications. The outlined issues are reflected in a range of scientific publications. A prime example of a narrow yet methodically thorough approach is the article by R. Curtis et al., which examines the use of Instagram as a platform for implementing a well-founded physical exercise program



for young women [2]. The researchers noted that the social network can provide an acceptable level of audience engagement, provided that content is published systematically and two-way communication is maintained with participants. However, the procedural assessment revealed a significant limitation: the platform does not provide mechanisms for deep, individualized adaptation of the load, which calls into question its suitability as an independent coaching tool for contingents with differentiated fitness goals. In addition, the authors noted a gradual decrease in engagement (from 88% to 56%) at the end of the program, which indirectly indicates the difficulty of maintaining long-term motivation only through social content without personalized support [2, p. 5]. While R. Curtis et al. considered Instagram primarily as a channel for communication and broadcasting exercises, C. A. Figueroa et al. investigated conversational digital trainers for Spanish- and English-speaking women, emphasizing that even automated systems are perceived by users as a source of emotional support that can replace friends or family in moments of lack of motivation. However, ensuring data privacy and taking into account linguistic and cultural characteristics are critical conditions for success [3].

Both works [2; 3] agree in concluding that gender, language, and sociocultural context significantly influence the adoption of a digital coaching tool, although methodologically the first [2] relies mainly on quantitative procedural evaluation, and the second [3] on a qualitative, user-centered approach to design.

The issue of motivation and commitment to exercise through digital platforms was examined in detail by J. Yang and J. Königstorfer, who analyzed the determinants of fitness application use and the role of gamification elements in shaping intentions for physical activity [4]. Their results demonstrate that the habit and the expected effectiveness of the application are stronger predictors of engagement than the mere presence of game mechanics. Gamification only moderately enhances short-term intentions, and its effect depends significantly on the user's initial motivation level. It is especially important that the authors found gender differences, because women are



more likely to focus on habit maintenance and behavioral control, while men are more likely to focus on achieving results and competitiveness. This observation is conceptually important, as it questions the idea of the universality of digital behavioral mechanisms [4]. Similar conclusions can be found in the systematic review by G. Al-Swayed et al. on mobile interventions for middle-aged women during menopause. Despite the moderate effectiveness of mobile programs in the short term, long-term maintenance of physical activity remains problematic, and mechanisms for retaining participants in programs are still described only fragmentarily [5].

Thus, both Y. Yang and J. Koenigstorfer [4] and the authors of this systematic review [5] actually identify the same scientific gap – a lack of understanding of how digital tools support women’s motivation not over a few weeks, but over a long training cycle.

The problem of the duration of the effect is even more acute in strength training. For example, L. Carlson, comparing the short-term effectiveness of supervised online training and traditional classes in the gym, found that effort intensity is maintained when switching to a virtual format [6]. This is a strong argument for online coaching from a physiological feasibility standpoint. Still, the authors themselves warn that the sample size was small and the observation period was short. Comparing the results obtained with the study of the effect of online training under the guidance of a trainer for female participants of the Immunity Fit Club, a certain convergence can be observed. Remote support does have a positive effect on muscular endurance and body composition [7], but again, these are mainly short-term adaptations. In addition, works [6; 7] practically do not analyze the psychological component of the training experience, focusing mainly on physiological indicators.

The above-mentioned gap is partially addressed by the study by C. Gjestvang et al., which compared in-person and mobile coaching in terms of their impact on psychosocial factors related to training adherence in inactive obese women [8]. The results showed that the mobile format, with an appropriate communication structure, is



not inferior to face-to-face support in terms of its impact on self-efficacy and intrinsic motivation. At the same time, the researchers emphasize that the complete replacement of human interaction with digital tools remains questionable, particularly regarding emotional support and long-term behavioral modification [8].

One of the most conceptually significant contributions to the understanding of evidence-based coaching is the article by H. Wackerhage and B. J. Schoenfeld. The authors justify the need for personalized, science-based training plans for various goals, ranging from sports performance to general health [9]. Their key argument is that without individualization, any program (digital or traditional) remains an average model that fails to account for the athlete's biological variability. This is why modern digital platforms are increasingly integrating wearable technologies, HRV monitoring and adaptive load algorithms [9]. Important in this context is the study by J.-P. Morin et al. on HRV-oriented remote coaching within a 6-week strength program, which attempted to combine online support with biofeedback [10]. This approach seems methodologically promising, as it allows for load adjustment based on objective physiological indicators rather than solely on the athlete's subjective feelings. However, the short observation period and unclearly defined sampling criteria significantly limit the ability to extrapolate the results.

Such theoretical positions are partly supported but also problematic, according to A. Rukstela et al., who, using a qualitative approach, showed that coaching strategies in bodybuilding do not always align with evidence-based recommendations [11]. It is the comparison of the works of H. Wackerhage and B. J. Schoenfeld with A. Rukstela et al. [10; 11] reveal one of the key contradictions of modern digital coaching - there is a significant gap between the normative model of evidence-based practice and the real practice of coaching in bodybuilding. A. Rukstela et al. note that bodybuilding coaches often rely on practical experience, recommending high-protein nutrition schemes, cardio on an empty stomach and a significant amount of low-intensity cardio, the



effectiveness of which is not always sufficiently confirmed by modern evidence-based studies [10].

In female bodybuilding and other areas focused on body aesthetics, this poses additional risks because digital platforms, in this case, serve not only as a means of communication or monitoring but also become an environment for remote control of complex physiological processes. However, no unified methodology for such support in the digital space has been identified.

The technological aspect of digital coaching is discussed in detail in the work of S. Krugly and J. Tucker, dedicated to the datafication and digitalization of coaching practice in CrossFit. The authors observed how coaches integrate digital data into everyday coaching practice and reached a not entirely obvious conclusion. Digital monitoring often becomes an end in itself, gradually displacing the qualitative interaction between coach and athlete. In other words, excessive fixation on numbers, namely repetitions, calories or indicators of wearable devices, can reduce the significance of subjective body sensation and individual coaching analysis [12]. This position echoes the study by B. Bennett and C. Szedlak, which emphasized that online and distance coaching require not only technological equipment but also the development of fundamentally new pedagogical competencies in the coach [13]. At the heart of the approach is the idea of facilitation and self-determined learning, in which the coach is no longer solely a translator of knowledge but acts as a navigator in a complex digital information environment [13]. Despite differences in methodological approaches, both studies [12; 13] criticize technological reductionism, so the effectiveness of digital coaching cannot be reduced to the mere presence of an application or an analytics system.

In Ukrainian scientific literature, this issue is also attracting increasing attention. Thus, T. Moshenska, N. Dolgoplova, and M. Sorochynska focus on the general aspects of using online platforms and fitness applications to form a healthy lifestyle [14]. In turn, V. Derii and O. Timasheva emphasize the features of building personal



classes using digital technologies and the characteristics of educational platforms for fitness trainers [15]. Both studies [14; 15] are important for understanding the domestic context of digitalization in the fitness industry, but are mostly descriptive and do not offer a systematic analysis of the effectiveness of specific digital coaching strategies for women's fitness. In addition, V. Derii and O. Timasheva draw attention to the insufficient level of digital literacy among trainers and the lack of standardized training for specialists to work with high-tech tools for remote support, which can significantly limit the practical effectiveness of even high-quality digital platforms [15].

Highlighting previously unresolved parts of the general problem.

Summarizing the results of modern research, several fundamental methodological trends can be outlined. First, the vast majority of studies use short-term programs and do not track effects beyond 12–16 weeks, although adaptive processes in strength and bodybuilding training take much longer to develop. Second, most scientists study either general female populations or mixed samples, in which the specifics of female bodybuilding are not analyzed separately. Third, there is an imbalance between the study of the technological side of digital coaching and its methodological content, because scientists are much more likely to study the functionality of platforms than the logic of building the training process, the principles of load progression, or pedagogical models of interaction between the coach and the athlete. Fourth, there are practically no studies that comprehensively combine the physiological, behavioral, and digital aspects of digital fitness coaching specifically in women's bodybuilding as a separate sports discipline.

Therefore, despite the active development of digital platforms and the growing interest of the scientific community in online fitness coaching, the methodological issues and the proven effectiveness of remote support in women's bodybuilding remain insufficiently researched. This necessitates systematizing modern approaches to digital coaching and further scientific substantiation of the methodological principles of remote support in women's fitness and bodybuilding, where the combination of digital



monitoring, behavioral support, and evidence-based training strategies requires a comprehensive rethinking.

Formulation of the objectives of the article (task statement). The purpose of the article is to systematize modern approaches to digital coaching and to theoretically substantiate the methodological principles of remote support in women's bodybuilding, a specific area of competitive fitness that requires a complex combination of digital monitoring, behavioral support and individualized training strategies. To achieve this goal, the following research tasks have been identified: 1) to conduct a theoretical analysis of digital coaching platforms in terms of their suitability for supporting women in bodybuilding; 2) to summarize evidence-based approaches to online coaching based on physiological and behavioral criteria; 3) to outline the theoretical principles for building an effective model of remote coaching in women's bodybuilding.

Presentation of the main material of the study. The rapid development of information and communication technologies in sports and physical culture has led to the emergence of a qualitatively new segment of sports coaching: digital remote support for female athletes. In the context of women's bodybuilding, a specific branch of competitive fitness with complex training requirements, digital platforms are gaining particular importance as a means of integrating training, nutrition and psychological support into a single, cohesive toolkit.

Theoretical analysis of the current market for digital coaching solutions allows us to distinguish several categories of platforms used in the training of female athletes: specialized online coaching platforms, multifunctional fitness applications with artificial intelligence (AI)-based analytics, integrated wearable monitoring systems, and hybrid solutions that combine automated tracking with live communication with a coach. Each of these categories employs distinct functional strategies and addresses the different needs of female athletes, depending on their level of training, goals, and phase of the training cycle.



Among the platforms that have become widespread in women's fitness and bodybuilding, Trainerize, MyFitnessPal, Whoop, TrainingPeaks, Cronometer, Mindbody and Apple Fitness+ deserve special attention. Promising tools for remote support are also TrueCoach, My PT Hub, CoachAccountable and Virtuagym, which implement the concept of technologically mediated coaching. Within the framework of this approach, the digital platform serves not only as a means of transmitting information but also as an integrated environment for interaction between the coach and the athlete, providing personalized management of the training process, monitoring of indicators and remote feedback. According to K. Bennell et al., participants who received SMS support and digital feedback while performing a home exercise program demonstrated a higher level of commitment to training than those who performed the program without additional digital support. In particular, the average exercise adherence score in the digital support group was 16.5 points, compared to 13.3 points in the standard support group. Participants in the digital support group also performed exercise more frequently [16]. The results indicate a positive effect of interactive digital support on regular exercise program completion and motivation for physical activity.

A comparative description of the functionalities of digital platforms and monitoring tools, and their potential benefits for female bodybuilding, is presented in Table 1.

Table 1

Comparative characteristics of digital coaching platforms in female bodybuilding

Platform	Main functions	Platform type + interaction format	Monitoring tools	Benefits of female bodybuilding
TrueCoach	Sending individual training programs, video	Specialized online coaching platform.	Watch workout videos, progress	Provides personalized feedback on



Platform	Main functions	Platform type + interaction format	Monitoring tools	Benefits of female bodybuilding
	demonstration of exercises, trainer comments, messaging and tracking training performance		photos and workout diary	exercise technique and supports ongoing interaction between the coach and client outside of training sessions
TrainingPeaks	Microcycle and mesocycle planning, training diary, training load analysis, acute and chronic training load modeling	Mostly asynchronous	GPS tracking, heart rate, power, and pace; integration with Garmin, Wahoo, and other sports devices	Provides objective control of training load in the preparatory and pre-competition periods and helps optimize the recovery of female athletes
CoachAccountable	Goal setting, regular client reports, automated reminders, questionnaires, habit and progress tracking	Specialized online coaching platform.	Customized progress metrics, self-monitoring journal, habit tracking	Supports systematic control of regimen adherence and uses behavioral support tools for long-term client support
Mindbody	Online training registration, online classes, CRM functions for trainers and studios, marketing tools	Asynchronous	Attendance tracking, payment and schedule management	Provides client base management, organization of online classes and coordination of group programs in



Platform	Main functions	Platform type + interaction format	Monitoring tools	Benefits of female bodybuilding
				the field of fitness and wellness
MyFitnessPal	Calorie and macronutrient tracking, food database, barcode scanning, nutrition monitoring	Specialized online coaching platform.	Manual data entry, barcode scanning, integration with wearables and fitness services	Provides convenient daily nutrition control and has a wide product base, which facilitates the use of the platform by users of different levels of training
Cronometer	Micronutrient analysis, calorie and macronutrient tracking, biomarker and nutritional monitoring	Mostly asynchronous	Manual data entry, synchronization with Fitbit and other fitness services, and personalized goals in the premium version	Provides a detailed analysis of the micronutrient composition of the diet and can be used to control nutritional support during weight loss programs
Apple Fitness+	Structured video training, real-time training metrics display, Apple Watch integration	Organizational and communication platform.	Monitoring of heart rate (HR), energy expenditure, activity indicators, and training metrics via Apple Watch	Provides access to structured physical activity programs and can be used to support the training regimen between personal coaching sessions



Platform	Main functions	Platform type + interaction format	Monitoring tools	Benefits of female bodybuilding
Whoop	Heart rate variability analysis, sleep and recovery monitoring, physiological monitoring and journal self-monitoring	Synchronous and asynchronous	Wearable bracelet with 24/7 monitoring of heart rate, SpO ₂ , sleep, and recovery indicators	Enables assessment of the level of recovery and adaptation to loads, as well as taking into account individual physiological indicators during the planning training process
Trainerize	Individual training programs, video library of exercises, nutritional recommendations and chat between trainer and client	Multifunctional fitness application for nutritional self-monitoring.	Integration with Apple Watch, Fitbit, Garmin; progress photos; physical activity monitoring	Provides a full cycle of digital coaching and supports communication between the coach and the client at all stages of training
My PT Hub	Individual training and nutrition plans, a video library of exercises,	Asynchronous	Progress tracking, anthropometric measurements, photo journal	Provides integrated management of training and nutritional support for clients and supports personalization of the digital coaching service



Platform	Main functions	Platform type + interaction format	Monitoring tools	Benefits of female bodybuilding
Virtuagym	CRM functions, invoicing and personalization of the trainer brand	Multifunctional nutritional monitoring application.	Anthropometric monitoring, training metrics, integration with Apple Health and Google Fit	Combines club and remote support for clients, supports the teamwork of coaches and uses gamification elements to increase user motivation

Source: author's own development.

A comparative analysis of modern digital platforms indicates a variety of approaches to organizing online coaching, ranging from automated monitoring of physical activity to personalized coaching support. At the same time, the effectiveness of using such platforms in female bodybuilding is determined not only by the functional capabilities of digital platforms but also by the ability to account for the specific physiological characteristics of the female body. In this regard, remote coaching in female bodybuilding is complicated by several specific physiological factors that must be taken into account when developing digital support models.

Firstly, the female endocrine system is characterized by cyclical variability in the hormonal background, which directly affects muscle strength, recovery, injury risk and the athlete's emotional state. Investigating the influence of the menstrual cycle on sports performance, A. Meignié et al. argue that hormonal fluctuations can affect certain parameters of neuromuscular function, strength indicators, load perception and recovery in female athletes. In particular, estrogen-dominant phases of the cycle are associated with more favorable conditions for the expression of strength and neuromuscular coordination. In contrast, in the luteal phase, some female athletes



experience increased fatigue and changes in tolerance to training load [17]. Digital platforms can account for such patterns through menstrual cycle tracking and adaptive load planning, providing a qualitatively higher level of individualization than traditional standardized programs.

An additional challenge remains the need to account for changes in leptin, thyroid hormones and sex steroids during the pre-competition period, which is especially characteristic of female bodybuilders during prolonged calorie deficits. In this context, digital platforms enable prompt correction of calorie intake and training volume based on daily biometric monitoring.

Second, Relative Energy Deficiency in Sport (RED-S), as described in the International Olympic Committee consensus, is considered a common risk in sports that involve prolonged periods of energy restriction and body composition control [18]. In female bodybuilding, the risk of developing RED-S may increase during competition preparation due to prolonged caloric deficits and high training volume. The use of digital nutrition monitoring, combined with the analysis of biometric indicators, including resting heart rate, heart rate variability and sleep parameters, creates opportunities for early detection of signs of insufficient recovery and energy deficiency and for timely correction of the nutritional strategy in a remote format.

The behavioral dimension of remote coaching also assumes particular importance in female bodybuilding, where the psychological pressures of a competitive environment, demands for appearance, and chronic stress from dietary restrictions create a specific psychological risk profile. Self-determination theory, adapted to the context of digital and behavioral interventions in health and physical activity by P. J. Teixeira et al., postulates that sustained motivation to train arises when three basic psychological needs are met: autonomy, competence, and connectedness [19]. Digital platforms with built-in features for tracking progress, gamification, and social support can systematically meet these needs and promote autonomous, rather than externally controlled, motivation.



Cognitive-behavioral components of online coaching, including goal setting, self-monitoring, and self-control, are effective in maintaining regular exercise. This thesis is supported by the results of a study by R. A. Krukowski, namely, interventions that include digital self-monitoring of behavior are more effective than traditional methods of motivational support, and the effect increases when self-monitoring is combined with personalized feedback from the coach [20].

The theoretical model of digital coaching in female bodybuilding integrates the provisions of several scientific disciplines: sports physiology, behavioral psychology, learning theory, and information technology. The core of this model is the principle of individualized adaptability, i.e., the system's ability to dynamically adjust training and nutritional parameters in response to the athlete's current biometric and behavioral data.

The methodological basis of this approach is a structural-functional analysis of the interaction among the coach, the athlete and the digital platform, in which technology serves as an active component of the coaching environment.

The concept of the “quantitative self”, operationalized through wearable technology and mobile tracking, forms an empirical basis for making coaching decisions in a remote format [21]. When the coach receives objective data on the quality of sleep, heart rate variability (HRV), calorie balance and dynamics of the athlete's strength indicators, subjective assessments of well-being are supplemented with quantitative indicators, which reduces the likelihood of erroneous decisions and allows for the formation of evidence-based recommendations.

Further development of digital coaching is associated with the implementation of AI and machine learning technologies. AI algorithms that analyze training datasets and detect individual recovery patterns can be used to predict a possible plateau and recommend optimal load variations. Studies by Y. J. Oh et al. and A. Aggarwal et al. confirm that AI personalization increases the effectiveness of fitness programs and reduces the failure rate compared to standardized approaches [22; 23]. For female

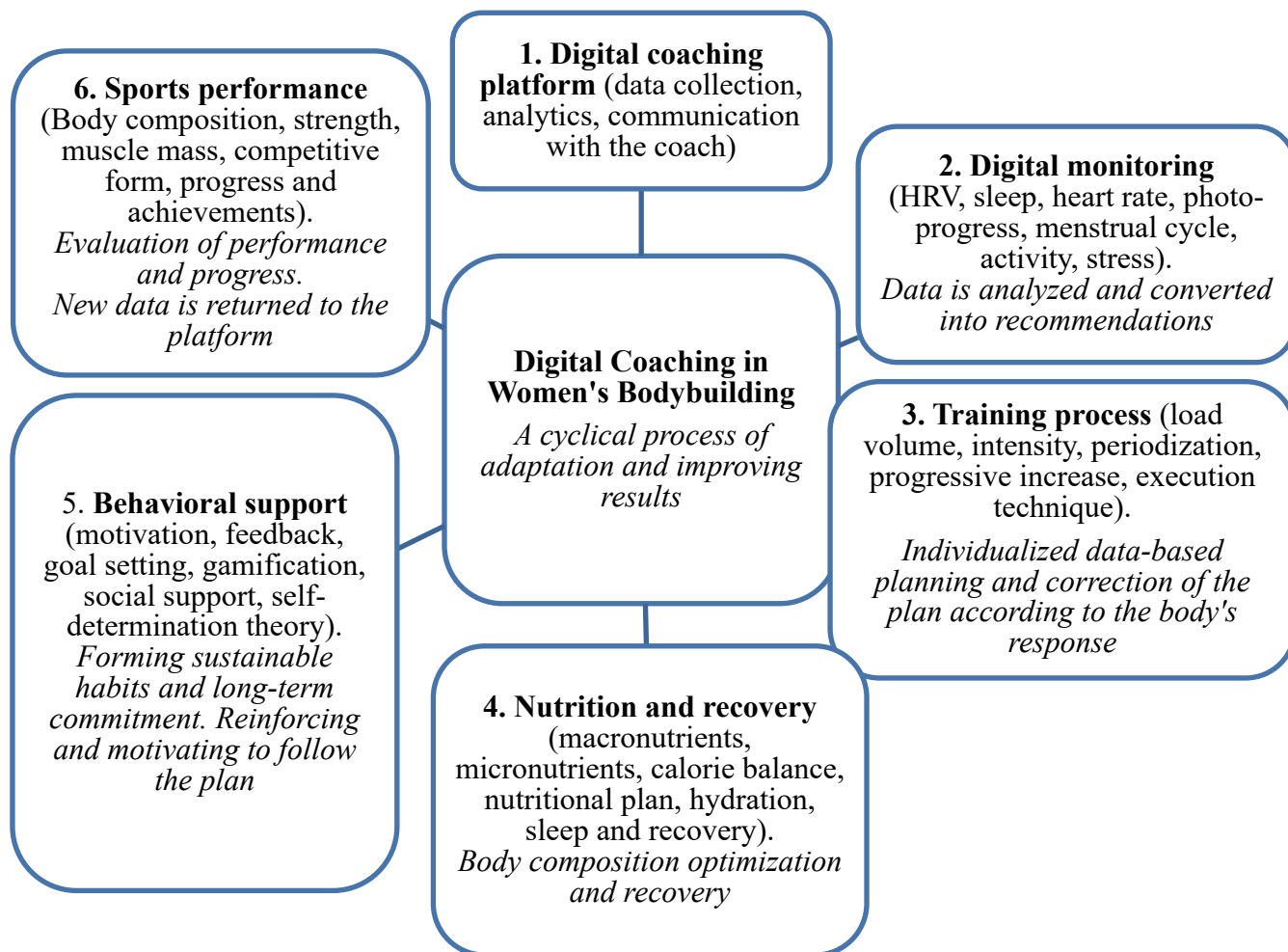


bodybuilding, where pre-competition training requires precise management of body composition and peak form, this level of analytics becomes paramount. The communication component of digital coaching is implemented through asynchronous (chat, video recording, training comments) and synchronous (video calls, online consultations) interaction channels. The optimal frequency and format of communication depend on the phase of training. Thus, in the pre-competition period (peak week), the frequency of contacts increases significantly, while in the base mesocycle, weekly feedback is sufficient. Social support theory confirms that a sense of support and connection with the coach is an independent predictor of adherence to the training program, underscoring the importance of a high-quality communication component in any digital coaching platform.

Therefore, the effectiveness of digital coaching in women's bodybuilding is determined not by individual technological solutions, but by the holistic integration of training planning, biometric monitoring, nutritional support, behavioral support, and communication interaction between the coach and the athlete. The combination of these components forms a multi-level system of remote support, within which digital platforms act not only as a control tool, but also as an environment for adaptive management of the training process. The generalized structure of such interaction is presented in Figure 1.

Figure 1

Digital coaching model in women's bodybuilding



Principles of the model: continuous adaptation cycle, data-driven individualization, improved results, prevention of injuries and overtraining.

Source: author's own development.

The generalized model of digital coaching in female bodybuilding (Fig. 1) demonstrates that modern digital platforms integrate training planning, nutritional support, biometric monitoring and behavioral support into a single system for remote management of the athlete's training. Such a complex interaction among components creates the prerequisites for improving the efficiency of the training process. It offers several practical advantages of digital coaching over traditional support formats.



Systematization of scientific data allows us to identify the key advantages of digital coaching in female bodybuilding. The primary one is geographical accessibility, when athletes from regions without a developed competitive fitness infrastructure gain access to competent coaching, which is especially relevant in the Ukrainian context. Digital platforms eliminate the barriers of physical distance and time constraints, making high-quality coaching available regardless of location. The second advantage arises from the continuity of monitoring, as wearable devices and mobile applications provide 24/7 tracking of biometric indicators, which cannot be replicated in face-to-face training.

Cost-effectiveness is another significant advantage, as online coaching can be cheaper than in-person training while maintaining or even improving the quality of support through systematic tracking [24]. Finally, documenting progress on digital platforms creates a detailed database of training and nutritional data, enabling retrospective analysis and optimization of long-term training strategies.

Along with the advantages, the theoretical analysis revealed significant limitations of remote coaching. The key one is the inability to physically correct exercise technique in real time. In power sports, proper technique is critical for training effectiveness and injury prevention, but even high-quality video cannot fully replace the presence of a coach. Another limitation concerns digital literacy, as the effective use of coaching platforms requires a certain level of technological competence from both the coach and the athlete. Finally, the risk of digital addiction and excessive self-monitoring may negatively affect the psychological health of some female athletes, forming a dysfunctional orientation to numerical indicators, which may distort the intuitive perception of one's own body [25].

Several technological trends determine the prospects for the development of digital coaching in female bodybuilding. Advances in AI algorithms will create opportunities for fully personalized, adaptive planning based on individual biometric profiles. The integration of computer vision technologies into mobile platforms will



enable automated analysis of exercise technique, partially compensating for the current limitation of the lack of physical correction. The introduction of menstrual tracking as a standard function of digital platforms will create opportunities for systematic load planning that takes into account the phases of the menstrual cycle, a particularly promising direction for optimizing the training of female athletes.

Thus, the results of the theoretical analysis confirm that digital coaching platforms in female bodybuilding constitute a functionally differentiated and scientifically grounded toolkit capable of providing comprehensive support to female athletes across all stages of the training cycle. Effective implementation of the potential of such platforms requires a conscious selection of technological solutions tailored to the individual needs of the athlete and the training phase, as well as competent coaching management of digital data. The combination of automated monitoring, digital analytics and live communication with the coach creates the prerequisites for developing an effective model of remote coaching that aligns with modern approaches to sports training and offers several potential advantages over traditional support formats.

Conclusions. The theoretical study showed that digital coaching platforms constitute a differentiated and functionally powerful toolkit for remote support of women in bodybuilding, integrating training planning, nutritional monitoring, physiological indicator control and behavioral support into a single system. Analysis of leading platforms (Trainerize, TrueCoach, My PT Hub, TrainingPeaks, CoachAccountable, Whoop, Cronometer, Virtuagym) confirmed that none of the presented tools provides comprehensive coverage of all aspects of an athlete's training on their own. Still, their methodically justified combination allows us to approach the model of full-fledged personalized online coaching. It was established that the effectiveness of digital support is determined not by the platform's technological richness but by the quality of its integration with evidence-based approaches to sports training and the coach's pedagogical competencies.



Based on the results of theoretical analysis, a model of digital coaching in female bodybuilding was developed, built on the principle of sequential integration. The digital platform serves as a central organizational environment; biometric monitoring underpins the management of the training process and nutritional strategy; and behavioral support functions as an end-to-end component that mediates the influence of all elements of the system on the final sports result. The proposed model can serve as a conceptual basis for developing practical online coaching programs for female bodybuilding.

It is theoretically substantiated that the specificity of female bodybuilding lies in cyclical hormonal variability, the risk of relative energy deficiency syndrome, the need for precise body-composition management, and the psychological pressure of the competitive environment. All of the above lead to a fundamentally more complex set of requirements for digital coaching than for general fitness programs. Wearable monitoring and HRV analytics technologies enable adaptive exercise planning based on menstrual cycle phases, while AI algorithms provide additional personalization.

The behavioral component of online coaching, theoretically rooted in the principles of self-determination theory, suggests that digital platforms focused on meeting the needs of autonomy, competence, and social support can foster stable intrinsic motivation for training, even in a remote format. At the same time, the analysis of the scientific literature revealed a significant gap between normative models of evidence-based coaching and real-world practices in bodybuilding, indicating the need for a methodological rethinking of approaches to remote support for female athletes.

At the same time, the results of the study outlined the fundamental limitations of digital coaching, such as: the impossibility of direct physical correction of exercise technique in real time, the risk of excessive orientation to digital self-monitoring and quantitative indicators, the dependence of the effectiveness of platforms on the level of digital literacy of the participants in the process, as well as the predominantly short-term nature of most existing empirical studies. These limitations do not devalue the



potential of digital support, but emphasize that an effective model of remote coaching in women's bodybuilding should be built on the synergy of automated monitoring, digital analytics, and live coaching interaction, rather than replacing one with another.

Prospects for further research are related to empirical testing of the effectiveness of specific digital platforms and their combinations in long-term training cycles, development of standardized protocols for integrating menstrual tracking into load planning, study of AI personalization in real pre-competition training, as well as research on psychological support for female athletes as an independent component of remote coaching, which requires separate methodological justification.

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