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Metacognitive strategies improve self-regulation skills in expert sports coaches

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Self-regulation is linked to the ability to learn successfully, adapt to change, and project one's future behavior. This study aims to evaluate the impact of metacognitive strategies on self-regulation skills in the creation of educational content. Nine expert sports coaches participated in the research, and a mixed-methodology research plan was used to conduct the research. The results highlight the transformative effects of metacognitive strategies on self-regulation skills and sports coaches' experiences. The use of metacognitive strategies had a positive effect on the improvement of self-regulation skills. The facilitation program based on metacognitive questioning significantly affected the expert sports coaches' self-reported self-regulation skills. The results of the thematic analysis revealed that coaches' behavior was characterized by greater freedom in organizing their professional activities. Development of self-regulatory skills through changing educational practices encourages coaches' curiosity and openness to innovation, recognition of otherness, broadening of horizons, understanding of complexity, and disclosure of connections.

Keywords Facilitation, Theory U, Self-regulation, Metacognitive strategies, Coaching, Sports

Self-regulation is an essential feature of living organisms that allows them to adapt successfully to a changing environment. Self-regulatory abilities have important practical and theoretical implications for predicting individual and group behaviors[1]. 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[2,3], but also psichological well-being[4,5], learning and academic success[6,7]. In educational contexts, self-regulation can effectively contribute to the idea of lifelong learning, as developing self-regulation develops competence to successfully manage one's own learning in educational and professional contexts[1].

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.

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. Recently, research on self-regulation has received increased interest in sport research practice[8–12]. Researchers are beginning to explore the links between self-regulation and deliberate practice in the search for an answer to the question of what ensures development and expertise[12,13].

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[14]. Zimmerman[15]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[16]. 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[17]. However, self-

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regulation skills can be improved by actively managing one's own behavior, planning activities, monitoring their implementation, and adjusting one's own behavior when necessary[18]. Conscious monitoring of one's own behavior can effectively improve self-regulation skills. By observing their own behavior, individuals gather information about how they perform certain activities, thereby shaping knowledge about their own 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)[19]. 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[20].

The dilemma of the concepts of self-regulation and metacognition

The dilemma between the concepts of self-regulation and metacognition arises from the fact that, although the two concepts have different objects, they often overlap. A fundamental challenge that researchers face relates to the definitions of these phenomena, which involve conceptual differences from the work of key theorists such as James, Piaget, and Vygotsky, whose research provided the basis for the development of the fields of self-regulation and metacognition[21]. Thus, how we define these phenomena depends on the tools we use to assess them, and how we interpret our research findings[22].

A detailed analysis of the 'boundaries' of self-regulation and metacognition has shown that self-regulation refers to an individual's actions and behaviors, whereas metacognition involves an individual's cognitive functions, that is, the processes that are important for structuring human thought and regulating behavior[23]. In simple terms, self-regulation refers to the ability to plan, monitor, and control one's actions in order to achieve a goal and includes the management of emotions, attention, and motivation, and the ability to adapt to changing circumstances. Metacognition, on the other hand, refers to the ability to perceive and understand one's own thought processes and involves the conscious monitoring and control of cognitive processes.

In scientific literature, metacognition is most commonly defined as a person's awareness of and control over his or her mental processes[24]or the ability to assess and manage his or her cognitive processes[25], which is manifested in various cognitive domains such as experience, perception, and memory. Metacognition can be assessed by analyzing different human activities, such as learning, performing specific tasks, and making decisions, and manifests itself in different cognitive domains, such as experience, perception, and memory.

Metacognitive strategies and self-regulation skills in competence development

The development and improvement of self-regulatory skills depends 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[26]. 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"[26]. 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[27]. The results of research[28,29] 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.

Self-regulation is intrinsically linked to the development of competence in vocational and professional education[30,31]. It argues that self-regulatory abilities are essential for acquiring and integrating knowledge, skills, and attitudes in both formal and informal learning contexts. Empirical evidence demonstrates that strong self-regulation correlates with vocational excellence, thus highlighting the necessity of incorporating self-regulatory skills into competence-based education programs[30].

The challenge of improving experts' competences

High-performance sports are unique because of their complexity. Coaches need to know the rules of sports and the methodology of sports training and be equipped with knowledge of other disciplines of sports science, such as physiology, biomechanics, and nutrition. Moreover, they should be aware of how this knowledge is

interrelated. High-performance coaches need to link knowledge across multiple fields, as this allows for a deeper understanding of the processes taking place and 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.

People's different needs, interests, concepts, and values are constantly encountered in the educational environment. The pursuit of high excellence a priori presupposes the search for a unique path; however, coaching systems are usually based on stereotypical thinking. Therefore, one of the keys to achieving the best results is to find ways to encourage experienced and accomplished coaches to improve their practice and find new ways of coaching.

The **aim of this research** is to assess the impact of a metacognitive strategy-based training program on expert sports coaches' self-regulation skills. This study attempted to promote the development of coaches' self-regulation skills by promoting their metacognitive activity. 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 focus on learning, the participants were offered to choose the theme of the training courses themselves. Through the application of metacognitive strategies, we helped the course participants to structure their own training content and accompanied them during the training courses.

Research methodology

Research idea and design

The research on the improvement of coaches' professional competences through self-regulation skills is based on a *case study*approach. According to Yin[32], *"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[33].

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. Therefore, for the empirical study, a model of coaches' professional competence improvement based on self-regulation skills was developed.

A facilitation program based on metacognitive questioning was used to develop self-regulation skills[34,35]. Metacognitive questions were used to encourage coaches to change their coaching habits more freely. The facilitation process was based on raising metacognitive questions to encourage coaches to better understand the coaching processes, structure and complexity of training, to help coaches overcome some perceived difficulties, and to organise their own thinking to be able to restructure their coaching practice autonomously and quickly in the future, if necessary.

Theoretical background of intervention

Each study participant was given the opportunity to choose specific training situations in which they would like to improve their coaching efficiency (such as technical or functional training, socioemotional education, etc.). The idea of training is grounded on the *Theory U: Leading from the Future*[36]and the principle of setting SMARTER goals[37,38].

The coaches' individual competence improvement programme is based on the values and principles of *Theory U*. 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. Therefore collaboration grounded on "eco-system awareness" and 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.

Intervention

The coaches' individual competence improvement programme lasted 12 weeks. Every week, 45–60 min individual sessions were organized, which were led by the researchers. During the first session, the researchers familiarised themselves with the participants' experiences, training philosophy, and the objectives of their participation in the competence improvement programme. The structure of the training content followed the steps of the *Theory U* (*Downloading, Seeing, Sensing, Presencing, Crystallizing, Prototyping, Creating*), guiding participants through deeper self-reflection and innovative thinking pathways.

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. Each participant in the study chose a topic of personal interest to participate in the competence development programme (see Annex 1), and together with the facilitators, they developed an implementation plan – a 12-week Transformative

Competence Development Programme, which identified specific objectives, actions, and detailed steps to achieve the goal, based on the SMARTER principle[37,38] (see Annex 2). 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

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[39]. To assess the impact of the intervention on coaches' self-regulation capabilities, the study began with quantitative data collection. The collection of qualitative data played an important role in the interpretation of quantitative indicators and in the understanding of how metacognitive questioning-based facilitation contributes to the development of coaches' professional competence and self-regulation skills. The research was implemented in the following stages:

1. quantitative diagnostic before the intervention;
2. quantitative diagnostics after the intervention;
3. qualitative diagnostic after the intervention.

Quantitative research

Self-regulation was evaluated with the help of the *Self-Regulation Questionnaire (SRQ)*, adapted for educational practice[40]. 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[41,42]. 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)[43,44]. 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.)[45]. The obtained quantitative data were analyzed using the "Jamovi" program.

Qualitative research

Philosophical assumptions

This qualitative study aimed to identify the underlying patterns of self-regulation skill development. To achieve this, a reflective inductive latent thematic analysis[46,47] was applied, which allows us to explore the hidden content of the participants' perceptions and identify recurring patterns. The philosophical and epistemological foundations of the study were derived from its conceptual framework. *First*, *Theory U* emphasizes conscious engagement in change, allowing for the creation of new understanding and future possibilities. *Theory U* seeks to go beyond existing boundaries and create new perspectives for the future by shaping new ways of thinking and acting and is therefore based on a constructivist approach. *Second*, self-regulation is not a static phenomenon; it evolves with personal experience, adaptation to new situations, and personal discoveries. The epistemological perspective on self-regulation encompasses questions on how individuals acquire knowledge about their learning processes, how this knowledge influences their actions and decisions, and how these processes relate

to their beliefs about learning and knowledge. The epistemology of self-regulation is therefore closely related to metacognition – the ability to reflect on one's own cognitive processes–to evaluate and adjust one's own cognitive activity, and is based on a constructivist paradigm. Therefore, the methodology of qualitative research is based on a constructivist perspective, which allows us to uncover patterns of self-regulation development.

Data collection

The focus group method was employed for data collection, providing valuable insights into participants' concepts and ideas related to the selected research question and highlighting the diversity of perspectives within the study sample[48]. The primary advantage of collecting data through focus groups is that the method maintains "congruity" between participants' perceptions and the context. The active interaction among participants and the discussions arising from this interaction offer comprehensive insights into their experiences, perspectives, beliefs, and behaviors[49].

A semi-structured interview was applied for the collection of qualitative research data[50] (see Annex 3). To encourage participant interaction, discussions were allowed to develop based on the direction of participants' responses. The focus group interviews were conducted by three researchers, the authors of this article, with one acting as the moderator. With participants' consent, each interview was recorded, and a detailed transcription of each recorded interview was conducted for data analysis.

Data analysis

Inductive thematic analysis was employed for the qualitative data analysis, allowing for the reflection and conceptualization of recurring meanings and interrelations to depict and convey their representation[46,47,51]. Latent coding was applied to present the research results, utilizing respondents' language to interpret deeper levels of meaning and significance[46,52]. Data analysis is carried out in 6 phases[46]: *familiarising yourself with the data (1), generating initial codes (2), searching for themes (3); reviewing potential themes (4), defining and naming themes (5), producing the report (6).* In the *first phase*, data transcription was conducted, during which researchers **scrupulously** read the transcripts multiple times and replayed the interview recordings to extract significant quotes for data analysis and to identify preliminary themes. The selected quotes served as meaning units, effectively conveying the participants' perceptions of the issue under analysis. In the *second phase*, the key terms were selected. Researchers performed a detailed examination of the data to identify recurring textual elements (words) that became keywords that characterized the meaning units. This coding process facilitates the reduction of complex textual data by highlighting essential aspects. In the *third phase*, the coded content was analyzed, and the codes were grouped into initial themes. From the broader dataset, information relevant to the emerging themes was selected, which began to take on more abstract meaning, moving beyond mere code repetition to represent deeper underlying meanings. In the fourth phase, developing themes were reviewed, and the relationships between themes and codes were evaluated. By re-reading all data, researchers assessed whether the identified themes meaningfully reflected the dataset or a specific aspect thereof, leading to the construction of a thematic map. In the *fifth phase*, the themes were described, focusing on the uniqueness and specificity of each theme. This phase was grounded in a thorough analysis aimed at conceptualizing the findings of the study. The distinctive aspects and meanings of each theme were refined based on the research context, and the interrelationships between themes were considered. The clearly defined names for each theme were formulated. In the *sixth phase*, a conceptual model is developed to synthesize the entire analysis. At this stage, a final selection of text extracts illustrating the themes is made.

The research participants

The sample was selected on the basis of criterion sampling[53]. The essential criterion for the selection of coaches is the presence of national-level athletes who represent the country in international competitions. Potential participants were invited via social partners to a remote event to present the idea, content, and process of the study, and the benefits of participation.

Nine coaches of team and individual sports who had voluntarily agreed to attend the training courses participated in the study (5 males, 4 females). 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 athletes in national and international competitions (Table 1).

Validity, trustworthiness and credibility of the study

The research *validity*was ensured in several ways[54]. *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 methodological rigour of the study was based on the principle of researcher triangulation. The research design and instrument were developed, and the data analysis and conceptualization of the main themes were the result of joint decision-making between the researchers.

To enhance the reliability of data analysis and conclusions, the *'Member Checking* 'method was applied[55]. During the final stage of data analysis, collaboration with the study participants was undertaken to assess the accuracy of data interpretation. For this purpose, a targeted follow-up meeting with participants was organized one month after the study, providing an opportunity to review the findings and allowing participants to share their perspectives.

Participant codes	Sports	Age (years)	Coaching experience (years)	Representing the national team	Athletes' highest achievement
#C1	Women's wrestling	46	25	Women's national coach	WC and EC medallists
#C2	Wrestling	34	8	Junior national team coach	WC and EC medallists
#C3	Taekwondo	47	26	Assistant coach of the national team	NC medallists
#C4	Basketball (male)	45	14	Youth national team coach	WC and EC medallists
#C5	Basketball (female)	53	17	Assistant coach of the girl's national team	U-20, U-18, U-16 EC winner
#C6	Football (female)	28	7	Women's national team coach	UEFA CL TOP 16, NC winner,
#C7	Swimming	60	39	Personal coach of Olympic team members	EC medallist, 4th place in the WC, 13th place in the Olympics
#C8	Athletics	53	18	Coach of national team athletes	NC winners and medallists
#C9	Weightlifting	29	3	Coach of national team athletes	NC medallists

Table 1. Characteristics of study participants. EC—European Championship; WC—World Championship; CL—Champions League; NC—National Championship.

Trustworthiness and *credibility* of the research results of the study were assured by the researcher's unique experience in sport, education and sport science. The researchers organizing the study were elite sports performance experts: three held PhDs in social sciences with a focus on sports, and one held a master's degree in sports. Two of the researchers were former high-level athletes with Olympic experience, whereas the other two were national team coaches in individual and team sports. This experience allows the researchers to engage in a constructive relationship with the participants, to collect data, and to analyze the data in a competent way, drawing on both sports science and practical experience, as well as coaches' and athletes' views.

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. Participants signed an informed consent form in which they were informed about the purpose, aim and procedures of the study, the ethical and data use principles and the declaration of free will to participate in the study[56]. 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 codes 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. The results of the study are presented by anonymising the participants.

Study was performed in accordance with the principles of the Declaration of Helsinki and the Code of Ethics of University. The study was approved by Vytautas Magnus University Institutional Review Board (approval number: VDU-SR-931).

Results

Results of the quantitative research

The facilitation program based on metacognitive questioning had a positive effect on the coaches' self-regulation skills. At the end of the program, the total self-reported self-regulation index of the coaches increased from 234.0 ± 13.0 to 248.8 ± 17.5 points ($p < 0.05$). Following the guidance for self-regulation evaluation provided by the authors of the scale[31], the self-reported self-regulation indicator rose from the moderate level to the high one. The analysis of self-regulation indicators revealed an increasing trend in most parameters, except for 'evaluating the information and comparing it to norms' (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"* ($p = 0.05$).

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 skills during the first study, i.e. before the training courses, showed that the correlations between the individual self-regulation demesnes were low. The highest statistically significant association was found only among the trainers' skills "Triggering change" and "Evaluating the information and comparing it to norms" ($r = 0.725$; $p < 0.05$).

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**

Table 2. Changes in self-regulation indicators. The analysis of self-regulation indicators revealed an increasing trend in most parameters,except for 'evaluating the information and comparing it to norms'.

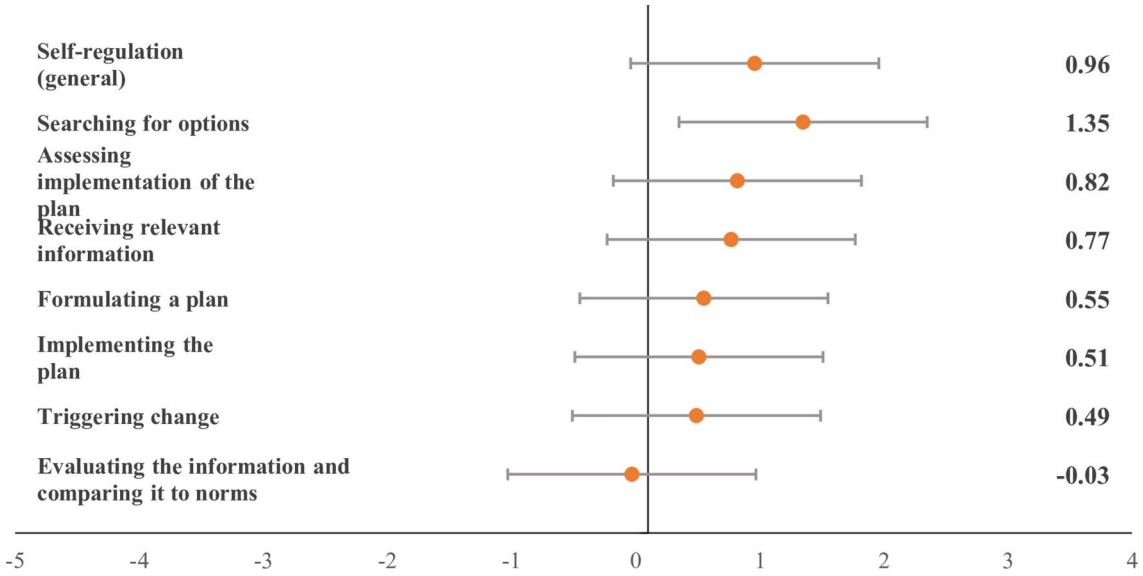

Fig. 1. Indicators of the value of the impact on the improvement of self-regulation capabilities.

No	Components of self-regulation	1	2	3	4	5	6	7
1	Receiving relevant information	1	−0.080	0.901**	0.877**	0.755*	0.695*	0.720*
2	Evaluating the information and comparing it to norms		1	0.085	−0.405	0.164	0.042	0.105
3	Triggering change			1	0.717*	0.556	0.451	880**
4	Searching for options				1	0.662	0.606	0.657
5	Formulating a plan					1	0.751*	0.443
6	Implementing the plan						1	0.174
7	Assessing effectiveness of the plan							1

Table 3. Correlations of self-regulation components after the research. *r- Spearman correlation coefficients, * $p < 0.05$; ** $p < 0.01$.*

After the training courses, the second study showed a significant increase in the correlation values of many parameters. Participation in the training strengthened the correlation between self-regulation skills. The correlations between some of the skills were at a medium to high level (Table 3). The study found strong interconnections between key self-regulation skills, particularly between receiving relevant information and actions such as triggering change, formulating, and implementing a plan. Skills such as searching for options and assessing plan effectiveness were also closely linked. However, evaluating information against norms showed weaker correlations with the other self-regulation components.

Results of the qualitative research

The analysis of qualitative data allowed distinguishing four qualitative themes that characterize the changes that have occurred during the training courses: curiosity and openness to innovation (i), recognition of otherness (ii), expansion of horizons (iii), understanding complexity and revealing connections (iv). The themes describe the coaches' personal experiences related to updating their training program reveal the impact of metacognitive strategies on coaches' behaviour (Fig. 2).

Theme 1: Curiosity and openness to innovation

The study revealed that participation in the competence improvement program sparked coaches' curiosity and encouraged them to rethink their coaching routine. The coaches' behavior showed an interest in and search for new information and knowledge (Table 4). Participants emphasized that meetings with mentors and new discoveries led to a personal ***commitment to exploration*** and devoted more time to the chosen training topic. 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, meetings, and conversations with athletes. New knowledge has helped discover new ways to improve teaching practices. Additionally, thinking and reflecting on how new knowledge can be integrated into routine practice has led trainers to fundamentally rethink their teaching concepts. Discussions with mentors encouraged coaches' ***concentration and cognitive focus*** on the chosen topic in search of ways to turn the original idea into reality.

Coaches have found that consulting mentors have helped them reflect on their experiences and ***decode routine practices***. The implementation of new ideas was based on the ***modelling and design*** of the trainer's personal behavior and educational content. ***Experiencing the impact of change*** empowered the coaches to be open to innovation and encouraged them to be bold in modelling their professional practice. The coaches also gave examples showing that during training, they not only started to look for new methodological information but also to communicate more with their athletes to be more interested in them stories and experiences. In conversations with their athletes, they wanted to better understand their own perceptions of training concepts in order to rediscover their intentions and motivations for behavior.

Theme 2: Recognition of otherness

Metacognitive questioning sessions with mentors encouraged coaches to engage in ***introspection*** and encouraged coaches to rethink their relationship with others (Table 5). 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.

Participation in the competence development programme stimulated coaches' **emotional sensitivity** and ***openness to dialogue***. The coaches mentioned that they learned to communicate and understand the athletes better. ***Awareness of equivalence*** among coaches and athletes expanded coaches' understanding of athletes' expectations and motivation for training. Some participants mentioned that they "had to be reacquainted" with their athletes. Interest in athletes' personal stories and attitudes towards training and sports was characterized by the ***recognition of others' autonomy.*** This helped the coaches gain a deeper understanding of the athlete's expectations and motivation for training and led to a rethinking of the coach-athlete relationship, which contributed to improved relationships and reduced internal tension.

Coaches' participation in the focus group discussion was one of the essential elements in learning to demonstrate and accept differences. This was one of the key personal discoveries of the trainers. During the interviews, the coaches emphasized 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 perspective 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.

Theme 3: Expansion of horizons

The coaches acknowledged that, during the training courses, they began to understand the importance of knowing how to see routine practices from other perspectives (Table 6). This ***openness to cultural and ideological diversity*** enables them to ***build and maintain relationships with others***, fostering a collaborative learning environment. During the interviews, the coaches noted that it was difficult to distance themselves from the perspective of an expert in the sport, as it was very difficult to change one's own perspective. The majority of the participants (6 out of 9) noted that, at the beginning of training, this raised doubts about the effectiveness of training courses, as it was customary to base their practice and evaluate their performance on conventional methods. However, over time, the coaches experienced the joy of expanding their horizons.

Although at the beginning of the course the integration of new topics seemed very difficult or even pointless, over time it was easily incorporated into their teaching practice. The decision to change the routine required the ***courage to create and change***, but this became an important condition for the coach's development.

Reflecting and contrasting phenomena allowed the trainers to better understand their practice and to see the wider perspectives of their work. This reflective practice was vital for ***solving the complex and unstructured*** problems that arose in their training environments. For the coaches, it was a highly valuable personal experience

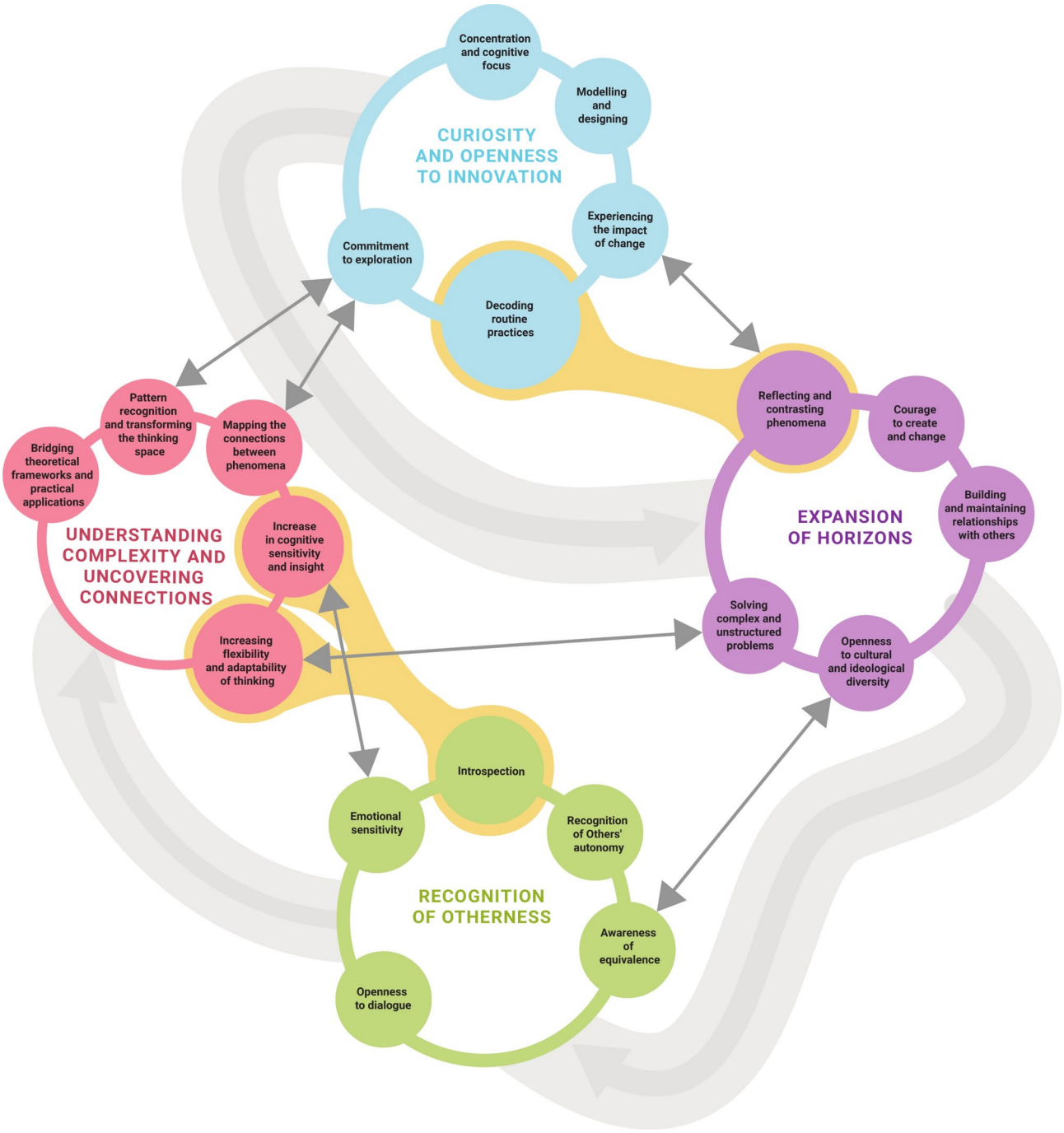

Fig. 2. Thematic map of the development of self-regulation skills in sports coaching experts. *Note* This map presents key patterns essential for the cultivation and advancement of self-regulation skills among expert sports coaches. The large gray arrow between the main themes illustrates the process of self-regulation skill development. ***Gray indicators.*** On the map, gray indicators show links between subthemes, acting as key connections between the main themes. The interacting subthemes do not merge with each other. Each subtheme retains its uniqueness and specific function and interacts in ways that promote or support the growth of others. For example, Emotional Sensitivity is related to an Increase in Cognitive Sensitivity and Insight, but each remains unique in its own context (theme), which helps you gain deeper insight into your reactions and behavior, which, in turn, impacts cognitive sensitivity. Cognitive sensitivity, on the other hand, fosters better emotional sensitivity and the ability to reflect on one's emotions and empathy. ***Blended areas.*** The areas highlighted in yellow indicate 'blended' subthemes. This fusion indicates that the subthemes seem to "share" certain characteristics necessary for their individual functions. However, although the themes share common features, they remain unique in their essence. For instance, Reflecting and Contrasting Phenomena and Decoding Routine Practices blend because both processes involve re-evaluating and analyzing established practices to gain new insights or perspectives. This shared reflective quality underscores their interrelated nature, even though each sub-theme maintains a distinct purpose.

Subthemes	Supporting statements
Decoding routine practices	**#C1:***I have changed some of my training priorities—some things are not as important to me now as they used to be, so I realized that it is possible to change my approach < … > I tried to apply [innovation] immediately, I saw very clearly where integration should take place in the [training] plan* **#C4:***Before the [facilitation] program, it seemed there was not much time, so we worked intensively. Now, I spend more time explaining, discussing, and correcting mistakes during the training than after the training*
Commitment to exploration	**#C2:***I see every movement as an opportunity to understand how to continue to improve, which has helped me to analyze my training process more consciously* **#C5:***Participating in the training helped me to understand that not everything has to be self-evident; sometimes you have to rediscover meaning* **#C9:***I am constantly observing how it [the exercises] affects the athletes and analysing which exercises give the best results—this has become an important part of my training*
Concentration and cognitive focus	**#C5:***I started to analyse myself more—when my emotions are more intense, when they are calmer—how I react emotionally, and the training helps me to look at myself [my behaviour] more* **#C6:***It's very important to see the little details that we might think are insignificant but can be very important for athletes. It helps them and me to achieve our goals faster*
Modelling and designing	**#C7:***The main challenge is to be flexible and creative in the way you introduce new exercises into the training process. It takes patience and making the athletes believe and want to do it… I try to introduce new techniques little by little to the students so that they can rethink and want to participate* **#C3:***In addition to the basic training exercises, there are integrated exercises for attention and concentration. And the athletes now understand the importance of concentration and how much that concentration is important to improve their performance*
Experiencing the impact of change	**#C1:***I have changed my behavior—when a serious competition was approaching, I realized that I was a mirror for the athlete. Now, to convey certain exercises to the team, I always try them myself. This has helped me to change and find the right ways to help the athletes"* **#C7:***'I didn't seem to change my behavior during training, but my athletes noticed the changes, they said "coach, what's wrong with you." < … > Now we talk to the athletes after training, and it is important to listen to their opinions*

Table 4. Subthemes describing Theme 1 'Curiosity and openness to innovation'.

Subthemes	Supporting statements
Introspection	**#C3:***I started to think more about how my actions and reactions affect athletes. This has helped me stop and think more often before making decisions during training* **#C5:***I analyze myself more now—I look at when my emotions are rising, when I am calmer. I realized that my reactions to my students' mistakes have a big impact on their well-being, so I am trying to be more patient* **#C6:***I started to be calmer about certain situations during training. I think about what I want to say and how I want to say it first; I do not jump to conclusions. This helps me to better understand my behavior and reactions*
Recognition of Others' autonomy	**#C2:***I told them directly that it was not compulsory. If they want to do it, they can do it; if they do not want to do it, they cannot do it. I don't want to force them, but it's about letting them choose and be involved responsibly* **#C3:***I realized that it was important to give athletes more responsibility for their actions. They have the opportunity to try new methods at their own pace and let me know what works best for them* **#C8:***It is very important for athletes to understand what they want from them, but they should also have the freedom to find their own way to achieve the goal. This encourages independence and greater sense of responsibility*
Awareness of equivalence	**#C3:***I learned that all athletes, regardless of their skill level, must have the opportunity to express themselves and listen to them. Communication between athletes and their coaches is important. We have to speak the same language to achieve the best results* **#C4:***Before only the leaders expressed their opinions in training, I have now managed to speak up for those who were on the sidelines. Now they are bold enough to talk about their state of mind, their mood, and even their health—they all feel important and equal in the team* **#C5:***The opinion of each team member is important, and I noticed that those who used to be silent are now more courageous to speak up and express their thoughts. This creates an equal and open relationship*
Emotional sensitivity	**#C1:***A coach's emotions are like a mirror for the athlete. Once I understood this connection, I started to calm the emotional states of the athletes, helping them to manage stress and excitement during training* **#C5:***During the training, I started to analyze my emotions more, especially when [the athletes] don't listen very well or make mistakes. I try to react more calmly and understand their feelings more, so that I can support them better* **#C6:***Once I understood their emotional state, I started to be more flexible with the exercises to keep them more engaged and motivated*
Openness to dialogue	**#C6:***My role is not only to give instructions but also to listen to athletes' opinions and experiences. This helps build mutual trust and openness, which is essential for effective coaching* **#C4:***I learned to focus more on communication with the athletes. Now they feel free to tell me how they are feeling before training or if they have any health problems. Such conversations help to build open and trusting relationships* **#C5:***My girls are starting to realize that it is not just about doing the exercises, but also about sharing how they are feeling. There is more dialogue, which helps them to be involved from the beginning of the workout*

Table 5. Subthemes describing Theme 2 'Recognition of Otherness'.

that allowed them to experience the meaning of their own efforts and to realise that meaningful change takes time and continuous practice.

Theme 4: Understanding complexity and revealing

Coaches'self-reflection influenced their thinking competencies. 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, which strengthened their understanding of the complexity of sports education and the interconnectedness of phenomena (Table 7). Participants also mentioned that understanding coaching is based on ***mapping connections between phenomena.*** During the interviews, the informants emphasized the links between the training systems and the environment. This complex systemic approach provides evidence of a change in the 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 relationships with athletes. Referring to the planning and implementation of the training process, the coaches mentioned that they started to consider how athletes might react to certain decisions or changes. That is, coaches' thinking and decision-making were based not only on the personal perspective but also on the athletes' perspective.

Subthemes	Supporting statements
Openness to cultural and ideological diversity	**#C1:***My mentor helped me see things differently. The similarities between different sports show new colors and approaches to coaching practice* **#C7:***During the training, I realized how many similarities existed between different sports. This unexpected discovery demonstrates how insights from different methodologies can enrich the coaching process. This allowed me to take a broader view of my work*
Building and maintaining relationships with others	**#C5:** *The athletes became more open and began to share their thoughts and reflect on their training. This not only helped to create an atmosphere of openness, but also strengthened the team's community* **#C8:***Every athlete has a personal goal. Collaboration [with athletes] builds relationships and helps us understand each other*
Courage to create and change	**#C1:***The integration of exercises into the training provided new colors, especially when we took risks to try unconventional methods. There was fear at the beginning, but the results showed that it was worth taking the courage to change* **#C7:***To incorporate more flexibility into my workouts, I started experimenting with new exercises and techniques. Although it was difficult in the beginning, I saw that the changes gave the athletes more variety and motivation*
Reflecting and contrasting phenomena	**#C2:***you analyse athletes' actions in training with their behaviour in competition to assess how their reactions and actions under pressure differ. This allows to adjust the training programme to better prepare athletes for stressful situations in competition* **#C6:***By comparing old methods with newly tested [methods] one can better understand what works and where changes are required. This allows her to apply techniques that provide the best results in a given situation*
Solving complex and unstructured problems	**#C1:***During training, I focused on the personal challenges of trainees and their unique situations. I have realized that each athlete has their own way of achieving their goals, so I am constantly looking for different solutions to help them cope with the challenges they face* **#C3:***Experimentation is very important in tournaments. By trying new things in training, we take risks and gain experience. If we don't experiment, we won't learn anything new and we won't improve*

Table 6. Subthemes describing Theme 3 'Expansion of horizons'.

Subthemes	Supporting statements
Increase in cognitive sensitivity and insight	**#C1:***Learning and looking into other [athletes'] experiences helped me re-evaluate my own decisions, allowing me to adapt quickly and make decisions in training* **#C6:***The training helped develop a more flexible approach to the coaching process—more insight into and comparison of different coaching methods. This helps her to find the most optimal solutions for each athlete* **#C9:***More focus on developing cognitive sensitivity < … > reflection on athletes' performance allows for more targeted decision making*
Pattern recognition and transforming the thinking space	**#C1:***Recognizing repetitive patterns in athletes' actions, especially in stressful situations, has allowed us to more accurately predict athletes' reactions and adapt the training process to develop their decision-making skills* **#C3:***Going deeper into the analysis of athletes' movements, noticing certain patterns of movement and reactions that are repeated. This helped to adapt the exercise sequences geared towards more effective training. It changed the training approach*
Mapping the connections between phenomena	**#C6:***Analysis helps to link the different actions of the athletes, which in turn helps to better plan the training sessions, tailoring them to specific needs* **#C7:***The analysis of different sport disciplines helped to see the links between [training] methods used in other sports, it enriched the training process by allowing a broader perspective and variety in coaching practice*
Increasing flexibility and adaptability of thinking	**#C2:***Every athlete reacts differently, and I started combining different exercises to keep the athletes interested and motivated, which led to a constant change in mindset* **#C7:***The [coach's] flexible approach encourages athletes to be more engaged and gives them more motivation to train*
Bridging theoretical frameworks and practical applications	**#C1:***The knowledge gained helped to integrate theoretical concepts into the athletes' training, leading to more effective results. I started to have more confidence in my coaching practice* **#C6:***Theoretical and practical knowledge is being integrated into the plan with the help of mentors. Understanding the theoretical foundations allows me to formulate training goals and methods more precisely*

Table 7. Subthemes describing Theme 4 'Understanding complexity and uncovering connections'.

Greater ***cognitive sensitivity and flexibility*** were observed in coaching, thinking, and praxis. 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 opinions on personally valuable ideas. The understanding of complexity helped coaches find new solutions faster and see how they could integrate into the existing system, ***increasing flexibility and adaptability of thinking***.

Reflective practices increased coaches' sensitivity to themselves and their environment, rethinking their personal relationships with others and 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. Increased sensitivity to small things helps 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 existing invisible connections, ***bridging theoretical frameworks, and practical applications.***

Furthermore, the training courses facilitated **an *increase in cognitive sensitivity and insight*,** allowing coaches to develop pattern recognition and transform their thinking space. This transformation has enabled them to better understand the dynamic and multifaceted nature of sports coaching, ultimately leading to more effective and responsive coaching practices.

Discussion

High-performance coaches work in a highly dynamic and constantly evolving competitive environment, where it is crucial to quickly adapt to changes and master the latest technologies and methods for athletic development. The challenges and difficulties coaches face in their practice imply specific needs for the development of their competencies. The ability to solve new and complex situations requires flexibility and creativity. When confronted with complex and unexpected situations, coaches must shift their usual thinking and behavioral patterns, which demands strong self-regulation skills. Deliberate problem-solving in atypical situations ensures

expert development[57]. Studies have highlighted the links between self-regulation skills, deliberate practice, and expertise[13]. Deliberate practice involves the ability to set new, personally valuable, and ambitious goals, the pursuit of which allows for continuous expansion of competencies[58]and promotes metacognitive self-regulation[59].

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[60]. 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[61]. While organizing such learning, it is important that individuals actively monitor their understanding, evaluate their performance, and improve their strategies[62].

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[63]. Metacognitive activity is a very important part of self-regulatory learning[64]. 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[65]).

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[66]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[66]. 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[67]. 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.

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. However, it is not clear how long the identified changes can be sustained. The results of the qualitative study revealed changes in the thinking of experienced coaches. Although facilitation based on metacognitive questioning helped the coaches to 'liberate' and increased their creativity, to assess the sustainability of the intervention, it is appropriate to assess these links in the long term using quantitative research methods.

Open learning environments provide authentic contexts and rich resources to explore complex phenomena, integrate new knowledge and everyday experiences, and conduct learner-centred research[68]. 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.

Conclusion

In summary, this study results highlight the importance of integrating self-regulation skills into coaches' professional development. A facilitation program based on metacognitive strategies had significantly positive effects on experienced coaches'self-regulation skills. Participation in the competency development program improved coaches' self-regulation skills and increased the interrelationship between self-regulation dimensions. The coach's behavior manifested itself in greater personal freedom in organizing his professional activities, starting from searching for options and formulating a plan to assess its effectiveness. The qualitative analysis revealed that coaches' facilitation of the integration of innovation into their educational practice led to their curiosity and openness to innovation, recognition of otherness, broadening of horizons, understanding complexity, and revealing connections, which characterized their transformative experiences. The results suggest that the use of metacognitive strategies in the design and integration of individualized content related to educational practices can improve experts' self-regulation skills and encourage innovation. The study therefore advocates the inclusion of self-regulation skills alongside specific professional competencies in competency-based vocational and professional training programs.

Data availability

Data cannot be shared openly but are available on request from authors. Access to the study data is available upon a reasoned request to the corresponding author.

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Author contributions

Conceptualization and study design, S.S.; methodology, S.S., D.G., N.Ž. and T.K.; formal analysis, T.K. 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.

Declarations

Competing interests

The authors declare no competing interests.

Ethics approval

All procedures was performed in accordance with the principles of the Declaration of Helsinki and the Code of Ethics of University. The study was approved by Vytautas Magnus University Institutional Review Board (approval number: VDU-SR-931).

Informed consent

All participants were informed about the objectives and procedures of the study before the study. All participants signed an informed consent form, which included information on the aim and purpose of the study, a description of the study procedures and duration, the anticipated inconveniences or risks, the benefits, the ethical principles, the protection of the data, the use of the study data and the conditions for publication for scientific and educational purposes, the consent to participate in the study, and the option to withdraw from the study at their own will, without any harm.

Additional information

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