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CROSS-TRAINING IN COMBAT SPORTS: INTEGRATION OF BJJ, TAEKWONDO AND TRADITIONAL MARTIAL ARTS TECHNIQUES

Summary. *The problem of optimizing highly specialized training in Brazilian jiu-jitsu (BJJ) is due to the fact that, when the emphasis is placed on the intensive development of ground-fighting skills, stagnation or even partial loss of kinematic characteristics inherent to striking styles, particularly taekwondo (TKD), is often observed. Under these conditions, priority is given to the development and scientific-theoretical substantiation of an integrative cross-training model that synergistically combines the principles of BJJ, TKD and traditional martial arts (TMA) with the aim of increasing the overall effectiveness of competitive performance in BJJ athletes. A combination of systematic review procedures and conceptual modeling was used as the leading methodological foundation, providing for a comparative analysis of key biomechanical demands (leverage and work with mechanical advantages in BJJ as opposed to the high-speed striking technique of TKD), characteristics of physiological profiles (V̇O2 max, indices of anaerobic power), and psychophysiological frameworks related to adaptability, arousal regulation and emotional regulation. The obtained results indicate that the purposeful inclusion in the training process of dynamic, high-speed exercises borrowed from TKD leads to an increase in anaerobic power and a reduction in motor response latency, which is significant for phases of explosive effort characteristic of offensive and counteroffensive actions in BJJ. At the same time, it was found that elements of TMA, structurally oriented toward*

discipline, rigorous regulation of motor patterns and high cognitive demands (maintenance of sustained attentional focus, preservation of emotional balance in a stress-inducing competitive environment), contribute to the deepening of psychological resilience and the growth of athletes' subjective self-efficacy. The developed model of cross-training periodization demonstrates the potential for the systematic utilization of the strengths of striking disciplines in the context of BJJ athletes' preparation, which makes it possible to overcome the limitations of monodisciplinary programs, especially in the aspects of specific endurance, speed-strength readiness and cognitive adaptability to a changing competitive situation. The presented materials possess high applied value for sports physiologists, practicing coaches and highly qualified BJJ athletes focused on the universalization of their technical arsenal and the enhancement of the integrity of functional preparedness.

Key words: *cross-training, Brazilian jiu-jitsu, Taekwondo, Traditional martial arts, Biomechanics, Physiological adaptation, Cognitive resilience. Sports science, Integrative approach, Periodization.*

Introduction. The current stage of development in combat sports, largely determined by the evolution of mixed martial arts (MMA), is characterized by a shift of emphasis from narrow specialization toward the formation of universal, multicomponent combat readiness. In the period 2024–2025, a steady increase is recorded in scientific interest in training paradigms aimed at the synergistic integration of various motor profiles and multidirectional kinematic demands [3, 7]. Under increasingly complex competitive conditions, a high-level athlete loses the opportunity to rely solely on dominance in one phase of the bout; competitiveness is determined by the ability to transition efficiently and rapidly between standing position and ground fighting, as well as by pronounced cognitive and psychophysiological resilience that ensures stable decision-making under stress [10; 11].

Brazilian jiu-jitsu (BJJ) traditionally forms a specific model of motor activity based on the maximization of grip strength, the use of leverage principles, and the prioritization of positional control on the ground [1]. Preparation in this combat sport conditions the formation of a unique physiological profile, within which high muscular endurance acquires dominant importance, expressed especially in the trunk extensors [4], as well as substantial values of maximal oxygen uptake ($\dot{V}O_2$ max), which in competitive cohorts can reach 42–52 ml/kg/min [2]. At the same time, the structure of a BJJ match presupposes the presence of multiple intense anaerobic bursts against a background of prolonged submaximal work, which determines a double-peak pattern of energetic demands and imposes increased requirements on both the aerobic and anaerobic components of energy supply [8; 9; 13].

In contrast, taekwondo (TKD) represents a fundamentally different, striking-oriented paradigm of motor organization, in which central importance is assigned to high angular and linear movement velocity, dynamic balance, and pronounced flexibility required for the execution of fast and high-distance kicks [1]. The training process in TKD purposefully develops the explosive power of the lower limbs and minimizes motor reaction latency, thereby forming a different type of neuromuscular specialization compared to BJJ. Traditional martial arts (TMA) complement this spectrum by introducing into the training system not only advanced parameters of strength and balance [5, 17], but also a significant philosophical and pedagogical component that includes discipline, self-control, sustained attentional concentration, and a pronounced potential for reducing anxiety [3; 15]. Thus, BJJ, TKD and TMA constitute a set of largely complementary motor and psychophysiological models.

Despite the obvious mutual complementarity of these disciplines, a systematized methodology that ensures optimal transfer of kinematic characteristics (TKD speed, flexibility and motor control cultivated in TMA) into the strictly specific competitive context of BJJ remains insufficiently developed.

The existence of individual studies demonstrating the physiological and psychological advantages of each style [5] does not compensate for the lack of a coherent, empirically substantiated periodization model that would simultaneously take into account the risk of skill interference, the need to preserve a high degree of specialization of the BJJ athlete, and the specifics of the energy-structural organization of the match. This identified imbalance between practical demand and theoretical-methodological support forms a significant scientific gap in the field of sports science, applied kinesiology and the theory of multidiscipline preparation in combat sports [10; 12].

Under these conditions, **the aim of the study** is the development and substantiation of a conceptual cross-training model that unites specialized techniques of Brazilian jiu-jitsu, speed-striking preparation in taekwondo, and the psychophysical as well as pedagogical principles of traditional martial arts, with an emphasis on enhancing the physical, cognitive and psychophysiological effectiveness of athletes competing in combat sports. To achieve this aim, it is proposed, first, to carry out a detailed comparative analysis of the biomechanical and physiological profiles of BJJ, TKD and TMA with the identification of zones of greatest synergistic compatibility and functional complementarity; second, to formulate methodological principles of cross-training periodization that ensure the targeted and effective transfer of motor qualities (speed, flexibility, endurance) into the competitive structure of BJJ; third, to evaluate the potential psychophysiological effects of integrated preparation, including changes in cognitive resilience, emotional regulation and stress resistance of BJJ athletes.

The scientific novelty of the study lies in the presentation of a comprehensive, theoretically and methodologically substantiated cross-training model that integrates fundamentally different motor profiles (standing position and ground fighting) into a single system aimed at forming a homogenized competitive potential while preserving the key advantages of each discipline.

As the author's hypothesis, the assumption is considered that the

systematic integration of BJJ techniques (leverage, strength dominance and positional control) and TKD techniques (speed and flexibility components of the motor act) within a single training cycle, supplemented by the psychophysiological and disciplinary frameworks of TMA (attentional focus, self-regulation, structured discipline), leads to a statistically significant improvement in the aggregate of sports metrics of the BJJ athlete that exceeds the effects achieved under a monodisciplinary preparation model.

Materials and Methods. Within the framework of this study, a comparative analysis method was applied, aimed at juxtaposing the key biomechanical, physiological and cognitive parameters of three disciplines — BJJ, TKD and TMA — including the analysis of characteristic movement patterns, the structure of the involved energy systems (aerobic and anaerobic power), and the psycho-emotional effects of training exposure.

The selection of bibliographic material was carried out in compliance with heightened requirements for academic rigor and relevance. As sources of information, only peer-reviewed scientific journals indexed in leading international databases (Scopus, Web of Science, PubMed), as well as proceedings of authoritative scientific conferences, were used. In the process of information processing, a complex of theoretical methods was applied. Synthesis and classification were used to systematize disparate data concerning physiological profiles, in particular V̇O2 max levels in BJJ and TKD, as well as to integrate various psychosocial frameworks describing the cognitive and affective demands of martial arts. Modeling and abstraction were employed in the construction of a hypothetical periodization model reflecting the optimal alternation of specialized BJJ load with auxiliary high-speed TKD load and the inclusion of elements of static and dynamic stability characteristic of TMA.

Conceptual modeling was focused on the development of a training protocol oriented toward high-level competitive BJJ athletes. Such a focus is conditioned by the necessity of targeted compensation for the systemic

limitations of monodisciplinary preparation in grappling, manifested in insufficient dynamic flexibility, a deficit of explosive speed in the standing position, and reduced cognitive adaptability when switching motor strategies. In this context, elements of TKD and TMA are considered as instrumental means of increasing overall kinetic efficiency and the level of psychophysiological readiness of the BJJ athlete, without undermining the basic specialized structure of their technical-tactical arsenal. In the analysis of biomechanical profiles, data were taken into account from studies demonstrating the absence of substantial biomechanical differences between BJJ athletes with different preferred fighting styles (for example, those oriented toward guard passing and those specializing in guard play), which indicates a high adaptive potential and the possibility of relatively non-conflicting integration of new movement patterns. Such results confirm that even while maintaining a stable stylistic preference, BJJ athletes must be functionally prepared for a wide spectrum of competitive scenarios, which conceptually and practically justifies the use of cross-training.

Results and Discussion. The results of the analysis demonstrate that cross-training in the context of BJJ athletes' preparation is not reduced to a mechanical summation of training volumes, but represents a complex process of synergistic integration of heterogeneous motor and psychophysiological components. The interaction of different disciplines forms a complementary effect in which physical qualities (strength endurance, explosive power, flexibility) and psychophysiological resilience do not develop in isolation but in mutual support, ensuring a higher level of integral competitive readiness. Such integration makes it possible to correct typical imbalances characteristic of narrow specialization and forms a more adaptive functional profile that meets the demands of a dynamic and variable competitive environment.

A comparison of the biomechanical demands of BJJ and TKD reveals their seemingly polar orientation, which, under methodologically structured integration, is transformed into a source of pronounced competitive advantage.

Brazilian jiu-jitsu is based on the principles of leverage, which enable athletes with lower body mass to effectively control and neutralize larger opponents through precision technique, well-developed grip strength, and prolonged positional dominance on the ground [1]. In contrast, taekwondo is structured around high linear and angular movement velocities, dynamic balance, and continuous motion, which allow strikes to be delivered from distance before the opponent initiates an adequate defensive response [1]. Under such conditions, the transfer of motor skills from TKD to BJJ can be described as a phenomenon of dynamic transfer, in which the speed-strength and flexibility components of the striking discipline are functionally embedded into the kinematic structure of grappling. Although high muscular endurance has been empirically confirmed for BJJ athletes [4], their potential is often limited by insufficient dynamic flexibility and a deficit of explosive speed, especially in the critical phases of transitions from standing to ground, the execution of fast sweeps, or instantaneous transitions to joint locks and choking techniques. The inclusion in the training process of specialized TKD exercises aimed at developing explosive strength of the lower limbs and increasing the dynamic mobility of the hip joints can substantially enhance the effectiveness of such key BJJ elements as rapid guard passing, explosive reversals, and lightning-fast entries into finishing techniques. The level of flexibility required in TKD for the execution of high and fast kicks is directly associated with an increase in the functional range of motion, which is a fundamental prerequisite for building a variable and technically rich guard game in Brazilian jiu-jitsu.

Below, Table 1 presents for illustrative purposes a comparative analysis of the key physical and technical demands in combat sports.

Table 1

Comparative analysis of key physical and technical requirements in martial arts

Indicator	Brazilian Jiu-Jitsu (BJJ)	Taekwondo (TKD)	Traditional martial arts (TBI)
Dominant physical qualities	High strength endurance, especially of the trunk extensors; well-developed grip strength; sufficient level of general and local aerobic endurance.	Explosive power of the lower limbs; high speed endurance; pronounced flexibility of the hip joints; well-developed coordination.	General strength preparedness; static and dynamic stability; good posture and tone of postural muscles; functional flexibility and coordination.
Biomechanical and technical specificity	Predominance of work on the ground; use of lever principles (leverage) and positional control; emphasis on holds, guard passing, sweeps, and transitions to joint locks and choking techniques.	Strike-oriented technique; high linear and angular velocity of strikes; continuous movement and dynamic balance; work in a standing position at medium and long distances with emphasis on kicks to the torso and head.	Structured stances and forms (kata, taolu and others); combination of striking, throwing, and blocking techniques; emphasis on correct position of the torso and center of mass; multicomponent motor patterns developing body control and balance.
Energy requirements	High demands on the aerobic base ($\dot{V}O_2$ max in competitive athletes ~42–52 ml/kg/min); the bout includes numerous short anaerobic bursts against a background of submaximal work (double peak of energetic demands).	Predominance of high-intensity anaerobic intervals with short rest pauses; significant involvement of the alactic and glycolytic systems; sufficient aerobic base to maintain work capacity between rounds and series of actions.	Moderate but prolonged-intensity work; combination of statodynamic loads; development of general aerobic endurance and strength endurance; strengthening of the musculoskeletal system and proprioceptive control.
Psychophysiological emphases	Prolonged concentration of attention under conditions of physical pressure; patience and tolerance to discomfort; tactical thinking and planning of sequences; regulation of arousal level in the struggle for position.	Minimization of motor reaction latency; decision-making within fractions of a second; пр	

Source: compiled by the author based on [1–5; 7–12]

Thus, cross-training transforms the nature of physical conditioning of the

BJJ athlete: the dominance of a purely static strength component, typical of monodisciplinary grappling training, is replaced by the formation of more universal kinetic efficiency. Its basis is the coordinated development of speed, flexibility, and precise timing, which ensures not only positional retention and control, but also the capacity for rapid initiation of offensive actions, dynamic transitions, and adaptive responses to the changing configuration of the bout.

The physiological profile of Brazilian jiu-jitsu is characterized by extremely high demands on the energy supply systems. The mean $\dot{V}O_2$ max value in competitive BJJ athletes is estimated at approximately 49.4 ml/kg/min [2], which corresponds to about the 99th percentile in the general population and indicates the necessity of an exceptional aerobic base. At the same time, a competitive BJJ bout structurally comprises numerous short but maximally intense anaerobic bursts. Observational studies aimed at the development of tests for assessing anaerobic fitness show that the dynamics of a BJJ match are functionally comparable to the repeated performance of 40-yard sprints with minimal rest intervals (about 25 seconds between repetitions) [2]. Within this domain of demands, the key role of taekwondo is revealed as an instrument of targeted anaerobic conditioning. The TKD training process, focused on high-speed and powerful strikes organized according to an interval principle, structurally models and effectively develops the anaerobic power of BJJ athletes. In contrast to nonspecific interval loads, such exercises preserve a complex motor pattern associated with rapid muscle activation and coordinatively demanding actions. The integration of such specific loading contributes to the implementation of the concept of a dual peak of energetic adaptation: on the one hand, the high aerobic base formed by BJJ conditioning is maintained and supported, while on the other hand the capacity for rapid resynthesis of adenosine triphosphate and creatine phosphate and for repeated execution of explosive efforts increases substantially [7, 10, 14]. This, in turn, reduces the risk of premature onset of metabolic fatigue and increases the athlete's resistance to

cumulative fatigue under competitive load (see Fig. 1).

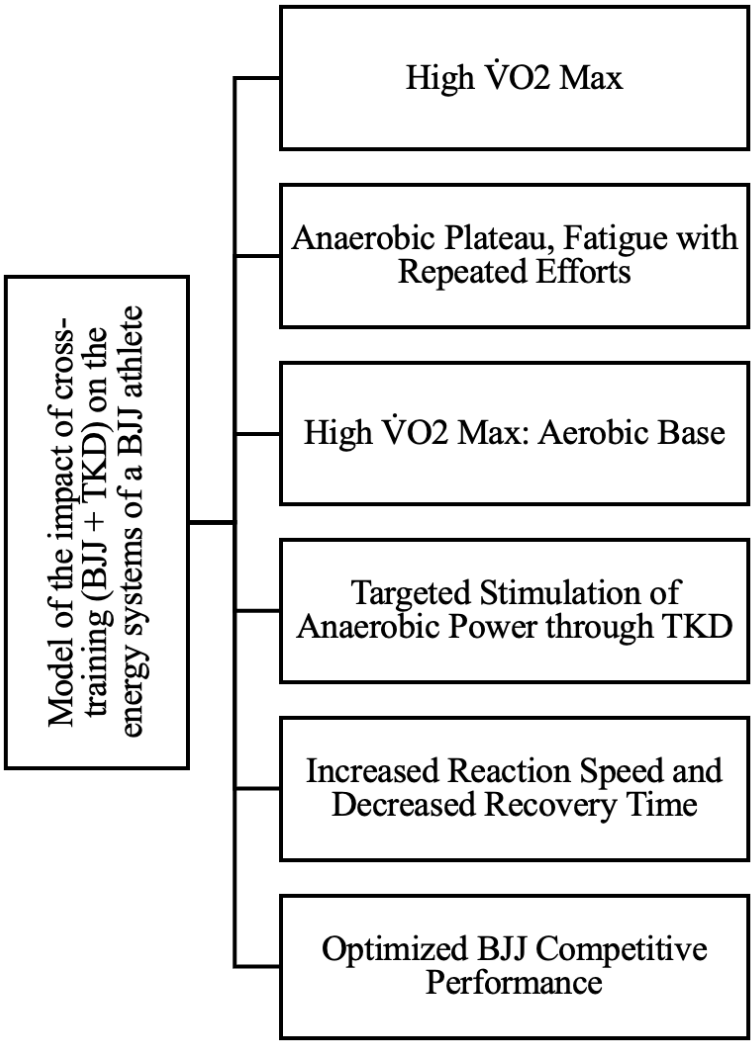

Fig.1. Model of the impact of cross-training (BJJ + TKD) on the energy systems of a BJJ athlete

Source: compiled by the author

Contemporary theoretical models in sport psychology indicate that engagement in martial arts is associated with pronounced cognitive and affective loads, which are closely interrelated with indicators of mental well-being [3]. Integrated combat sports practice requires the maintenance of a stable focus of concentration, high behavioral and cognitive adaptability, as well as the ability to preserve emotional equilibrium under dynamic and stress-inducing conditions [3].

The inclusion of traditional martial arts (TMA) such as karate, wushu, or aikido, which emphasize balance, breathing patterns, and disciplinary regulation [5], in the training process alongside the high-speed, dynamically saturated demands of TKD and the tactical multidimensionality of BJJ functions as a kind of cognitive accelerator. The constant need for rapid transitions from distance fighting strategies characteristic of TKD to close-contact and ground-fighting models typical of BJJ compels the athlete's nervous system to continuously update and switch motor and tactical programs [12-15]. Such loading promotes the consolidation of cognitive flexibility, accelerates information processing, and increases decision-making speed under conditions of pronounced physical and psychological stress.

The psychological effects of cross-training are multilevel in nature. Systematic combat sports practice that includes elements of a mindfulness-based approach and structured stress-management techniques [3] can lead to reductions in anxiety and depressive symptomatology, as well as to a pronounced increase in subjective self-efficacy, improvements in emotional regulation, and enhanced overall psychological resilience. Phenomenological studies note that the very fact of engagement in a bout, which presupposes a combination of active resistance to the opponent with the simultaneous recognition of their agency and autonomy, creates a significant transformational potential for the development of individual well-being [6; 16]. For a BJJ athlete engaged in a prolonged and high-intensity competitive cycle, such psychophysiological training attains an importance comparable to the development of physical conditioning and becomes a key factor in maintaining stable performance at the elite level.

Below, Fig. 2 presents a conceptual assessment of the potential improvement of key psychological constructs as a result of integrated training.

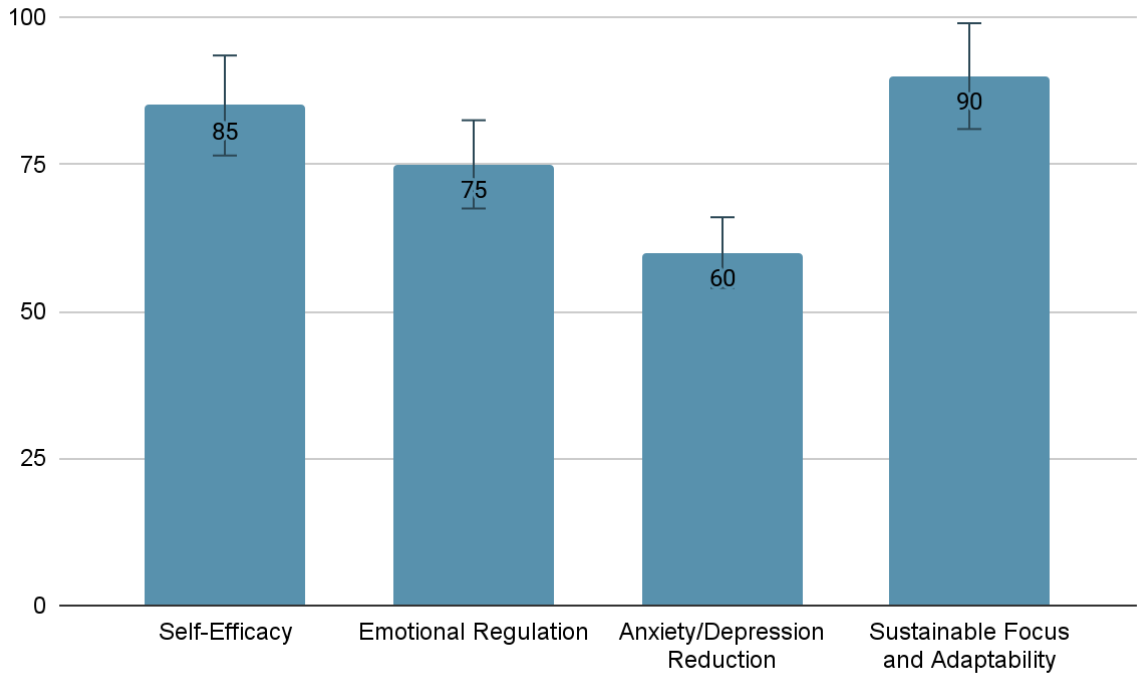

Fig. 2. Conceptual assessment of the potential improvement of key psychological constructs as a result of integrated training

Source: compiled by the author based on [3]

Effective implementation of the advantages of cross-training while simultaneously reducing the risk of overtraining and skill interference is possible only when it is embedded in a strictly structured system of periodization. Since the primary target remains the BJJ athlete, the main specialization must continue to dominate, accounting for approximately 50–80 % of the total training volume, whereas TKD and TMA elements function as targeted auxiliary modules addressing bottlenecks in physical and psychophysiological preparedness.

Within instrumental periodization, the training cycle is structured in such a way that the emphases shift sequentially depending on the objectives of each phase. At the basic stage, priority is given to the development of general endurance, primarily to the improvement of V̇O2 max indices, the formation of a strength foundation, and the deepening of proprioceptive control. During this period, TMA elements are used to enhance dynamic balance and strengthen core musculature [5, 12], while TKD-type training sessions, organized in the format

of high-intensity but relatively voluminous loading, contribute to an increase in aerobic capacity. As the transition to a more specific phase occurs, the emphasis shifts to the development of competitive speed and explosive power: TKD is applied predominantly in the form of short, high-speed interval sessions that simulate the anaerobic bursts characteristic of BJJ bouts [2], whereas within the BJJ block the relative proportion of sparring and tactical-technical drills increases. At the pre-competitive stage, the share of auxiliary styles is purposefully minimized, with the main focus shifting to the tactical component of BJJ and the formation of psychological readiness, including the development of concentration and emotional regulation [3]. TKD elements are retained only in the form of light activation exercises designed to maintain speed characteristics and reaction quickness without introducing excessive fatiguing load.

In Table 2, the periodization of cross-training is described: integration of BJJ and TKD (using a 6-week cycle as an example).

Table 2

Periodization of cross-training: integration of BJJ and TKD (using a 6-week cycle as an example)

Phase (weeks)	Main objectives of the phase	Content of the BJJ block	Content of the TKD block	Content of the TBI/OFP block
1–2 (Basic)	Development of the aerobic base; development of the strength foundation and proprioception; preparation of the musculoskeletal system for more intensive loads.	High-volume technical work: practice of basic positions (guard, mount, side control), positional drills, guard passing at submaximal intensity; light sparring with emphasis on technique.	Interval training of moderate intensity: basic kicking technique, footwork, work on pads/bags at moderate speed; development of general coordination and dynamic flexibility.	Elements of TBI and OFP: stances, exercises for balance and trunk stabilization, static–dynamic positions, breathing practices, general developmental exercises.

3–4 (Specific)	Maximization of interdisciplinary transfer; development of speed–strength endurance and anaerobic power; modeling of the energetic profile of a BJJ bout.	Increase in the proportion of sparring and situational matches (specific sparring); practice of rapid transitions from standing to ground, high-speed guard passes, explosive sweeps and transitions to joint locks and chokes; work at a pace close to competitive.	Short high-intensity interval sessions (HIIT): serial fast kicks; exercises for reaction speed and reduction of motor response latency; modeling of repeated explosive efforts of the sprint-series type.	TBI/cognitive block: exercises for dynamic balance and coordination; short sessions of breathing regulation and mindfulness; development of emotional resilience and attentional concentration under fatigue.
5–6 (Precompetitive)	Tapering towards competition; reduction of the overall volume while maintaining			

In the phase of specific preparation (weeks 3–4), when the inter-disciplinary transfer reaches its highest expression, the weekly distribution of load must be regulated with a high degree of precision. Dominance of BJJ at the level of approximately 65 % of the total volume appears critically important for maintaining and deepening narrow specialization, preserving the athlete's technical-tactical identity, and preventing the dilution of profile-specific motor patterns. The remaining 35 % of training time is expedient to allocate to strictly dosed auxiliary preparation, including conditioning and kinematic TKD and TMA modules. In this block, the emphasis is placed on the development of speed-strength qualities, dynamic flexibility, balance stability, and psychophysiological regulation, which makes it possible not only to consolidate previously formed adaptations but also to enhance their functional transfer into the competitive BJJ context. Such a ratio of loads ensures an optimal compromise between preserving the dominant role of the primary specialization and maximizing the added value of cross-disciplinary components (see Fig. 3).

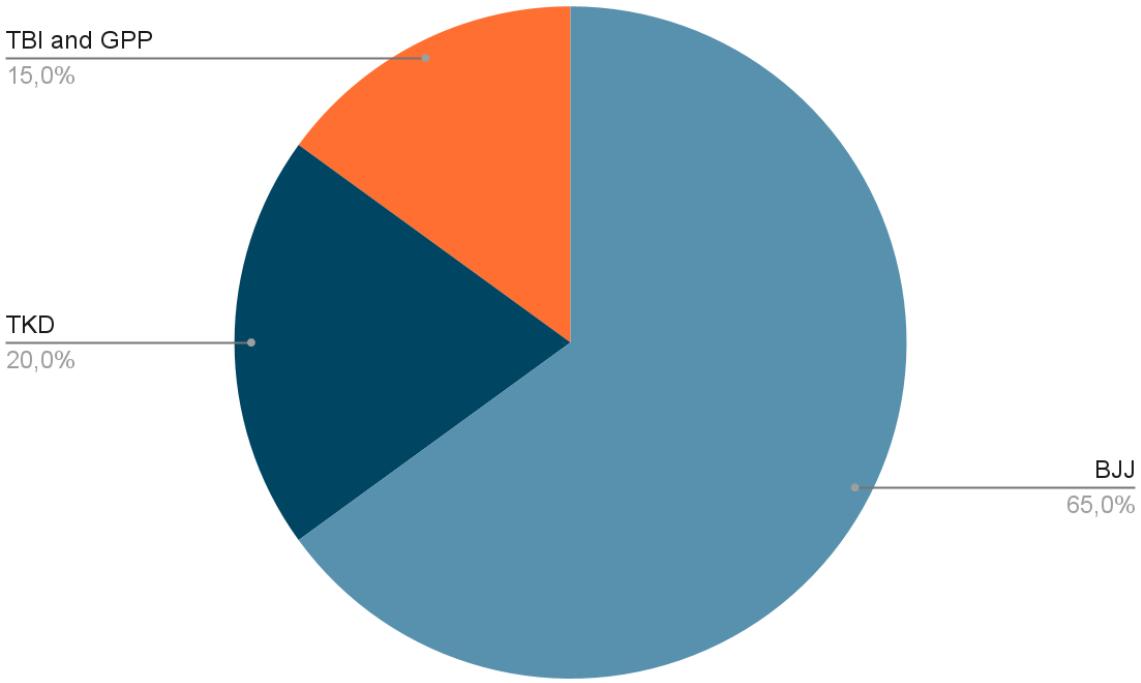

Fig. 3. Recommended distribution of weekly load in the specific training phase (percentages).

Although the results of conceptual modeling provide fairly compelling evidence of the potential synergy of integrated cross-training, its practical implementation encounters a number of methodological and physiological limitations. One of the central barriers is the risk of skill interference. Thus, the stable set formed in TKD, which is oriented toward working at long range and relies on high reaction speed, may come into conflict with the motor and tactical pattern dominant in BJJ, namely the immediate closing of distance to enter a clinch or initiate a takedown. Minimizing this risk requires strict adherence to the principles of periodization and clear differentiation of the target goals of training sessions by type of load and task.

An additional constraining factor is the increased risk of injury. Rapid transitions between modes of high dynamic flexibility characteristic of TKD and pronounced static tension with an emphasis on grip strength and isometric work, typical of BJJ, can generate excessive mechanical stress on the joint-ligament

apparatus. In this regard, elements of TBI that promote the development of basic strength, trunk stability, and proprioceptive control [5, 18] perform an important preventive function by reducing the likelihood of injury through increased structural stability of the musculoskeletal system. Another substantial methodological limitation is the quality and design of the existing evidence base: a significant portion of the conclusions regarding the psychosocial effects of martial arts is based on cross-sectional studies and self-report data [6], which greatly limits the possibilities for reliable reconstruction of causal relationships and for assessing the long-term effects of integrated training protocols.

The further development of the cross-training model under consideration is directly linked to the implementation of longitudinal randomized controlled trials [13, 16]. At the next stage it is necessary to empirically confirm that BJJ athletes who use an integrated preparation protocol demonstrate statistically significant improvements in objective physiological indicators compared with athletes who practice exclusively BJJ. As key criteria, it is advisable to consider an increase in V̇O2 max, improved performance in tests of anaerobic power (for example, a modified 40-yard sprint protocol) [2], as well as improved scores in cognitive tests, including choice reaction time and attentional stability under stress-inducing load.

On the basis of the above, it should be emphasized that effective cross-training is not a mechanical increase in training volume, but the result of a carefully planned, structured process. Such an organization of preparation allows a BJJ athlete, while maintaining a core specialization in grappling, to use the unique kinematic resources provided by TKD, as well as to rely on the fundamental psychophysiological foundations formed by the practice of TBI. As a result, an athlete is formed who not only possesses high technical power and stability on the ground, but is also characterized by speed and tactical adaptability, as well as pronounced psychological resilience at all phases of the bout.

Conclusion. The conducted study has confirmed the high importance of developing and integrating comprehensive methodological approaches into the training process of highly qualified combat athletes. The description of a cross-training model that consolidates the seemingly opposite motor profiles of Brazilian jiu-jitsu (leverage, positional control) and taekwondo (speed, dynamic mobility), while relying on the basic psychophysiological principles of traditional martial arts, demonstrates a pronounced potential for increasing the competitive effectiveness of the BJJ athlete. Within this concept, technical and tactical specialization in grappling is not diluted but reinforced through the targeted use of striking and psychophysical components as functional modifiers.

The results of the literature analysis showed that the integration of high-speed anaerobic loads characteristic of TKD can serve as an effective tool for achieving a double peak state in energy conditioning. This is of fundamental importance for BJJ, since this combat sport simultaneously imposes demands for an exceptional aerobic base ($\dot{V}O_2$ max up to 52 ml/kg/min) and for the ability to repeatedly produce short-term explosive efforts structurally similar to series of short interval sprints. In this way, cross-training provides not only an expansion of the physiological reserve, but also more economical use of energy resources under conditions of competitive stress.

Additionally, the analysis confirmed the significant contribution of cross-training to the development of the cognitive and affective domains. The need for rapid switching between complex motor and tactical patterns of BJJ and TKD creates a powerful stimulus for cognitive adaptability, accelerates information processing, and increases decision-making efficiency. In combination with the psychological attitudes characteristic of TBI (focus, discipline, self-regulation), this contributes to the enhancement of emotional regulation and stress resilience, which is a key component of effective pre-competitive and competitive readiness.

The proposed model of instrumental periodization forms a clear methodological framework for the implementation of cross-training, ensuring the

use of TKD elements strictly in those areas where they enhance the specific kinematic and conditioning aspects of BJJ, rather than duplicate or distort existing skills. While the study conducted within this work is predominantly theoretical and conceptual in nature, further development of this direction requires empirical research with quantitative assessment of motor skill transfer and long-term psychophysiological effects. Such validation is necessary for transforming the proposed model into a fully tested training protocol suitable for standardized use in the preparation of elite BJJ athletes.

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