Decoding coaching. How does a metacognitive strategy-based training program affect coaches' self-regulation skills?

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Abstract

Self-regulation can be understood not only as a feature, but also as a process that learners use to control and organize their thoughts and turn them into skills used in learning. Self-regulated learning relies on the activation and use of metacognitive skills. Meanwhile, metacognitive strategies applied by educators help learners to become aware of their thinking processes during learning. Self-regulation skills are significant when operating in difficult or extreme conditions that require exceptional human abilities and efforts.

Conscious observation and reflection on own activities enables an individual to improve personal metacognitive skills. Observing and reflecting on own behaviour can significantly contribute to changing behaviour, that is, to improving self-regulation processes. The aim of this research is to assess the impact of a metacognitive strategy-based training program on coaches' self-regulation skills.

Results. The facilitation program for improving self-regulation skills had a positive impact on coaches' self-regulation skills. At the end of the program, the total self-regulation index of the coaches increased. The training programme based on metacognitive questioning allowed for enhancing self-regulation skills of experienced coaches. Self-reflection and implementation of metacognitive strategies influenced coaches' cognition, thinking competences and behaviour.

Introduction

Self-regulation is an essential feature of living organisms that allows them to adapt successfully to a changing environment. The positive effect of self-regulation is highly appreciated both in professional activities and in social life, organizing activities, correcting or inhibiting behaviour, responding to different challenges. Self-regulation affects not only personal efficiency [1,2] but also psichological well-being [3,4], learning and academic success [5,6].

Self-regulation skills are significant when operating in difficult or extreme conditions that require exceptional human abilities and efforts. Undoubtedly, high-performance sports can be attributed to such activities. Although the phenomenon of self-regulation is not new and there are researcher-developed self-regulatory educational methodologies and self-regulatory learning concepts, it is a paradox that formal educational practices are still rarely based on these ideas. Education of both young people and adults is generally based on the transfer of knowledge but not on the development of sustainable skills. Although self-regulation is an integral attribute of high achievements, in the field of sports, this topic is only in the beginning of development.

Self-regulation: characteristics and process

Self-regulation is a set of conscious and unconscious processes by which people control their psychological functions, states and internal processes to achieve certain goals [7]. Zimmerman [8] states that individuals not only control but also adapt their feelings, thoughts, actions, motivations, etc. pursuing

their goals. Self-regulation can be understood not only as a feature but also as a process that learners use to control and organize their thoughts and turn them into skills used in learning.Self-regulation is the process of continuous monitoring progress while pursuing a goal, checking results, and redirecting unsuccessful efforts [9]. Thus, efficient regulation of one's own behaviour allows an individual to maintain positive functioning longer and demonstrate higher efficiency.

Researchers emphasise the importance of social relations to self-regulation. Self-regulation is influenced not only by innate biological and cognitive factors but also by the social environment; that is, the behaviour of parents, friends, colleagues, and teachers is important for the formation of self-regulation skills [10]. However, self-regulation skills can be developed and improved by actively managing the individual's own behaviour, planning activities, monitoring their implementation, and correcting their own behaviour if necessary [11]. The effective development of self-regulation relies on monitoring one's own learning or behaviour. By controlling their behaviour, learners collect information about how they learn or perform certain activities, in this way forming knowledge about their understanding. Thus, self-regulation is associated with self-knowledge, the ability to evaluate and improve one's own skills, and the purposeful regulation of one's own activity. The cyclical recurrence characteristic of the self-regulation process includes the following three phases: self-reflection (self-evaluation, self-judgment, self-determination), forethought (task analysis, setting goals, selecting a strategy) and performance (self-control, self-instruction, visualization, creating images) [12]. Self-control and introspection embrace the ability to self-evaluate how assignment is completed. Introspection facilitates the identification of progress and the understanding of what should be corrected [13].

The dilemma of the concepts of self-regulation and metacognition

It must be recognized that even in the scientific literature, the concepts of *self-regulation* and *metacognition* are used ambiguously. Sometimes these concepts are used hierarchically, when metacognition is considered part of the concept of self-regulation, or vice versa. In addition, there are cases when both concepts are used as synonyms. Analysing the theoretical and empirical limits of self-regulation and metacognition, Dinsmore et al. [14] conducted an analysis of 255 research studies and concluded that self-regulation is related to the actions and behaviour of an individual, whereas metacognition embraces cognitive functions, i.e. metacognitive processes are sources of structuring human thinking and regulating behaviour. Metacognitive abilities provide the possibility of expanding one's own understanding of personal experiences and cognitive processes and investigating the processes that serve as the basis for self-monitoring and control of one's own activities.

Thus, Flavell [15] defines metacognition as the understanding of an individual about his or her own mental processes and their management. Rouault et al. [16] characterises metacognition as an ability to evaluate and control one's own cognitive processes. In other words, metacognition is seen as the individual's awareness of his or her own knowledge and understanding of his or her own understanding. Metacognition can be assessed by analysing different human activities, such as learning, performing

specific tasks, making decisions, etc., and manifest itself in different cognitive domains, such as experience, perception, memory.

Metacognitive strategies and self-reflection

Self-regulated learning relies on the activation and use of metacognitive skills. Meanwhile, metacognitive strategies applied by educators help learners become aware of their thinking processes during learning. The application of metacognitive strategies can promote people's thinking about their thinking and decision-making, that is, improve the understanding of their activities and the causality of events, processes and phenomena. Effective reflection on experience requires metacognitive skills that are considered crucial in developing adaptive expertise [17]. Conscious observation and reflection on one's own activities enables an individual to improve personal metacognitive skills. Observing and reflecting on one's own behaviour can significantly contribute to changing behaviour, that is, to improving self-regulation processes.

Studies on teachers' learning experiences show that there is a link between teachers' self-regulation and effective reflection, which enables teachers to become "adaptive experts" [17]. Although the work of coaches is similar to the work of teachers in its purpose and meaning, high-performance sports are characterized by a number of exceptional characteristics and requirements that make high-performance work a specific field of activity. The training of highly skilled athletes requires not only a high level of knowledge from the coach but also the ability to work effectively under conditions of high competition to be resistant to various stimuli, stress and fatigue. The development of sports technology promotes the change in training techniques, the emergence of new equipment and the change in the rules of competition. All this requires constant updating of the knowledge base and improvement of competences.

The results of research on people's ability to learn from experience suggest that people have certain biases that prevent them from taking advantage of the information provided by experience.Such biases may include a tendency to use corroborative evidence, reasons for causality, and ignoring negative information [18]. The results of research [19,20] show that coaches prefer to learn from colleagues, and sports practice shows that coaches start looking for new information when they encounter difficulties when planned training programs do not allow them to achieve the planned results. Considering this, we organized training courses for coaches who work with high-performance athletes, encouraging them to rethink their coaching concepts and empowering them to update their training programs. The purpose of the training courses was to help coaches model and promote their growth-oriented behaviour by improving their self-regulation skills.

A key challenge was to find ways to encourage experienced and high-achieving coaches to improve their practice and explore new coaching paths. Based on the attitude that people can develop in close and interesting to their activities, which can encourage them to invest more mental effort and to focus on learning, the participants were offered to choose the theme of training courses themselves. Through the

application of metacognitive strategies, we helped the course participants structure their own training content and accompanied them during the training courses.

The **aim of this research** is to assess the impact of a metacognitive strategy-based training program on coaches' self-regulation skills. This study attempted to promote the development of coaches' self-regulation skills by promoting their metacognitive activity. By applying metacognitive questioning, we sought to make the coaches participating in the study change their coaching habits in a freer way. The entire facilitation process was based on raising metacognitive questions to help the coaches overcome certain perceived difficulties, encouraging a better understanding of the ongoing processes, the structure, and complexity of these processes, and thus helping them organize their thinking so that in the future, in case of need, they could independently and promptly reorganize their educational practice.

Methodology

Research design. The research on the improvement of coaches' professional competences is based on the concept of a *case study*. According to Yin [21], *"A case study is an empirical inquiry that (i) investigates a contemporary phenomenon in depth and within its real-life context, especially when (ii) the boundaries between phenomenon and context are not clearly evident"*. The *case study* allows in-depth and multifaceted investigation of complex issues in their real-life context [22]. From the perspective of educational sciences, it is important that learners are able to connect the newly acquired theoretical and practical knowledge closely with the knowledge already possessed, projecting new knowledge into specific educational practices and thus forming new knowledge in a real environment. Before the empirical study, a model for the improvement of professional competences based on the development of self-regulation ability was developed. However, each study participant was given the opportunity to choose the context of educational practice in which they would like to improve their coaching efficiency (such as technical training, functional training, socioemotional education, etc.). Training courses for coaches were led following the principle of facilitation; they lasted 12 weeks, and every week, 45–60-minute individual consultations were organised, which were led by the researchers. The idea of training is grounded on the *Theory U: Leading from the Future* [23] and the principle of setting SMARTER goals [24,25].

Following the values and principles of *Theory U*, the individual content of training courses was conceptualized. The *Theory U* proposes a transition from a personal approach, i.e. an individual-oriented approach to a collective approach, i.e. a group-oriented approach for a more sustainable and healthy life. Collaboration grounded on "eco-system awareness" concentrates on solving future-related issues. Such an approach facilitates overcoming unproductive patterns of behaviour that lead to routine and inefficient decision-making and limit the ability to empathize with the needs of learners. The values of Theory U are of extreme significance to training specialists in education because all the activities of these specialists are focused on enhancing and improving educational practice.

From a personal perspective, Theory U allows a systematic view of personal changes and can be understood as the organization of the way of thinking (i), the method of promoting change (ii) and the way of being in connection with the higher aspects of self (iii). The purpose of Theory U is to discover the power of thinking and thinking *together* and to help see what has been unseen before. Fundamental changes start with focusing on how the change maker relates to the system they want to modify and what kind of system they want to create. The principle of an open mind (empathy), an open heart (curiosity) and an open will (courage) helps to get rid of your old identities and prepare for the future arising from yourself or from your relationship with others.

During the first consultation, the researchers familiarised themselves with the experiences, training concepts and philosophies of the research participants as well as their training goals. The coaches were encouraged to reflect and critically evaluate their previous experiences to search for new training paths. The participants were asked to rethink their routine practices and create their own unique learning content foreseeing innovations they would like to implement in their training program. After defining the area of personal development, with the help of researchers, the study participants set the specific goals, actions and detailed steps to the goal based on the SMARTER principle [24,25]. The acronym SMARTER means *Specific, Measurable, Achievable, Realistic, Timely*, *Evaluate, and Reward.* Setting such personal development goals allows evaluating the importance of activity and giving the activity a sense of direction and motivation. Reflections on their new experiences, concepts and discoveries of research participants were encouraged during consultations with them.

Empirical research design. A mixed methods study was chosen to investigate the impact of the facilitation programme on coaches' self-regulation skills and to describe unique experiences in improving their competences. The case study was conducted by applying the research design of concurrent embedded mixed methods [26]. To assess the impact of the applied methodology on coaches' self-regulation capabilities, the study began with quantitative data collection. The collection of qualitative data played a supporting role in interpreting the quantitative indicators and in explaining how the development of self-regulatory skills improves coaches' metacognitive experiences in teaching and training athletes. The research on metacognitive processes was implemented in the following stages:

1. quantitative diagnostics prior to the case study;
2. qualitative research (interview) at the end of the case study;
3. quantitative diagnostics two weeks after the end of the case study;
4. qualitative research (interview) four months after the end of the case study.

Quantitative research. Self-regulation was evaluated with the help of the Self-Regulation Questionnaire (SRQ) [27]. The SRQ is designed to evaluate the processes of self-regulation in developing, implementing and flexibly adapting planned behaviour to achieve goals based on personal self-reflection. The SRQ model is based on the concept of seven steps that determine behavioural and operational (non)success:

1. Receiving relevant information;

2. Evaluating the information and comparing it to norms;

3. Triggering change;

4. Searching for options;

5. Formulating a plan;

6. Implementing the plan;

7. Assessing the effectiveness of the plan.

When completing the SRQ, the research participants expressed their personal opinions by marking the answers that most closely corresponded to their personal preferences. In response to each SRQ statement, the study participants marked one out of five responses ranging from "disagree" (1) to "completely agree" (5). The level of self-regulation is evaluated by summing the estimates of all 63 SRQ statements and is measured as follows:

≥ 239 High (intact) self-regulation capacity;

214-238 Intermediate (moderate) self-regulation capacity;

≤ 213 Low (impaired) self-regulation capacity

Statistical data analysis. The criteria of nonparametric statistics are applied to evaluate the impact of the methodology. The differences between the first and the second study were assessed using the *Wilcoxon Signed Rank Test* when a p value of less than 0.05 was considered statistically significant. However, it is not enough to calculate the *p-value* alone when evaluating the effectiveness of the applied impact measures. Therefore, to evaluate the effectiveness of training, the *effect size* indicators were calculated according to *Cohen's* methodology [28,29]. It should be noted that *the effect size* indicator is valuable in studies with small samples when it is difficult to expect statistical significance of the difference. *Effect size* measurements allow for an objective and reasonable assessment of the change in benchmarks.

To evaluate the internal consistency of the SRQ and sub-scales, Cronbach α coefficients were calculated (acceptable limit> 0.7) [30,31]. The structural validity of the SRQ was evaluated according to the correlation of statements with the subscale coefficient ITC (*Item-total Correlation*) and according to the statement after elimination of the Cronbach α coefficient (α e.t.) [32]. The obtained quantitative data were analyzed using the "Jamovi" program.

Qualitative research. A semi-structured interview was applied for the collection of qualitative research data [33]. Each respondent participated in the interviews twice. The first interview took place after the training program ended (the duration of the interview was approximately 80 minutes on average). The second interview was conducted 5 months later (interview duration was 45 minutes on average). Having received consent from the research participants, every interview was recorded, and a full transcription of

every recorded interview was conducted for data analysis. Qualitative content analysis was used [34], and the obtained data were analysed in an inductive way without applying predefined categories or theoretical models. The analysis was performed using MAXQDA software.

The research participants. Nine coaches of team games and individual sports who had voluntarily agreed to attend the training courses participated in the study. The expertise of the coaches was assessed considering their unique experience: the length of their coaching career, the experience in working with the national team athletes and the achievements of coached athletes in national and international competitions (Table 1).

Table 1 Characteristics of study participants

Name	Sports	Sex	Age (years)	Coaching experience (years)	Representing the national team	Athletes' highest achievement
Arthur	Women's wrestling	Male	46	25	Women's national coach	WC and EC medallists
Michael	Wrestling	Male	34	8	Junior national team coach	WC and EC medallists
David	Taekwondo	Male	47	26	Assistant coach of the national team	NC medallists
Thomas	Basketball (male)	Male	45	14	Youth national team coach	WC and EC medallists
Rebecca	Basketball (female)	Female	53	17	Assistant coach of the girl’s national team	U-20, U-18, U-16 EC winner
Teja	Football (female)	Female	28	7	Women's national team coach	UEFA CL TOP 16, NC winner,
Ruth	Swimming	Female	60	39	Personal coach of Olympic team members	EC medallist, 4th place in the WC, 13th place in the Olympics
Marta	Athletics	Female	53	18	Coach of national team athletes	NC winners and medallists
Dylan	Weightlifting	Male	29	3	Coach of national team athletes	NC medallists

Abbreviations: *EC - European Championship; WC - World Championship; CL - Champions League; NC - National Championship*

The research validity and reliability were ensured in several ways [35]. *Descriptive validity* is achieved through full transcription of the interview texts. *Interpretative validity* is reflected in the use of extracts from “live” interviews of the research participants while presenting research results. *Theoretical validity* is based on presenting real research examples: concepts and phrases of the research participants are used encoding, abstracting and conceptualising the data. *Summative validity* is grounded in researcher triangulation, combining qualitative and quantitative research, which contributes to deeper awareness of the researched phenomenon.

The ethics of research. The research participants received detailed information on the goal and purpose of the study, and the course and procedures were also explained to them. The decision to participate in the research was conscious. The research participants signed informed consent documents, which provided information on the principles of the research and ethics [34,36]. While organising the interview, attempts were made not to cause tension and stress to the research participants, i.e. to ensure the possibility of avoiding vulnerability. Respecting the dignity of the study participants, each of them was informed about the possibility of withdrawing from the research. Respect for the participants’ privacy was ensured following the principles of anonymity and confidentiality. Adhering to the principle of anonymity, it was ensured that no data obtained during the research could be associated with a specific person. Individual pseudonyms were assigned to participants while transcribing the recorded interviews. In accordance with the principle of confidentiality, it is guaranteed that the data collected during the research will be available and stored in special electronic files created for the research and that information will be accessible only to the researchers.

Results

Results of the quantitative research. The facilitation program for improving self-regulation skills had a positive impact on coaches’ self-regulation skills. At the end of the program, the total self-regulation index of the coaches increased from 234.0±13.0 to 248.8±17.5 points ($p<0.05$). Following the scale for self-regulation evaluation provided by the authors of the methodology [27], the self-regulation indicator rose from the moderate level to the high one. The analysis of indicators of self-regulation elements showed an increasing trend in most of the analysed parameters (Table 2). However, statistically significant differences were identified only by analysing the indicators of the subscale *“Searching for options”* ($p<0.05$), and a significant change trend was found in the subscale *“Assessing effectiveness of the plan”* ($p=0.05$).

Table 2 **Changes in self-regulation indicators**

Subscale	X±SD		Wilcoxon Signed Rank Test	***P* value**
	Before training	After training		
Receiving relevant information	3.78 ± 0.43	4.07 ± 0.31	1.54	0.123
Evaluating the information and comparing it to norms	2.95 ± 0,24	2.94 ± 0.35	-0.21	0.831
Triggering change	3.72 ± 0.35	3.89 ± 0.34	1.26	0.206
Searching for options	**4.12 ± 0.32**	**4.56 ± 0.33**	**2.20**	**0.028**
Formulating a plan	3.81 ± 0.54	4.09 ± 0.47	1.07	0.284
Implementing the plan	3.96 ± 0.36	4.16 ± 0.42	1.18	0.236
Assessing effectiveness of the plan	**3.65 ± 0.35**	**3.94 ± 0.36**	**1.96**	**0.050**
Self-regulation (general)	**234.00 ± 12.99**	**248.78 ± 17.48**	**2.07**	**0.038**

The effect size indicators calculated during the analysis of methodology effectiveness showed that coaches' involvement and participation in the training courses had a positive impact on their self-regulation skills (Fig. 1). A considerable change was established in the general evaluation of self-regulation skills (d> 0.8). Analysing the influence of methodology on separate abilities, the most significant impact was identified on *"Searching for options"* (d=1.35), a significant effect was observed on "*Assessing effectiveness of the plan*" (d=0.82), and moderate influence was established in the categories "*Receiving relevant information", "Formulating a plan"* and *"Implementing the plan"* (Fig. 1).

Correlation analysis. Analysing the correlations of self-regulation abilities during the first study, that is, before the training courses, it turned out that the correlation among individual aspects of self-regulation is not strong. A strong correlation was established between the coaches' self-regulation (general) abilities and the implementation of the training plan (r=0.804, p<0.01). When analysing the relationships between self-regulation factors, a statistically significant correlation was found only between the coaches' abilities "Triggering change" and "Evaluating the information and comparing it to norms" (r=0.725; p<0.05).

After the end of the study, during the second survey, it was found that the values of the correlation indicators of many parameters, as well as the correlations between the self-regulation (general) and self-regulation aspects, increased significantly (Table 3). The study showed not only the improvement of self-regulation abilities but also the sustainability of the newly acquired skills. It should be noted that during the second survey, the correlation indicators of "Evaluating the information and comparing it to norms" with other components decreased in comparison with the results of the first research.

Table 3 **Correlations of self-regulation components after the research**

No.	Components of self-regulation	1	2	3	4	5	6	7	8
1	Receiving relevant information	1	-.080	.901**	.877**	.755*	.695*	.720*	.916**
2	Evaluating the information and comparing it to norms		1	.085	-.405	.164	.042	.105	.092
3	Triggering change			1	.717*	.556	.451	880**	.792*
4	Searching for options				1	.662	.606	.657	.807**
5	Formulating a plan					1	.751*	.443	.929**
6	Implementing the plan						1	.174	.681*
7	Assessing effectiveness of the plan							1	.664
8	Self-regulation (general)								1

*Note: r- Spearman correlation coefficients, * $p<0.05$; ** $p<0.01$*

Qualitative research. The analysis of qualitative data allowed distinguishing three qualitative categories that characterize the changes that have occurred during the training courses. The categories describe the coaches' personal experiences related to updating their training program. Four qualitative categories were distinguished, revealing the impact of metacognitive strategies on coaches' behaviour.

Curiosity and openness to innovation. The research disclosed that participation in the training courses triggered the curiosity of coaches. The participants emphasised that meetings with mentors and new discoveries encouraged them to allocate more time to the chosen topic for studies. The behaviour of the coaches was manifested in the interest and the search for new information and knowledge. The coaches began to take additional interest and search for information on the chosen training topic and gained valuable knowledge that was used in training sessions, meetings and conversations with athletes. The new knowledge helped to discover ways to improve training practices. Moreover, thinking and reflecting on how new knowledge can be integrated into routine practice prompted coaches to fundamentally rethink their concept of training. Discussions with the researchers helped the coaches focus on the chosen topic and encouraged them to find ways to turn the original idea into reality.

The coaches noted that consultations with researchers helped them to rethink their experiences, consult and discuss issues that arise. The coaches also gave examples showing that during the training, they not only started to look for new methodological information but also began to communicate more with their athletes, and they became more interested in their stories and experiences. In conversations with their athletes, they wanted to better understand the athletes' own concepts of training to perceive their intentions and motives for behaviour. Undoubtedly, such conversations expanded the coaches' understanding of athletes' expectations and motivation for training. Some participants mentioned that

they “had to get reacquainted” with their athletes. Interest in the personal stories of the athletes and the attitudes of the athletes towards training and sports helped coaches form a deeper understanding of the athlete’s expectations and motives for training and prompted them to rethink the coach-athlete relationship, which contributed to improving relationships and reducing internal tensions.

Recognition of otherness. Data analysis revealed that coaching behavior was characterized not only by increased openness to innovation but also by recognition and acceptance of otherness. The coaches noted that they are satisfied with and appreciate the new learning experience because during the training courses they managed to realize, what they had not had the courage or time before. Typically, coaches base their training practices on “reliable” training methods that are previously tested and trusted by them. The coaches admitted that although they realized that the training process required updating, introducing a new topic into the training practice was a kind of challenge. The training courses encouraged coaches to reflect and think critically and encouraged them to implement innovations in their training practices.

The joint discussions of the coaches of different sports were significant for the recognition of otherness, which made it possible to understand the commonalities of the activities of the coaches working in different sports. One of the essential discoveries of coaches during training was related to their participation in the *focus group* discussion. The coaches emphasized during the interviews that before the joint discussion, they could not understand how it is possible to talk about sports education with representatives of different sports. However, the issues of sports education discussed during the conversation from the perspectives of coaches of different sports allowed each participant to discover common traits linking the concepts of coaches. These discoveries not only led to the openness of coaches to diversity but also helped discover connections between phenomena that previously seemed unfamiliar to them during the training courses.

Expansion of horizons. High-performance sports are unique in their complexity. Coaches need to know the rules of the sport and the methodology of sports training and be equipped with knowledge of other disciplines of sports science, e.g., physiology, biomechanics, and nutrition. Moreover, they have to be aware of how this knowledge interrelates. High-performance coaches need to link knowledge across multiple fields, as this allows for a deeper understanding of the processes taking place and having a comprehensive vision. However, even a broad but strictly one sport discipline-determined “vision” still restricts the view of other concepts or possibilities that could contribute to and improve training practices.

The coaches acknowledged that during the training courses, they began to understand the importance of knowing how to see routine practices from other perspectives. During the interviews, the coaches noted that it was difficult to distance oneself from the perspective of an expert in the sport, as it was very difficult to change one’s own perspective. Several coaches noted that at the beginning of training, this even raised doubts about the effectiveness of training courses, as it was customary to base their practice and evaluation of their performance on conventional methods. However, over time, the coaches experienced the joy of seeing their horizons expand. At the beginning of the training courses, the integration of new topics seemed extremely complicated or even pointless, but over time, it was easily

implemented into their educational practice. It was an extremely valuable personal experience for the coaches, which allowed them to experience the meaning of their efforts and to understand that the meaningful change requires time and constant practice.

Understanding complexity and revealing connections. The self-reflection of coaches influenced their thinking competences. The coaches noticed that during the training courses, they began to reflect more on their coaching abilities and communication with the athletes. The coaches admitted that the broader vision had an impact on their coaching philosophy - it strengthened the understanding of the complexity of sports education and the interconnectedness of phenomena. The course participants also mentioned that they were discovering more connections between different segments of sports education. During the interview, the informants emphasised the links between training systems and the environment. Such a complex systemic approach is evidence of a change in their usual coaching approach. The coaches mentioned the changes in relationships with athletes as a discovery and said that the understanding of the athlete's world improved the quality of training and the relationships with athletes. Referring to the planning and implementation of the training process, the coaches mentioned that they started to think and consider how the athletes might react to certain decisions or changes.

Greater cognitive sensitivity and flexibility were observed in coaching thinking. Flexibility enabled them to better adapt to changes; for example, it became easier to adjust the training program or react less to extraneous factors when decisions had to be made under changing conditions. Flexibility also made it easier for them to change their opinion about personally valuable ideas. The understanding of complexity helped coaches find new solutions faster and see how they can integrate into the already existing system.

Reflective practices increased coaches' sensitivity to themselves and their environment, rethinking their personal relationship with *others* and with athletes. The coaches mentioned that they began to listen more to the thoughts of the athletes and began to discuss issues of training planning with them more. Increased sensitivity to small things helped the coaches form an understanding of the relationships that exist in complex systems and realize their importance. It was sensitivity that helped coaches adopt an empathic approach focused on athletes and on existing invisible connections.

Discussion

High-performance coaches work in complex, ever-changing environments personalizing athletes' education and development. The need for competency-building arises from the educational practice, the difficulties and challenges that coaches seek to address by training athletes at the highest level. The needs for competence development are unique. Therefore, coaches need opportunities for professional development that meet their professional needs.

Our study was aimed at helping coaches develop their own self-regulation skills to encourage them to empower themselves to develop and improve sports education programs. The concept of training courses proposed to coaches largely corresponds to the concept of open-ended learning, where learners decide what, how and when to learn based on their unique intentions and external goals [37].

Participation in the training motivated and encouraged the coaches to change and integrate new topics into their educational practice. However, the coaches noted that at the beginning of the training courses, they experienced a sense of uncertainty as they faced the challenge of choosing the training theme and transforming the training program within it. The researcher's support, questioning, and positive reflection helped coaches become more courageous, commit to participating in training, and make an effort. Notably, the ability of learners to overcome their fears is important for the implementation of changes. It helps make the process appropriate by asking reflective questions [38]. While organizing such learning, it is important that individuals actively monitor their understanding, evaluate their performance, and improve their strategies [39].

A unique aspect of the training is that the coaches were encouraged to rethink their routine coaching practices and make some changes to the training program based on the tacit knowledge of the coaches. Tacit knowledge is an essential basis for developing learners' abilities to learn, especially for understanding and solving problems [40]. Metacognitive activity is a very important part of self-regulatory learning [41]. Therefore, organising the training courses for coaches, their reflections regarding metacognitive knowledge, (b) metacognitive experiences, (c) goals (or tasks), and (d) actions (or strategies) were encouraged (according to Flavell [42]).

Interviews with the research participants and their survey data showed that before participating in the training courses, coaches made projections on the rules and norms existing in their environment when thinking and talking about their behaviour. The research [43] shows that people typically look to and compare themselves to others as if setting benchmarks for how to behave, think, and feel when organizing and coordinating their activities. Therefore, in terms of training philosophy, the concept of social comparison prevailed in the mindset of the coaches involved in the study. It should be noted that social comparison is associated with cultural practices that promote strict norms and penalties for deviation [43]. However, participation in the training courses promoted the "liberation" of coaches. In other words, coaches ceased to judge themselves according to generally accepted norms and standards and stopped comparing themselves with others. It is the application of metacognitive questioning that led to a change in the locus of control and improved their self-regulation.

Metacognitive activities play a very important role in self-regulated learning [44]. Coach meetings and discussions with mentors boosted the metacognitive activity of coaches. This increased their sensitivity to themselves, their experiences and their relationship with the environment and environmental phenomena. This enabled the coaches to see and understand more existing but previously unrealized opportunities in their educational practice. It also led to a deeper exploration of the coaches' practice and the chosen learning topic, reflecting on their experiences from different perspectives, both by interacting with researchers and by receiving indirect feedback by observing changing relationships with athletes.

Open learning environments provide authentic contexts and rich resources to explore complex phenomena, integrate new knowledge and everyday experiences, and conduct learner-centred research [45]. Namely, this led to the "liberation" of coaches from externally perceived requirements and standards

and resulted in the formation of a unique one. The results of our study showed that coaches improved their search for causal relationships in phenomena, sensitivity and attention to phenomena and details and improved their perception of the complexity of phenomena. The coaches noted that the study of a topic relevant to them, mentor support, and individual learning pace had a significant impact on their personal journey of learning during the training courses. The study of coaches' practices expanded the field of their interest, deepening into the understanding of differences and the perception of their own relationships with the surrounding phenomena.

Limitations and strengths. The research design of the mixed research methodology enabled the researchers not only to evaluate the effectiveness of the applied training methodology but also to investigate the unique experiences of the research participants in changing their educational practices by improving their self-regulation abilities. Facilitation based on metacognitive questioning helped coaches rethink and transform the routine practice of training athletes. The organization of training in active communities was a key advantage of the study, allowing coaches to link training content to educational practice where they could apply new knowledge, experience and reflect on it.

One of the major limitations of the study was the small sample size. Therefore, the generalization of the results could be limited. Conducting a larger survey and involving more study participants would require higher time costs. It should be noted that the results of the study are important because they present unique training experiences of coach experts, improving self-regulation skills. Although the importance of self-regulation is universally recognized, we have found a very limited number of publications analysing the development of educators' self-regulation skills. However, such practices could be effective in the professional development of educators. Therefore, future research should consider replicating the study in more representative samples.

Despite the small-scale study, the results of the study showed an improvement in the self-regulation of coaches. The results of the qualitative study revealed changes in the thinking of experienced coaches. Facilitation based on metacognitive questioning helped coaches "liberate" and boosted their creativity. Therefore, it would make sense to evaluate these connections with the help of quantitative research methods.

Conclusion

The training programme based on metacognitive questioning allowed for enhancing the self-regulation skills of experienced coaches. Participation in the training courses not only led to the improvement of individual coaches' self-regulation indicators but also promoted their interconnectedness. Self-reflection and implementation of metacognitive strategies influenced coaches' cognition, thinking competences and behaviour. The coaches' behaviour manifested itself in curiosity and openness to innovation, recognition of otherness, broadening of the horizons, awareness of complexity and disclosure of connections.

Declarations

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Contributions

Conceptualization and study design, S.S. ; methodology, S.S., D.G., N.Ž. and T.K. ; formal analysis, D.G. and S.S. ; investigation, S.S., D.G. and N.Ž. ; data curation, S.S. ; writing-original draft preparation, S.S. ; writing-review and editing, D.G., N.Ž. and T.K. ; visualization, S.S. ; supervision, N.Ž and T.K. All authors have read and agreed to the published version of the manuscript.

Competing interests

The authors declare no competing interests.

Data availability statement

Due to privacy and ethical concerns, neither the data nor the source of the data can be made available.

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Figures

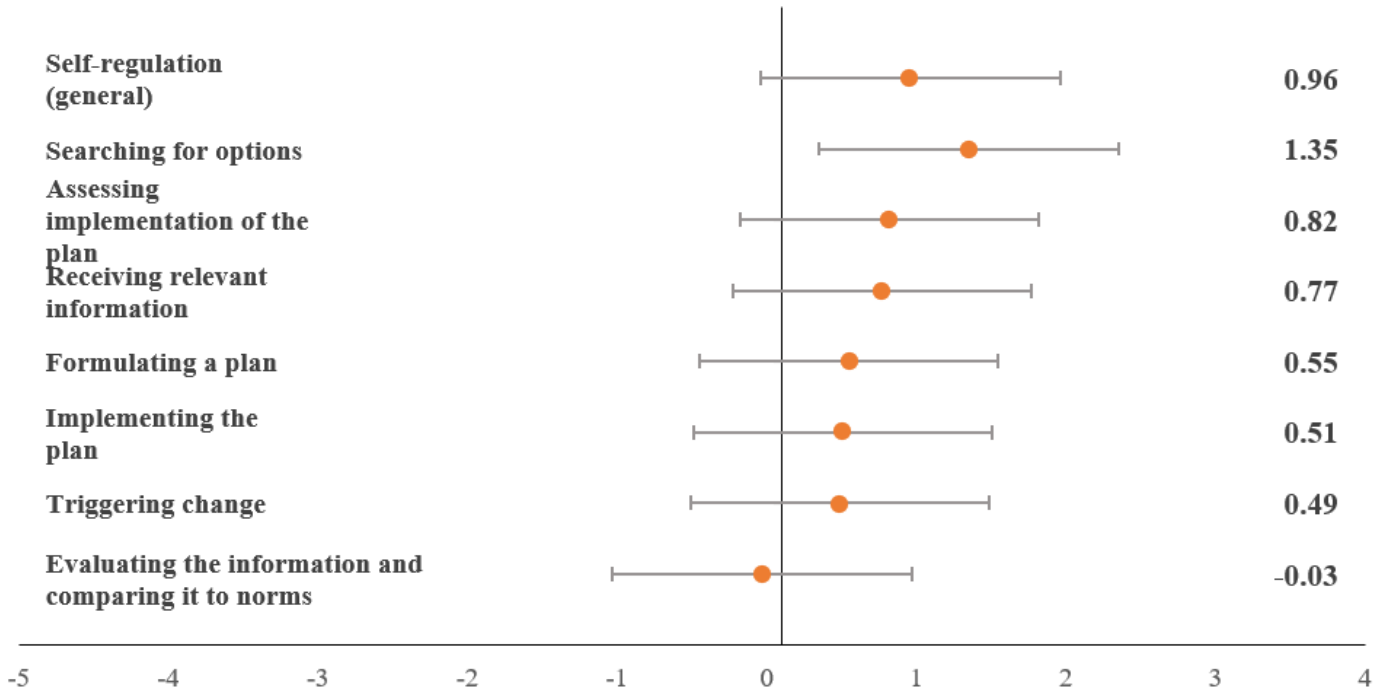

Figure 1

Indicators of the value of the impact on the improvement of self-regulation capabilities