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AntiDop: Training Missions on Nutritional Supplements for Athletes Support Personnel to Support Anti-Doping

D2.2. Learning Gaps and User's Requirements

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Abbreviations

ADEL	Anti-Doping Education and Learning of World Antidoping Agency
ASP	Athlete Support Personnel
ICT	Information and Communication Technologies
IOC	International Olympic Committee
OVEP	Olympic Values Education Programme
PEDs	Performance-Enhancing Drugs
SCT	Social Cognitive Theory
SDT	Self-Determination Theory
TPB	Theory of Planned Behavior
WADA	World Anti-doping Agency
WADC	World Anti-doping Code
UKAD	UK Anti-Doping

Executive Summary

This report presents the findings of a qualitative cross-national needs analysis carried out as part of the AntiDop project, aimed at identifying learning gaps, training needs, and educational preferences of Athlete Support Personnel (ASP) in relation to doping prevention and the safe use of nutritional supplements. The study involved semi-structured interviews with ASP (coaches, trainers, physiotherapists, medical staff, and other stakeholders) organized across six countries, Belgium, Germany, Greece, Lithuania, Malta, and Serbia, and including participants from 12 countries, Belgium, Croatia, Germany, Greece, Hungary, Italy, Lithuania, Malta, The Netherlands, Poland, Serbia and Spain.

Findings indicate significant variability in ASP' roles and involvement in doping-related matters, but a consistent pattern of limited formal education on doping and nutritional supplements. Across all countries, ASP reported a lack of structured, accessible, and evidence-based educational opportunities. While some demonstrated high awareness of supplement-related risks and expressed strong motivation to support clean sport, others relied on informal sources of knowledge and displayed uncertainty in guiding athletes safely.

The report highlights the psychological and contextual factors influencing the use of supplements and the potential link to doping behavior, including moral disengagement, social norms, and motivational climates. ASP overwhelmingly called for short, flexible, multimedia-based training formats tailored to their professional roles. They emphasized the importance of real-world applicability, language accessibility, and certification.

The findings provide essential input for the next phases of the AntiDop project, particularly the co-design and development of educational materials and digital learning tools. The report supports the need for a flexible, multilingual training system that empowers ASP as informed, ethical, and proactive agents in doping prevention.

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1. Introduction to Doping

1.1. Anti-doping policy

The **World Anti-Doping Agency (WADA)** has developed a thorough and globally consistent system to tackle doping in sports, with the **World Anti-Doping Code** at its core. This Code acts as the primary reference that unifies anti-doping regulations, policies, and procedures across international sports organizations and national governments. Its purpose is to promote fairness and uniformity in doping detection, enforcement, and prevention efforts (WADA, 2021a).

Supporting the Code are several **International Standards** that offer specific instructions to ensure these policies are applied consistently across contexts. These include:

1. **International Standard for Testing and Investigations (ISTI):** Defines essential procedures for planning doping tests, notifying athletes, collecting samples, and transporting them to laboratories. It also outlines how anti-doping intelligence is collected and how investigations into suspected violations are conducted (WADA, 2021b).
2. **International Standard for Laboratories (ISL):** Ensures WADA-accredited labs adhere to strict quality control and deliver accurate, consistent analytical results in testing for banned substances (WADA, 2021c).
3. **International Standard for Therapeutic Use Exemptions (ISTUE):** Provides a structured process through which athletes can legally use banned substances for medical reasons, ensuring such approvals are applied fairly and consistently (WADA, 2021d).
4. **International Standard for Education (ISE):** Sets mandatory requirements for developing, implementing, and evaluating effective education strategies to prevent doping in sport (WADA, 2021e).
5. **International Standard Prohibited List:** It provides the list of prohibited substances; it is updated every year (WADA, 2021f).

Together, these standards and the Code form a unified framework that applies the same principles and procedures to all athletes, reinforcing the credibility and fairness of sports worldwide.

In addition, to preserve the integrity of sport and protect athlete health, WADA has defined a set of **Anti-Doping Rule Violations (ADRVs)** under the Code. These serve as the legal framework for identifying and penalizing doping-related infractions. The eleven current ADRVs encompass a broad range of actions or failures to act and are applicable not only to athletes but also to their support personnel, including coaches, medical staff, and administrators (WADA, 2021a).

1. Presence of a Prohibited Substance (Article 2.1). In this violation a banned substance (or its markers/metabolites) is found in the athlete's sample.

2. Use or attempted use (Article 2.2). In this violation the athlete uses or tries to use a prohibited substance or method, regardless of whether it was detected in testing.

3. Evading, refusing, or failing to submit to sample collection (Article 2.3). In this violation the athlete refuses, evades, or fails to provide a sample when required without a valid reason.

4. Whereabouts failures (Article 2.4). In this violation the athlete fails to file accurate whereabouts or misses scheduled tests three times in 12 months.

5. Tampering or attempted tampering (Article 2.5). This violation involves Interference with any part of the doping control process (e.g., manipulating samples, providing false information).

6. Possession (Article 2.6). This violation involves possessing prohibited substances or methods, unless for a genuine medical reason with a Therapeutic Use Exemption (TUE).
7. Trafficking or attempted trafficking (Article 2.7). This violation involves selling, transporting, distributing, or attempting to distribute banned substances or methods.
8. Administration or attempted administration (Article 2.8). This violation involves giving, prescribing, or trying to give a prohibited substance or method to an athlete.
9. Complicity or attempted complicity (Article 2.9). This violation involves helping, encouraging, covering up, or being otherwise involved in an ADRV.
10. Prohibited association (Article 2.10). This violation involves working with coaches, trainers, doctors, or other personnel who are sanctioned for anti-doping violations.
11. Acts to discourage or retaliate against reporting (Article 2.11). This violation involves intimidating or retaliating against someone for reporting doping or cooperating with authorities (e.g., whistleblowers).

1.2. Adverse effects of doping

Doping in sport carries profound and multifaceted consequences that extend beyond the immediate performance gains sought by athletes. On a physiological level, the use of performance-enhancing drugs (PEDs) such as anabolic-androgenic steroids, human growth hormone, and erythropoietin results in severe and often irreversible health damage. These include cardiovascular issues like hypertension, arrhythmias, and heart disease, as well as endocrine disruptions that can lead to infertility and hormonal imbalances. Hepatic and renal complications are also prevalent, particularly in athletes who engage in long-term or high-dose usage. Psychologically, PEDs are linked to mood disturbances, including aggression, depression, and even suicidality, while their withdrawal can create dependency-like symptoms. Gender-specific effects further highlight the risks: men may experience testicular atrophy and gynecomastia, while women can suffer from virilization symptoms. These wide-ranging health consequences underscore the need for robust anti-doping education and prevention strategies (Pope et al., 2014).

Beyond health, doping carries serious societal consequences that affect not only the athlete but also the integrity of sport as a social institution. Athletes who violate anti-doping rules often face public disgrace, social stigma, and damaged reputations, which can have longer-lasting psychological impacts than formal sanctions. The principle of strict liability in doping cases means that even unintentional infractions can lead to harsh penalties, sometimes resulting in emotional distress or even suicide. At a broader level, widespread doping scandals erode public trust in competitive sport, weakening its symbolic role in society and threatening the legitimacy of sports governing bodies. Persistent doping controversies challenge the effectiveness of anti-doping regulations and complicate public and institutional support for enforcement measures (Dimeo and Møller 2018; Huybers and Mazanov 2012; Overbye et al. 2015).

The financial repercussions of doping are equally devastating. Sanctioned athletes often lose not only competition opportunities but also significant income through forfeited prize money, appearance fees, and lucrative sponsorship deals. High-profile cases like Lance Armstrong and Marion Jones illustrate how doping can strip athletes of millions in earnings and sponsorships. Legal expenses, fines, and damages further compound these losses. Moreover, doping tarnishes an athlete's post-career

prospects, limiting opportunities in coaching, commentary, and leadership roles in the sports industry. The reputational damage caused by doping often results in exclusion from future career paths that depend on credibility and public trust, making the economic costs both severe and enduring (Overbye et al., 2015; Raynor, 2015).

In sum, the consequences of doping are comprehensive and deeply damaging. They encompass serious health risks, societal and psychological harm, and far-reaching financial fallout. These outcomes highlight the critical importance of proactive intervention from Athlete Support Personnel (ASP), who play a central role in educating, guiding, and protecting athletes from the pressures and temptations of doping. Their involvement is key to fostering ethical decision-making, ensuring compliance with anti-doping regulations, and ultimately preserving both athlete well-being and the integrity of sport.

2. A Literature Review on Doping Determinants

2.1. Doping determinants

The understanding of doping behavior in sport has evolved from a narrow biomedical and detection-oriented focus to a broader psychological, social, and systemic analysis. Contemporary research identifies doping as a complex, multifactorial phenomenon influenced by personal motivations, social dynamics, cultural contexts, and institutional structures. Several theoretical frameworks have been employed to explore these dimensions, each shedding light on different determinants of doping intentions and actions.

One of the most influential frameworks is the Theory of Planned Behavior (TPB), which views doping as a rational, intentional act driven by attitudes, subjective norms, and perceived behavioral control. Research consistently shows that positive attitudes toward doping and high perceived control over doping behavior are the strongest predictors of doping intentions. While subjective norms also play a role, they are generally considered less predictive. Extensions to TPB, including constructs such as anticipated regret and situational temptation, enhance its predictive utility and underscore the rational and emotional components of decision-making (Ntoumanis et al., 2014, 2024).

Motivational theories, such as Self-Determination Theory (SDT) and Achievement Goal Theory, contribute important insights into how internal motivations and goal orientations influence doping. Athletes driven by intrinsic motivation and mastery goals are generally less susceptible to doping, while those guided by external pressures or performance-oriented climates are more vulnerable. Controlled forms of motivation, linked with external rewards and pressure, are particularly associated with unintentional doping, emphasizing the role of coaching environments and sport culture in shaping doping attitudes (Guo et al., 2021; Hardwick et al., 2022; Kavussanu et al., 2020; Wang et al., 2020).

Social Cognitive Theory (SCT), particularly the concepts of moral disengagement and self-regulatory efficacy, has also been widely adopted. Athletes who rationalize unethical behaviors (e.g., by minimizing harm or diffusing responsibility) or lack the confidence to resist doping under pressure are more likely to dope. These constructs interact with other predictors, often mediating or moderating the effects of attitudes and motivation on behavior. Integrative frameworks like the Integrative Model of Doping Behavior and Theory of Triadic Influence highlight how distal variables, such as personality traits, cultural norms, and sport type, influence proximal variables like attitudes, self-efficacy, and intentions (Hurst et al., 2019; Lazuras et al., 2010, 2017).

More recent models, such as the Sport Drug Control Model (SDCM) and the Drugs in Sport Deterrence Model (DSDM), further enrich understanding by introducing moral, legal, and social deterrents as key influencers. These models emphasize that moral and health-related concerns are often more effective deterrents than legal threats. Other models, like the Life-Cycle Model of Performance Enhancement and the Systemic Model of Doping Behavior, underline the dynamic and contextual nature of doping decisions throughout an athlete's career and within complex social systems (Ourda & Barkoukis, 2025).

In conclusion, doping behavior is not solely a matter of individual will or moral failing but emerges from a complex interplay of cognitive, motivational, moral, and contextual determinants. Future research and interventions must adopt a holistic, longitudinal, and systemic perspective that considers both personal aspirations and the broader sport ecosystem in which athletes operate.

2.2. Nutritional supplements and doping

The association between nutritional supplement (NS) use and doping has received growing attention in sport science literature, with accumulating evidence suggesting that NS use may act as a precursor or risk factor for doping behavior. Two main approaches have been utilised to assist in the understanding of the association between nutritional supplements and doping; the gateway hypothesis (Backhouse et al., 2013) and the co-occurrence hypothesis (Barkoukis et al., 2020). The gateway hypothesis suggests that the use of legal performance-enhancing substances, such as nutritional supplements, may act as an entry point or "gateway" toward the future use of banned substances like doping agents. According to this perspective, supplement use fosters cognitive and behavioral familiarity with enhancement practices, which can gradually reduce psychological resistance to doping. Athletes may begin to perceive doping as a logical next step in their performance enhancement journey. In contrast, the co-occurrence hypothesis proposes that supplement use and doping do not follow a sequential path but rather stem from common underlying psychological and situational factors, such as high performance orientation, moral disengagement, or favorable attitudes toward enhancement. This means that athletes who engage in both behaviors may be driven by shared motivations rather than a progression from one behavior to the other.

A recent meta-analysis by Hurst et al. (2023) reported that doping was 2.74 times more prevalent among dietary supplement users compared to non-users. The review, which analyzed data from over 13,000 athletes across 26 studies, also found that supplement users expressed stronger intentions to dope and held more positive attitudes toward doping. This robust evidence base indicates that supplement use is not merely a benign behavior but one that may lower psychological barriers to doping, especially in environments where performance enhancement is strongly emphasized. Barkoukis et al. (2025) showed that adolescent athletes who used supplements but did not report doping displayed significantly more favorable attitudes and intentions toward doping than non-supplement users. This supports the "co-occurence hypothesis", which posits that NS and doping share common mental representations. The psychological mechanisms at play include biased reasoning, social projection, and normalization of performance enhancement strategies.

Another study by Hurst et al. (2019) examined the social cognitive factors influencing this relationship, highlighting that the motivational climate, moral disengagement, and attitudes toward legality and efficacy of supplements all contribute to the likelihood of doping. Athletes who believe in the effectiveness of supplements and who perceive less moral risk in their use are more likely to rationalize or consider doping. These findings underscore the importance of addressing not just supplement use but also the beliefs and values that surround such practices in athletic cultures. In this line, research by Barkoukis et al. (2020) provides important insights into the psychological mechanisms that underlie this association. Their study showed that athletes who used supplements exhibited more positive attitudes toward doping and were more likely to morally disengage, i.e., use cognitive justifications to legitimize or excuse doping behavior. The findings also revealed that moral disengagement and favorable attitudes toward doping mediated the link between supplement use and doping intentions. This supports the view that the relationship between supplement use and doping is not automatic but influenced by how athletes interpret and rationalize their behavior within their sport context. Similarly, work by Barkoukis et al. (2020) and Hurst et al. (2019) has demonstrated that factors such as moral identity, anticipated guilt, and the motivational climate play a central role in shaping athletes' intentions. Athletes who emphasize personal ethics, feel guilt about rule-breaking, or operate

in a task-oriented climate are less likely to progress from supplement use to doping. These findings suggest that the supplement-doping link is best understood through a social-cognitive lens, where beliefs, norms, and emotions determine how athletes navigate performance enhancement. Therefore, understanding this association requires more than examining behaviors alone, it must involve a deeper look into athletes' beliefs, values, and social environments.

It is crucial to emphasize that all evidence supporting these hypotheses is correlational. Studies do not demonstrate a direct cause-and-effect relationship between supplement use and doping behavior. While strong associations have been observed, such as those reported by Hurst et al. (2023), who found doping to be significantly more prevalent among supplement users, these findings cannot confirm that supplement use leads to doping. Instead, they point to a pattern of co-occurrence shaped by various personal and contextual influences. Taken together, the research highlights the need for anti-doping policies and education programs to include content on supplement use, especially regarding safe practices and the psychological implications of long-term use. Since many athletes use supplements without ever doping, future interventions should also focus on identifying and reinforcing protective factors, such as strong moral reasoning and intrinsic motivation, that can decouple supplement use from doping intentions. Overall, the body of evidence suggests that addressing supplement use is a critical component in the broader strategy of doping prevention.

2.3. Anti-doping education

Anti-doping interventions have evolved into a comprehensive and multifaceted approach that emphasizes education, awareness, and ethical development in sport. These interventions aim not only to inform athletes and support personnel about the rules and consequences of doping but also to instill values that promote clean and fair competition. A wide array of programs, led by international bodies like WADA, national anti-doping organizations, and EU-funded projects, form the backbone of this global educational framework. Initiatives such as WADA's ADEL platform, USADA's 'TrueSport,' UKAD's '100% me,' and the IOC's OVEP provide structured resources and values-based education. Newer tools like the *Speak Up!* platform and *iRunClean* further engage athletes through interactive modules, decision-making scenarios, and ethics-based learning.

The development of novel interventions marks a significant shift from traditional, rule-centric education to more engaging, theory-driven approaches. Programs like *SafeYOU*, *CoachMADE*, *ANTI-DIF*, and *iPlayClean* integrate cognitive, ethical, and emotional components, helping athletes understand the social, psychological, and health implications of doping (Barkoukis et al., 2022; Nicholls et al., 2020a; Ntoumanis et al., 2021). Innovative tools such as *TARGET* (a serious game) and *VIRAL* (a VR-based simulation) utilize immersive technology to simulate real-life doping dilemmas, enhancing moral reasoning and resistance to social pressure (Barkoukis et al., 2019, 2021). Meanwhile, interventions like *HEROES*, *VIRTUE*, and *ADVICE* focus on moral disengagement and self-efficacy, equipping athletes and coaches with practical skills to navigate complex situations ethically (Kavussanu et al., 2022, 2025; Nicholls et al., 2020b).

The integration of ICT tools has further expanded the reach and effectiveness of anti-doping education. Learning Management Systems (LMS) such as Moodle and Canvas, podcasting, mobile applications, serious games, and AI-based adaptive learning platforms have revolutionized the delivery of content. These technologies support personalized learning paths, facilitate real-time progress monitoring, and allow for diverse educational formats, including quizzes, animations, simulators, and

gamified modules. However, a significant portion of existing resources still relies on static PDFs or non-interactive formats, highlighting the need for ongoing modernization to engage digitally native learners. Equally important are the innovative teaching methodologies underpinning these interventions. Problem-Based Learning (PBL), flipped classrooms, ethical case studies, peer mentoring, and collaborative learning have been widely adopted to foster critical thinking and behavioral change. These methods move beyond knowledge acquisition to actively shape athletes' attitudes, ethical judgment, and resilience against doping-related pressures. By combining cutting-edge technology with theory-informed pedagogy, contemporary anti-doping education provides a holistic, values-based framework that supports long-term prevention and reinforces the integrity of sport.

2.4 Conclusion

In conclusion, understanding doping behavior requires acknowledging its complexity and multifaceted nature, shaped by individual cognition, motivation, morality, and broader socio-cultural contexts. While existing theoretical frameworks effectively illuminate various determinants influencing doping, the nuanced role of nutritional supplements remains less explored. In addition, the role of ASP and their involvement in anti-doping education is still underexplored. Therefore, future research should prioritize qualitative methodologies to obtain deeper insights into ASP's knowledge, perceptions, motivations, and guidance needs related to supplement use. Enhanced qualitative inquiry can uncover ASP's needs for anti-doping education and lead to education that will better equip them to give guidance to athletes in decision making in the use of nutritional supplement to lower the risk of intentional en unintentional doping use by nutritional supplements. Overall, the present deliverable aims to uncover contextual and personal dynamics that quantitative measures alone may overlook, thereby enriching ASP's anti-doping strategies and promoting holistic, values-based interventions in sport.

3. Method

3.1 Participants

A total of 74 Athlete Support Personnel (ASP) from 12 countries participated in the interviews conducted as part of the AntiDop project. The participants represented a wide range of professional roles, including sports dieticians, sport coaches, athletes, physiotherapists, and various other support roles such as psychologists, parents, and fitness trainers. The overall mean age of participants was 34.8 years (SD = 10.19; 36 males and 38 females). The breakdown of the participants in each partner country is as follows:

The Netherlands: A multinational focus group was coordinated by EFAD, the Belgian partner, involving 5 female sports dieticians from Croatia, Hungary, Italy, the Netherlands and Poland. All participants were working with high performance athletes. The mean age of the participants was 40.2 years (SD = 18.38). Also 1 female high performance sports dietician participated in the in-depth interviews. Moreover, two high performance sports dieticians from Croatia (1 male and 1 female) participated in the in-depth interviews. The mean age of the participants was 29.5 years (SD = 1.5). In addition, two high performance sports dieticians from Italy (1 male and 1 female) participated in the in-depth interviews. The mean age of the participants was 29 years (SD = 2.00). And also 2 high performance female sports dieticians from the Netherlands participated at the in-depth interviews. The mean age of the participants was 53.5 years (SD = 0.71). Lastly, in this multinational focus group three high performance sports dieticians from Spain participated in the in-depth interviews. The mean age of the three male participants was 31 years (SD = 4.97).

Germany: The sample obtained in Germany comprised 12 participants, including sports dieticians, sport coaches, and sport psychologists, a legal guardian of an elite athlete, and fitness trainers. The mean age of the participants was 29.2 years (SD = 6.1, 6 males and 6 females).

Greece: In Greece 24 participants, including sports dieticians, sport coaches, parents and fitness trainers. The mean age of the participants was 32.5 years (SD = 6.99, 15 males and 9 females).

Lithuania: Ten participants representing coaches, athletes, parents and physiotherapists were recruited in Lithuania. The mean age of the participants was 34.19 years (SD = 8.85, 1 male and 9 females).

Malta: Similar to Belgium an international focus group was coordinated by the Maltese partner, involving 5 participants from Malta and UK. These participants represented a broad professional range, including coaches and sports scientists. The mean age of the participants was 35.2 years (SD = 5.93, 2 males and 3 females).

Serbia: In Serbia 10 participants, including sports dieticians, sport coaches, sport psychologists, parents, and fitness trainers took part in the interviews. The mean age of the participants was 48.6 years (SD = 10.78, 7 males and 3 females).

3.2 Interview matrix

To explore the perceptions, knowledge, and educational needs of Athlete Support Personnel (ASP) regarding nutritional supplement use and doping, a structured interview matrix was developed and employed. The matrix was designed to guide semi-structured interviews based on eight key thematic areas aligned with the objectives of the ANTI-DOP Erasmus+ project. The interview topics included: understanding of doping and its distinction from supplement use, previous education received on doping and supplements, selection processes and sources of advice for supplement use, perceived health and sport-related risks, current practices in quality checking supplements, and preferences for educational content and delivery. Each topic included primary open-ended questions (e.g., How can an ASP check the quality of a supplement?) accompanied by targeted probes (e.g., Are there any platforms or entities that check supplements?) to elicit deeper insights and clarify participant responses. This thematic framework ensured consistency across interviews while allowing for flexibility and richness in the data collected. The development of the matrix was informed by the project's aim to design educational interventions and e-learning resources tailored to the needs of ASP.

3.3 Design

To investigate the beliefs, knowledge, and educational needs of Athlete Support Personnel (ASP) regarding nutritional supplement use and anti-doping practices, we employed a qualitative content analysis design. This approach allowed for a systematic and flexible analysis of verbal data, enabling us to identify patterns in participants' responses related to their understanding of supplements, risk perceptions, and preferences for educational content. Content analysis is particularly well-suited for examining the frequency and context of specific concepts and categories within interview data, making it an appropriate method for exploring ASP experiences and views in a structured yet open-ended manner (Neuendorf, 2017).

Given the limited conceptual frameworks addressing the educational needs of ASP in relation to supplement use and doping prevention, content analysis allowed us to explore this area inductively, without imposing predefined theoretical categories. This was especially relevant given the diverse cultural and professional backgrounds of the participants, who were drawn from 12 European countries, Belgium, Croatia, Germany, Greece, Hungary, Italy, Lithuania, Malta, The Netherlands, Poland, Serbia and Spain, through national interviews and focus groups and multinational focus group coordinated by the partners in Belgium and Malta. Through careful coding and categorization of participant responses, the analysis captured the key themes related to information sources, decision-making criteria, perceived risks, and the desired format and content of anti-doping education. The use of content analysis supported a data-driven exploration of these issues, reflecting participants' actual experiences, roles, and perspectives as ASP.

3.4 Procedure

This study received ethical approval from the Research Ethics Committee of the Aristotle University of Thessaloniki. The interviews were conducted by trained facilitators under the coordination of national project partners. Interviewers were selected for their familiarity with the sporting context and their ability to create a respectful and open environment for discussion. Participants were recruited through the professional and academic networks of the national coordinators and project partners. Prior to the

interviews, participants received detailed information about the aims of the project, their rights as participants, and the voluntary and anonymous nature of their involvement. All participants signed an informed consent form and completed a brief demographic questionnaire.

The interviews were conducted in person (some via zoom), in the participants' native language (the multinational focus groups were held in English), and were audio-recorded with their permission. On average, interviews lasted approximately 45 minutes. Interviews followed a semi-structured format based on a predefined interview matrix and were guided using open-ended questions, active listening, and contextual prompts to encourage reflection and elicit meaningful insights (Sparkes & Smith, 2014; Smith & Sparkes, 2016). Interviewers also used follow-up questions to probe further into participants' experiences, opinions, and professional practices related to nutritional supplement use and anti-doping education.

3.5 Data analysis

All interviews were transcribed verbatim and analyzed using qualitative content analysis. The analysis followed a structured, collaborative approach consistent with best practices in cross-national qualitative research. Given the project's focus on exploring ASP's knowledge, beliefs, and educational needs regarding nutritional supplements, a codebook-driven content analysis was employed. This approach balanced a practical orientation, guided by the project's objectives, with methodological rigor and consistency across partner countries.

Initially, the Greek dataset was analyzed to develop a preliminary codebook. Following established content analysis procedures (Neuendorf, 2017), the research team engaged in a six-step process: a) familiarization with the transcripts through repeated reading, b) initial coding based on recurring concepts relevant to the project, c) category development by grouping similar codes, d) review and refinement of categories to ensure coherence, e) definition and naming of the main categories and subcategories, and f) data representation, with relevant excerpts extracted to support each category.

This initial analysis informed a shared coding framework that was subsequently applied and refined by research teams in each partner country. While using the preliminary codebook as a guide, national teams were encouraged to adapt or expand the coding scheme when new patterns or concepts emerged in their datasets. This iterative and collaborative process helped ensure both consistency and cultural/contextual relevance in the analysis. The analysis process was primarily inductive, allowing categories to emerge naturally from the data. However, deductive elements were later incorporated to organize and refine the final set of categories in line with the project's objectives.

To ensure the rigor and trustworthiness of our study, we followed the principles proposed by Smith and McGannon (2018). Particular attention was given to the credibility and accuracy of data transcription and analysis across partner countries. To minimize bias and verify transcription accuracy, one independent researcher per partner country, who was not involved in the original data collection, reviewed the interview transcripts. This independent verification process reinforced the integrity of the data before analysis. Throughout the coding and category development stages, a collaborative and reflexive approach was adopted. One member of the research team took on the role of a critical friend, reviewing the coding framework, the initial categorization, and the emerging patterns across datasets. The entire research team then engaged in continuous discussion, reflection, and refinement of the

categories and interpretations. This iterative dialogue contributed not only to the methodological rigor but also to the relevance and practical utility of the findings.

The collaborative and multi-perspective structure of the project further strengthened the trustworthiness of the findings. The data were collected by diverse interviewers with sporting experience and analyzed by experts from different professional and cultural backgrounds. This pluralism in perspectives, combined with the variation in ASP roles and national contexts, allowed the project to embrace a wide range of viewpoints and educational needs. The interviews are analysed and described based on the location of the partner(s).

4. Results

4.1. The Netherlands

4.1.1 ASP's role and interaction with athletes

In the analyzed batch of interviews, athlete support personnel (ASP) consistently describe their role as centered on providing individualized, evidence-based nutritional guidance tailored to the demands of each sport and athlete. Most ASP emphasize the importance of evaluating body composition, designing flexible dietary plans, and adjusting supplementation and food intake according to the intensity, frequency, and timing of training sessions.

Interviewee 8, who works within motorsport, explains: "Our role is to design nutritional plans… and we liaise with the coach to fully understand the training schedule and then adjust the nutrition plan accordingly." Similarly, interviewee 9, supporting handball athletes, states: "I try to advise them depending on the exercise load… I make nutritional planning that is not closed but gives them several guidelines depending on the training day."

ASP involvement also extends to maintaining communication with the athlete's broader team, including coaches and medical professionals, to ensure consistency across training and nutritional practices. Interviewees highlight a balance between scientific recommendations and the athlete's personal context, acknowledging that performance optimization requires both structured support and practical adaptability.

This emphasis on multi-stakeholder cooperation was reflected in the focus group as well. Interviewee 3 from the focus group shared: "In motorsport there are strict protocols and I mainly talk there with the team physician. In soccer we work multidisciplinary and 1 to 1." Interviewee 4 from the focus group stated: "I mainly work 1 to 1," while interviewee 6 added: "In Poland I work 1 to 1 and give group sessions." Interviewee 7, who supports over a thousand Olympic athletes in Hungary, noted: "I coach 15 athletes, educate the staff, official, medical, paramedical personnel and the catering personnel about sports nutrition and doping." These insights confirm that ASP across Europe engage in a mix of individualized and team-based support, emphasizing interdisciplinary collaboration and tailored guidance to meet athletes' evolving needs.

4.1.2 ASP's experience with doping control

Across the interviews, ASP reveal limited direct experience with doping controls. Most acknowledge a general understanding of anti-doping principles but report minimal involvement in formal anti-doping processes. Their insights stem primarily from theoretical knowledge or personal initiative rather than institutional training or routine practice.

Interviewee 8, for example, notes that while they are well aware of doping definitions and its implications, they have not received structured education on anti-doping: "Not directly, not at university, nor in the master's programs. Most of it has come from personal interest, as a former athlete, and by staying informed through WADA." Similarly, interviewee 9 admits: "As I do not deal with doping frequently… in the long run, you forget about it. You know about WADA and so on, but not much."

Although there is a shared awareness that anti-doping issues are crucial, particularly regarding supplement contamination or medication use, most ASP admit that doping controls are not integrated

into their day-to-day responsibilities unless an incident arises. This reflects a gap between the importance of anti-doping compliance and the practical training ASP receive to navigate this area.

4.1.3 ASP's knowledge and education on doping and nutritional supplements

ASP generally report receiving more formal education on nutritional supplements than on doping. Training related to supplements is often embedded in undergraduate or master's programs in nutrition or sports science. Interviewee 9 explains: "In the master's degree, there is a whole subject that helps with nutrition and supplementation… always based on scientific evidence." Interviewee 7 described a more structured approach in Hungary: "Every Olympic athlete and athlete support person needs annually to follow a course and do a test to receive a certificate." However, education on doping tends to be superficial or outdated. Interviewee 6 said: "I learned about doping and nutritional supplements at the sports nutrition course in the UK. In Poland we didn't receive info." Several ASP mention that whatever knowledge they have regarding doping came from brief modules or from following updates online. Interviewee 8 shares: "It's true that I studied a long time ago… most of the anti-doping knowledge came from my own curiosity and reading WADA updates."

Many supplement-related topics, such as ergogenic aids, usage protocols, and classification systems like the AIS (Australian Institute of Sport) model, are better understood among ASP. Nevertheless, they frequently highlight the need for continuous, up-to-date learning due to the evolving nature of both supplement science and doping regulations.

Participants in the focus group echoed this imbalance. Interviewee 4 from the focus group confirmed: "No, we didn't receive any information related to nutritional supplements and doping." Interviewee 5 noted: "I learned it by doing my job at the Dutch antidoping authority. And now I know where to seek actively for information if I need it." Interviewee 3 added: "In Croatia we have every 2 years a new back-up course about doping; afterwards you need to do a test. If you pass you receive a certificate. These examples highlight differences in national approaches and point to a broader lack of consistent, mandatory anti-doping training for ASP across Europe. These inputs show that although some countries have more formalized systems, most ASP rely on fragmented and often outdated sources for doping education, highlighting the need for more consistent and accessible learning.

4.1.4 Ways of selecting nutritional supplements for athletes

The selection of supplements is primarily guided by scientific evidence, sport-specific physiological demands, and the individual needs and preferences of athletes. ASP stress the importance of understanding the metabolic processes of each sport to identify where supplementation can make a meaningful impact.

Interviewee 8 describes their approach as akin to food industry hazard analysis systems: "We follow an internal model similar to HACCP… identify physiological areas where we can intervene and then select scientifically validated supplements." Interviewee 9 echoes this, stating: "First, I try to understand what happens in the sport physiologically… then find supplements with evidence to support performance."

Other considerations include the athlete's training schedule, taste preferences, and tolerance. Interviewee 9 points out the importance of practicality: "Science is great, but putting it into practice is

difficult. What prevails is how the athlete feels." This highlights the personalized and pragmatic nature of supplement selection among experienced ASP.

This pragmatic and evidence-based selection process is confirmed in the focus group. Interviewee 3 from the focus group shared: "Sometimes I try to contact somebody of the national antidoping authority." Interviewee 5 warned about the bias in marketing: "Sometimes it isn't a good idea to contact the producer because they want to sell their products and can give you wrong information. Marketing sometimes uses only the positive part of the research to promote their products on the website." Interviewee 2 emphasized differences in regulation across Europe: "In Belgium we have a lot of whey enriched products in the supermarkets… a colleague sports dietician was urged by her team manager to contact all the producers to be sure they are safe for the doping control since cyclists get a lot of doping controls." These contributions illustrate that ASP across countries use a mix of formal sources, direct inquiries, and regulatory awareness to guide supplement choice, yet face challenges with trust, marketing bias, and varying levels of national oversight.

4.1.5 Health and doping safety of nutritional supplements

ASP express strong awareness of the potential risks associated with nutritional supplements, especially regarding contamination and doping violations. They emphasize the importance of verifying the safety and legality of supplements, particularly when working with elite athletes subject to anti-doping controls. Interviewee 8 states: "Provided you've done your homework and checked active ingredients and certifications, you should be fine. But if the athlete decides to go off-script… that's their problem." Interviewee 9 points to systemic issues: "There's so little regulation in supplementation… it's very easy to test positive unintentionally."

From a health perspective, ASP warn that inappropriate or excessive use can displace healthier food choices or lead to gastrointestinal issues. Interviewee 9 remarks: "If you replace all your food with supplements, that's clearly not healthy… it should be an aid, not a replacement." These concerns were mirrored by the focus group participants. Interviewee 6 from the focus group pointed out a specific risk: "That supplements used for weight loss can provide a positive doping test." Interviewee 5 emphasized marketing distortions: "Marketing sometimes uses only the positive part of the research to promote their products or to create a need like they do for vitamins and minerals." Interviewee 2 added a health-based observation: "Nutritional supplements are often ultra-processed foods and too much isn't that healthy. So you preferably stick to pure foods and only use additional a bar or a gel and not the whole day." Interviewee 3 noted: "As long as they are clean and helping to fuel I don't think so," indicating a belief that safety depends on supplement purity and appropriateness. Interviewee 7 from the focus group added a policy-oriented concern: "A warning about harmful products on the market" should be available, underscoring the need for accessible, proactive risk communication. Overall, the interviews and focus group reveal a strong, shared recognition that nutritional supplements pose health and doping risks if not carefully managed, especially when trust in producers, clarity of labeling, or regulatory oversight is limited.

4.1.6 Checking the quality of nutritional supplements

To ensure supplement quality, ASP rely on third-party certifications and recognized verification platforms. Common references include Informed Sport, the Cologne List, and national regulatory

agencies. Interviewee 9 explains: "I would make sure of third-party systems… and avoid brands that sell hormonal products due to cross-contamination."

In some cases, ASP request formal documentation from supplement manufacturers to confirm anti-doping compliance. Interviewee 8 notes: "We drafted a declaration of responsibility for brands not certified by WADA… we don't prescribe without it." Careful review of labels and knowledge of manufacturing standards is considered essential, especially when supplements are sourced internationally. ASP emphasize documentation and email confirmation rather than informal communication with athletes or suppliers. This careful, systematic approach was echoed in the focus group. Interviewee 6 stated: "I check the label, the website of the producer or seller and if possible I check them on a UK website for safe products." Interviewee 5 warned: "Sometimes it isn't a good idea to contact the producer because they want to sell their products and can give you wrong information."

Interviewee 2 added: "A colleague sports dietician was urged by her team manager to contact all the producers to be sure they are safe for the doping control since cyclists get a lot of doping controls." Interviewee 6 also mentioned platforms used in Europe: "They can contact their team dietician or go to the German, Dutch or UK platform that check supplements." Finally, interviewee 5 called for clarity: "An infographic about how to check the safety of nutritional supplements" would help other ASP navigate verification steps. The combination of formal checks, institutional collaboration, and demand for accessible tools demonstrates ASP's commitment to ensuring supplement safety despite structural and market challenges.

4.1.7 Perceptions of supplement safety, health benefits, and potential health risks

ASP hold a nuanced view of supplement safety and health implications. While they acknowledge that scientifically validated supplements can be beneficial when used correctly, they stress that misuse poses both health and performance risks. Interviewee 8 argues: "If a professional athlete isn't supplementing, they're likely performing below their competitors. But in amateur sport, it can create poor habits." Interviewee 9 warns: "The main risk is displacement of nutritious food… if you replace eating with a pill, you're missing more than just nutrients." They also highlight the potential for gastrointestinal issues and the psychological risk of dependency, particularly when athletes believe performance is solely supplement-driven. Overall, the consensus is that supplements can be healthy aids, but only when integrated responsibly within a well-planned diet.

The focus group echoed many of these concerns. Interviewee 2 stated: "Nutritional supplements are often ultra-processed foods and too much isn't that healthy… you preferably stick to pure foods and only use additional a bar or a gel and not the whole day." Interviewee 5 warned about the influence of marketing: "They create a need like they do for vitamins and minerals," which may lead to unnecessary or excessive use. Interviewee 7 emphasized a need for warnings: "A warning about harmful products on the market." Interviewee 4 stressed: "We need more mandatory education… followed by a certificate… so [ASP] can prove they are up-to-date." These insights show that while ASP recognize legitimate benefits of supplementation, they remain cautious due to the potential for health risks, ethical compromise, and misinformation.

4.1.8 Enhancing ASP knowledge and preferred learning formats

There is a shared interest among ASP in improving access to concise, scientifically accurate education on supplements. Most express a preference for short-form content, such as video clips,

podcasts, or infographics, which are more accessible and engaging than lengthy lectures or articles. Interviewee 8 suggests: "Short videos or podcasts, something I can fit in whenever possible. Reading is harder to make time for." Interviewee 9 adds: "Use social media platforms like Instagram or TikTok to make this content more visible and accessible."

ASP learning should be driven by relevance and practicality, focusing on current research and real-world application rather than dense academic theory. Clear, visually engaging content is preferred across the board. This aligns strongly with feedback from the focus group. Interviewee 3 proposed: "An informative session or an online course. A short video or animation." Interviewee 6 emphasized structured learning: "A first course of 1 week followed by an annual update." Interviewee 5 added the need for accessible European-level tools: "A European website where you can find information about supplements available in all European countries." Interviewee 2 suggested: "A guideline for an evidence-based use of nutritional supplements," while interviewee 4 advocated for certification: "More mandatory education… followed by a test so they can prove they are up-to-date." Interviewee 5 also recommended educational material that addresses emotional aspects: "Learning how an athlete feels about struggles with the use of nutritional supplements and doping control… and how we better can coach them on these topics." Together, the interviews and focus group demonstrate a strong desire for engaging, mobile-accessible educational formats rooted in evidence-based content and delivered by professionals.

4.1.9 Desired learning outcomes from supplement education

ASP express a strong desire to gain clear, actionable knowledge on which supplements have scientific backing, their proper protocols, and which sports they are most applicable to. Interviewee 9 notes: "I want to know which supplements have evidence, what the dosage is, what the protocol is, and in what disciplines they are used."

There is also interest in learning the basics of metabolic pathways, but many believe this is too technical for brief training formats. The emphasis should be on practical application, how to use the supplement, for what purpose, and under what circumstances, rather than detailed biochemical mechanisms. The goal is to strengthen evidence-based practice and reduce misinformation among both ASP and athletes.

Focus group participants echoed this priority. Interviewee 2 from the focus group stated: "A guideline for an evidence based use of nutritional supplements" is something that is missing and would be useful for ASP across Europe. Interviewee 4 emphasized the need for broader understanding: "What is influencing the doping control. Not related to nutrition, but more to the environment, the lifestyle of the athlete and the used control methods." Interviewee 3 stressed interdisciplinary collaboration: "A guideline about how to cooperate with a sports dietician to avoid unwanted positive doping results from nutritional supplements. Given by a NADO representative plus a sports dietician." Interviewee 5 added a psychosocial dimension: "Learning how an athlete feels about struggles with the use of nutritional supplements and doping control and how we better can coach them on this topic."

These desired outcomes highlight ASP's strong interest in education that goes beyond ingredients and protocols, integrating contextual, emotional, and ethical factors into learning.

4.1.10 Educational design preferences and final reflections

ASP favor short, flexible, modular learning sessions that can be accessed on demand. Suggestions range from 45-second videos to 15-minute podcasts, depending on the level of depth. Interviewee 9 states: "I wouldn't go for hour-long sessions… if you want to reach dieticians with existing degrees, go for the format they're already consuming on social media." There is consensus that education should be delivered by professionals with expertise in sports nutrition, ideally tailored to specific sports. Interviewee 9 concludes: "Science is appealing, but translating it into practice is the challenge. The athlete's habits and health must take priority." Overall, ASP emphasize that supplements should only be introduced once a solid nutritional foundation is in place and that educational materials must bridge the gap between theory and practice effectively.

The focus group strongly reinforced these views. Interviewee 3 recommended: "An informative session or an online course. A short video or animation." Interviewee 6 proposed a hybrid structure: "A first course of 1 week followed by an annual update." Interviewee 5 advocated for European-level support: "A European website where you can find information about supplements available in all European countries (since the formulation can differ country by country)." Interviewee 1 summarized the group consensus: "Everybody who's working with elite athletes or those who can become tested on doping has to follow on a regular base a course about nutritional supplements and doping, followed by a test to check their knowledge." Interviewee 7 added: "A warning about harmful products on the market" is also needed, while Interviewee 4 and Interviewee 2 stressed access to reliable information on new products and technical changes in doping detection. Interviewee 5 emphasized practicality and emotional understanding: "Infographics, structured updates, and content on how to coach athletes on these issues" are crucial to implementation.

In conclusion, ASP want educational experiences that are flexible, accessible, concise, and evidence-based, delivered by credible experts, with real-world relevance. Certification, regular updates, and centralized, multilingual resources were highlighted as critical components for future development.

4.2. Germany

4.2.1 ASP's role and interaction with athletes

Across all interviews, Athlete Support Personnel (ASP) consistently described their role as being deeply engaged in the daily lives of young athletes, though the extent and nature of involvement varied depending on the setting. They often served as mentors, caregivers, and logistical coordinators, creating stable and supportive environments around the athletes. In boarding school environments, ASP often functioned as full-time caretakers. As interviewee 7 explained: "We look after the young people who live at the boarding school four days a week, 24 hours a day, coordinating with the clubs, the school, their families." This included not only general supervision but emotional support and logistical coordination with families and clubs. Similarly, interviewee 3 noted their responsibility to help athletes manage stress and maintain structure: "We help them manage school stress, organize their schedules, and stay mentally balanced, especially during demanding training periods." For ASP in less immersive environments, the interaction was more ad hoc. Interviewee 2 said: "Sometimes athletes approach us with questions, even if we're not directly involved in training; we try to help with what we know." Interviewee 1 from the focus group stated: "As coaches, we're always there, not just during practice but also for everything around it, like food, emotions, school matters. It's more than just sport." Interviewee 3 from the focus group added: "We try to be a point of stability, someone the athlete knows they can trust no matter what issue they're facing."

4.2.2 ASP's experience with doping control

The majority of ASP interviewed had limited exposure to doping control procedures and no formal training on how to manage such scenarios. Their awareness was often limited to general knowledge that tests could occur, without understanding how to support athletes through the process. This lack of structure leaves them unprepared to assist athletes if and when testing occurs. Interviewee 6 said: "We know doping tests can happen, but we've never received structured training on how to support athletes in those cases." Similarly, interviewee 2 admitted: "I've heard of doping controls taking place, but I wouldn't know how to advise an athlete, there's no formal protocol or information for us." Even in sports boarding schools where doping controls are more likely to occur, the communication about these procedures is often informal. Interviewee 7 described: "I've been in this field for quite a while... but in any case, there was no official, 'You're working here now, here's what you need to know.'" Interviewee 2 from the focus group explained: "Doping controls exist in elite sport, yes, but no one ever trained us on how to react if it happens to one of our athletes." Interviewee 5 from the focus group added: "Sometimes we find out a doping test happened only after the fact, we're not part of the process, and that's a risk."

4.2.3 ASP's knowledge and education on doping and nutritional supplements

A consistent theme across interviews was the lack of systematic education for ASP regarding both doping and the use of nutritional supplements. Most ASP indicated they had never received formal instruction and instead relied on general awareness or sporadic informational sessions. Many expressed concern over the vagueness of the knowledge they possessed and the absence of structured support. Interviewee 3 pointed out: "We know that doping exists and that supplements can be risky, but no one has ever explained to us the difference in a structured way." Interviewee 6 echoed this, stating: "There's been no training on what kinds of supplements are safe or how to recognize problematic ones. We're

mostly guessing based on what we hear from others." In some cases, nutrition-related information was provided, but it lacked depth and continuity. As interviewee 7 noted: "We've had nutrition talks at the boarding school, but they didn't really go into the specifics of doping or supplements." Interviewee 3 from the focus group said: "I never had proper education about supplements or anti-doping, everything I know is self-taught or comes from experience." Interviewee 4 from the focus group reinforced this: "We've been left to figure things out on our own. I've never been offered formal training."

4.2.4 Ways of selecting nutritional supplements for athletes

Most ASP reported minimal involvement in the selection or recommendation of nutritional supplements for athletes. These decisions are typically made by the athletes themselves, or occasionally influenced by coaches or parents, with ASP stepping in only when a concern is raised. There was a general feeling of limited authority and uncertainty in navigating this area. Interviewee 3 stated: "We see that athletes use protein powders and various products, but they don't talk to us about them. It's not part of our involvement." Similarly, interviewee 6 mentioned: "Unless an athlete asks me directly, I don't know what they're using. I wouldn't know how to advise them anyway, I don't have the training." However, ASP sometimes intervene in special cases, such as weight management for combat sports. Interviewee 7 explained: "Only when a young person brings up the issue or if we notice something unusual do we try to speak with the athlete, the parents, or the coach." Interviewee 4 from the focus group commented: "Athletes often buy whatever is trending; they don't consult us unless there's a problem." Interviewee 2 from the focus group added: "Sometimes parents ask our opinion, but we don't always feel confident answering."

4.2.5 Health and doping safety of nutritional supplements

Concerns about the safety and health implications of supplement use were widespread among ASP. Several expressed worries about both the physical effects of excessive or improper supplement intake and the potential for unintentional doping violations. The dual concern of physical health and rule compliance was frequently raised. Interviewee 2 shared: "Some supplements might be contaminated or not properly labelled, athletes could unknowingly test positive." Interviewee 5 added a nutritional perspective: "If athletes replace real food with powders or pills, it can cause digestive problems or nutritional imbalances. It's not just about doping, it's a health issue too." Additionally, some ASP criticized the commercial motives behind the supplement industry. Interviewee 1 commented: "It's a business. They sell things that kids might not even need if they ate properly. But there's no one educating them about that." Interviewee 5 from the focus group noted: "Even if a supplement is legal, it doesn't mean it's healthy or safe. Some of them have hidden ingredients." Interviewee 1 from the focus group added: "Many of us worry that young athletes take things without knowing what's inside, or how it affects their long-term health."

4.2.6 Checking the quality of nutritional supplements

ASP often expressed uncertainty about how to assess the quality or legitimacy of dietary supplements. Very few knew of independent resources or quality seals that certify supplements as safe. In most cases, they relied on online searches or reading labels, which they recognized as insufficient. Interviewee 6 noted: "If an athlete asked me if a product was okay, I would google the ingredients, I don't know any official platforms." Interviewee 7 echoed this approach: "I'd probably read what's on the

label, what's in it, and if in doubt, I would google it." This reveals a widespread lack of access to reliable, centralized information. Interviewee 3 from the focus group emphasized: "We don't know where to check, there's no recognized portal or list we can turn to." Interviewee 5 from the focus group added: "There should be a neutral place where ASP can check products without having to rely on advertising or word of mouth."

4.2.7 Perceptions of supplement safety, health benefits, and potential health risks

ASP expressed a wide range of opinions about the safety and benefits of nutritional supplements, but a common thread was caution. Many acknowledged that supplements could be useful in some contexts but warned about overuse and reliance on commercial products. Interviewee 7 observed: "From what I've read, it's obviously an industry and a business. Money is made by offering things you should be getting from a normal diet." Interviewee 5 stated: "If athletes only use supplements and forget about real food, they could be doing long-term harm to their bodies." Interviewee 6 added: "I think supplements can give a false sense of security, like you've done everything right just because you took a shake." Interviewee 4 from the focus group explained: "It's easy for athletes to think more is better, but even too much of a good thing can backfire." Interviewee 2 from the focus group agreed: "Some athletes trust these products blindly. We've seen cases where this leads to health issues or poor performance."

4.2.8 Enhancing ASP knowledge and preferred learning formats

Most ASP expressed a strong desire for structured, accessible information on supplements and doping. There was a demand for clear, science-based guidance delivered in diverse and user-friendly formats. Interviewee 7 proposed: "A platform that lists supplements, what they're used for, and whether they're recommended, that would be very helpful." Interviewee 6 noted: "We need something we can turn to in real time, something official and trustworthy." Others emphasized the value of in-person discussion and interactivity. Interviewee 3 suggested: "If someone came to our staff meetings to give us input, we could ask questions and learn together." Interviewee 3 from the focus group mentioned: "It's important to adapt training formats, some prefer reading, and others want video or direct dialogue." Interviewee 5 from the focus group added: "Even short, structured modules could help us build the confidence to talk about supplements with our athletes."

4.2.9 Desired learning outcomes from supplement education

When discussing what they hoped to gain from education on supplements, ASP consistently pointed to the need for practical, situation-based knowledge. They wanted to be able to identify common supplements, understand their appropriate uses, and respond confidently to athlete or parent questions. Interviewee 7 said: "If I walk into a room and see five tubs of protein powder, I want to know what that means, what's normal, what's not." Interviewee 5 echoed this: "It's about knowing what to do if something feels off, when to raise a flag or look deeper." Interviewee 2 added: "We don't need to become experts, but we should at least be able to explain the basics clearly." Interviewee 1 from the focus group shared: "We want tools to help us identify risk, like what's fine, what's a warning sign, and what's a red flag." Interviewee 4 from the focus group explained: "Knowing which questions to ask an athlete could be more valuable than having all the answers."

4.2.10 Educational design preferences and final reflections

ASP favored a flexible, recurring education model that could accommodate different learning preferences and their often-irregular schedules. They highlighted the importance of interactive elements and case-based discussion to deepen engagement. Interviewee 7 proposed: "It makes sense to offer education every six months or annually, ideally with group sessions and interactive discussions." Interviewee 6 added: "Not everyone can attend live sessions, so having things online and accessible helps us stay up to date." Interviewee 3 mentioned: "Even a mix of short videos and downloadable guides would go a long way." Interviewee 2 from the focus group emphasized: "It shouldn't just be a lecture, make it interactive, so we can apply what we learn." Interviewee 4 from the focus group concluded: "Whoever delivers this training needs to be independent. Athletes' health should come before podium results."

4.3. Greece

4.3.1 ASP's role and interaction with athletes

Most interviewees described their roles as either coaches, trainers, or advisors who maintain regular, close contact with athletes. Their primary goal is to support athletes' performance, well-being, and development, both physically and mentally. Many emphasized a dual function that combines educational and athletic guidance. The interaction with athletes is often daily, involving personal communication, training planning, and advising on issues such as nutrition and performance routines.
Interviewee 22 says that: "My role is essentially dual: both educational and pedagogical. I aim to interact with my athletes as much as possible, in order to stay close to them and help them feel comfortable in their environment." Interviewee 17 says that: "I am a football coach and physical trainer. I interact with the players on a daily basis." Interviewee 14 says that: "My role is like an advisor. I provide advice to athletes and other coaches."

Several participants also highlighted the longevity and breadth of their experience, working with a range of athlete levels from youth to professionals. Interviewee 23 says that: "I have been a volleyball coach and physical education teacher for 37 years, working with children, amateurs, and professionals." Interviewee 24 adds a focus on early education, noting: "When I coached amateur teams, I used to inform the kids about what doping control is, even though no controls took place in our teams." This consistent involvement builds a strong relationship between ASP and athletes, which was highlighted as a foundation for trust and influence, particularly relevant when it comes to sensitive topics such as supplement use or doping prevention.

4.3.2 ASP's experience with doping control

The majority of ASP reported limited or no direct experience with doping controls among their athletes, particularly those working with youth, amateur, or non-elite athletes. In many cases, they mentioned that doping controls are rare in their context or handled entirely by governing bodies. Despite this lack of personal involvement, most recognized the importance of doping controls as a mechanism to maintain fair competition and protect athlete health. Interviewee 20 says that: "None of my athletes have undergone a doping control so far." Interviewee 13 says that: "No such experience." Interviewee 18 says that: "I don't have any such experience. However, I believe that doping control is a good thing because it helps distinguish athletes who work properly from those who choose 'other' methods to improve."

Some ASP working with higher-level or adult athletes noted that doping tests do occur occasionally in formal competitions, but they are not involved in the process. They also observed that beginner athletes may be more vulnerable due to their lack of awareness and education. In some cases, ASP emphasized their role in proactively educating athletes about doping, even in the absence of formal testing procedures. Interviewee 24 states: "There was no doping control in my teams, but I always made sure to educate the kids about what it is." Similarly, Interviewee 23 adds: "I've had athletes ask about certain preparations, and I always stress that they must be 100% sure of what it contains before using it." This gap between policy and everyday practice may contribute to the limited readiness among ASP to effectively respond to doping-related situations when they arise, reinforcing the need for broader awareness and education.

4.3.3. ASP's knowledge and education on doping and nutritional supplements

Educational exposure among ASP varies significantly. While some reported formal training through university programs or professional seminars, mainly focused on doping, many stated they received little to no structured education, particularly regarding nutritional supplements. In the absence of formal instruction, ASP often rely on informal sources such as internet articles, YouTube videos, colleagues, or product representatives, which differ greatly in credibility and scientific reliability.Interviewee 19 says that: "We attended two to three training seminars at the university. Each lasted about one to one and a half hours." Interviewee 10 says that: "Only what I read here and there." Interviewee 15 comments: "YouTube has videos from medical doctors and other experts, but unfortunately sometimes from not real-experts." Even those with academic backgrounds acknowledged that their knowledge is either theoretical or outdated. Seminars offered by commercial companies were commonly mentioned, though many participants questioned their objectivity. A recurring theme throughout the interviews was the recognition of a clear educational gap, particularly in understanding the legal framework, health implications, and best practices for safe and effective supplement use.

Some ASP had more consistent exposure to relevant education, particularly those involved in school or federation contexts. Interviewee 23 notes: "I've attended three seminars on anti-doping and on supplement use through school-based programs." Interviewee 24 adds: "I've delivered and attended doping seminars and speeches, and I also learn through articles and magazines." Across responses, there was a shared understanding that structured, up-to-date, and practically applicable education is lacking, posing a challenge for ASP who seek to provide informed and responsible guidance to athletes.

4.3.4 Ways of selecting nutritional supplements for athletes

The selection of nutritional supplements by ASP is often based on a mix of informal methods, personal judgment, and advice from external sources. A lot of ASP reported that, ideally, they refer athletes to qualified professionals such as doctors, pharmacists, or nutritionists when making supplement-related decisions. However, several acknowledged that, in practice, decisions are frequently influenced by less formal sources, such as internet articles, colleagues, product vendors, and personal experience, raising concerns about the consistency and credibility of the information used. Interviewee 18 says that: "Usually, I refer them to specialists with the appropriate knowledge… I would seek advice from someone who knows the subject well, not someone lacking clarity." Interviewee 13 explains: "Based on doctor's instructions, only vitamins are administered. In any case, we choose based on the volume of training and the overtraining of athletes." Interviewee 16 notes: "I select them mainly based on the kind of exercise they do and their age. I discuss things with colleagues, friends and a few customers."

Some ASP highlighted that they avoid recommending supplements altogether unless directly asked by the athlete or if there is a medical need. Others mentioned that age, training level, sport type, and phase of the athletic season often influence the selection process. Interviewee 23 contributes an example of a more structured approach: "We always select supplements in collaboration with doctors and nutritionists, under their supervision." This reinforces the call for clearer protocols and access to reliable expertise. The overall picture reveals a lack of standardized, evidence-based approaches to supplement selection. This variability underscores the need for improved educational tools and decision-making frameworks to help ASP provide safe, consistent, and effective guidance.

4.3.5 Health and doping safety of nutritional supplements

The majority of ASP perceive nutritional supplements as generally safe for both health and doping control, provided they are used correctly and under professional guidance. Many emphasized the importance of certified products, appropriate dosage, and the involvement of qualified professionals. However, this confidence was often accompanied by caution regarding the risks of misuse, particularly in cases of overconsumption or the use of low-quality or uncertified supplements. Interviewee 22 says that: "Yes, all supplements are safe, except for caffeine overconsumption, which is sometimes added or removed from the WADA list." Interviewee 17 remarks: "They are safe, as long as you know how to use them properly. However, incorrect or excessive use can lead to health issues." Interviewee 12 adds a physiological perspective: "Testosterone can affect the heart, the liver and the kidneys."

Some ASP pointed out that long-term risks may not be immediately visible, especially when supplements are taken without professional oversight. Others expressed concern that the distinction between legal supplements and banned substances is not always obvious, which could increase the risk of unintentional doping violations. Interviewee 23 echoes the importance of regulatory oversight, stating: "They are safe, as long as they are approved by the Greek Medicines Agency (EOF)." Interviewee 24 offers a balanced view: "There are specific dosages, and the body eliminates the excess, but some organs may still be stressed." Despite these reservations, the dominant view among ASP is that nutritional supplements, when used responsibly and in the context of athletic demands, are valuable for enhancing recovery, energy, and performance, especially when dietary intake is insufficient.

4.3.6 Checking the quality of nutritional supplements

Most interviewees acknowledged the difficulty in verifying the quality of nutritional supplements. Several emphasized the importance of choosing certified products, often referring to approvals from national authorities such as EOF (Hellenic National Organization for Medicines). Common strategies included consulting with medical professionals or nutritionists, reading ingredient labels, and relying on trusted sources like pharmacies rather than commercial gyms or online vendors. Interviewee 14 states: "I prioritize the EOF licence. For other supplements I check the ingredients. There are no known online platforms to check the quality." Interviewee 4 echoes this cautious approach: "I usually buy from pharmacies. I trust them more than shops or gyms." Interviewee 13 suggests a more academic strategy: "Studying the scientific literature can help ASP to get knowledge on the quality of the supplements."

Others admitted that they rely heavily on personal experience or anecdotal knowledge due to the lack of reliable verification tools. Interviewee 16 highlights this challenge: "There are no online platforms to check the quality; this is something you learn from practice over time. Personal experience and lab exercises are key." Additional insights emphasized the importance of examining product origin and formulation, especially when used in high-performance contexts. Interviewee 23 notes: "You need to check the country and place of origin and search the internet or books." Interviewee 24 adds: "Medical tests should come first to detect any deficiencies, then the origin and formulation should be checked." Across all responses, a clear need emerged for centralized, accessible, and evidence-based tools to help ASP confidently assess supplement quality. In the absence of such resources, many are left depending on fragmented, inconsistent, or unverified sources of information.

4.3.7 Perceptions of supplement safety, health benefits, and potential health risks

The majority of ASP viewed nutritional supplements as generally safe and beneficial when used correctly, emphasizing the importance of dosage control and appropriate supervision. Many highlighted the role of supplements in improving recovery, enhancing performance, and supporting overall well-being, particularly when dietary intake is inadequate due to high training demands. Interviewee 5 states that: "They are helpful and safe if you know what you're doing." Interviewee 10 adds: "Too much dose can be toxic. But for a period of 3 months, it is OK." Interviewee 20 explains: "Only if someone takes a supplement without guidance or exceeds the recommended dosage, it can become dangerous."

At the same time, a considerable number of ASP acknowledged the potential health risks associated with overuse, misuse, or consumption without professional supervision. Reported risks included organ strain (particularly liver and kidneys), toxicity, or adverse side effects, especially in relation to specific ingredients such as testosterone, creatine, or caffeine. Interviewee 12 remarks: "Testosterone can affect the heart, the liver and the kidneys." Interviewee 15 notes: "There have been reported some risks related to high transaminases in the blood, or problems in the liver." Interviewee 18 warns: "Maybe not immediately, but in the long run, they could cause health problems."

This overall view is one of cautious optimism, supplements are seen as potentially valuable tools, but only when used within scientifically informed boundaries and under qualified guidance. Interviewee 23 reinforces this position, stating: "Yes, they are healthy, when taken in controlled amounts and with medical supervision." Interviewee 24 adds a note of warning: "There could be issues if misused. Some organs might be stressed. Even though the body discards excess substances, it can be harmful." Ultimately, ASP recognize that the perceived benefits of supplements must be balanced against real health risks, making the role of education and supervision all the more critical.

4.3.8 Enhancing ASP knowledge and preferred learning formats

Nearly all ASP expressed a strong desire for further education on nutritional supplements, emphasizing that their current knowledge is often fragmented, self-taught, or acquired through non-specialist channels. Many acknowledged a clear knowledge gap and stressed the importance of targeted, scientifically backed training programs that would enable them to make informed decisions and better guide their athletes. Interviewee 13 emphasizes: "Training is important. I support the idea of university-level education." Interviewee 18 recommends: "We need interactive education, ideally with real-time Q&A and specialists providing input." Interviewee 22 suggests: "A 3–5-hour series of videos with expert nutritionists would be ideal."

ASP expressed a range of preferences regarding learning formats. Many favored short and flexible online sessions that fit into their busy professional schedules. Others highlighted the importance of face-to-face interaction for better engagement and the ability to ask questions in real time. Multimedia resources such as videos, eBooks, and podcasts were viewed as effective tools to enhance comprehension and retention. Interviewee 16 states: "Online learning and podcasts are realistic approaches. Media-enriched eBooks would be great." Interviewee 15 adds: "Scientists and medical doctors may look more convincing as teachers in a seminar like that." Interviewee 14 proposes: "Start with eLearning and then move to in-person seminars. Personalization is key."

Interviewee 23 contributes a practical suggestion: "Education should involve seminars, visits to medical or training centers, and listening to expert input." Similarly, Interviewee 24 emphasizes accessibility: "The information should be in simple, accessible language, so parents, coaches, and even

doctors can understand." There was a shared understanding that different ASP roles (e.g., coaches, medical staff, and parents) may require differentiated learning paths and formats. Parents, in particular, were identified as a group needing foundational awareness, while professionals would benefit from more technical and detailed instruction.

4.3.9 Desired learning outcomes from supplement education

The ASP consistently articulated a need for education that is practical, science-based, and tailored to their specific roles. They want to be equipped with knowledge that enables them to make safe and informed decisions, effectively advise athletes, and clearly distinguish between beneficial and potentially harmful substances.

Key learning outcomes mentioned include:

- Understanding which substances are legal, safe, and effective;
- Recognizing potential health risks and side effects;
- Learning how supplements interact with training regimens and athlete profiles;
- Identifying age-appropriate or role-specific supplement use.

Interviewee 10 explains: "Health information is the most important; I want to learn how supplements support training and contests." Interviewee 17 adds: "We want to know what's allowed, what's harmful, and what we can safely recommend." Interviewee 18 highlights: "I'd like to learn who is qualified to recommend supplements, what types are suitable, and what the short- and long-term effects are."

In addition to core knowledge, many ASP expressed interest in content that goes beyond theoretical material. They advocated for the inclusion of real case studies, athlete testimonials, and practical tools such as user questionnaires, resources that could provide insight into how supplements are actually used in sporting contexts. Interviewee 12 stresses: "Education should raise awareness on doping and provide mapping of supplement use with real examples." Interviewee 19 recommends: "Training should include personal experience from athletes, this would help us understand practical outcomes." Interviewee 20 notes: "I'd prefer a concise, practical education, with structured presentations and webinars." There was strong agreement that educational content should be engaging, current, and grounded in real-world sports practice, not just abstract or overly technical. ASP seek content relevant to their day-to-day responsibilities, helping them support athletes confidently and responsibly.

4.3.10 Educational design preferences and final reflections

The interviewees collectively expressed a preference for flexible, engaging, and scientifically grounded educational formats. They emphasized the need for practical training tailored to their professional roles and highlighted a clear desire for short, modular sessions enriched with visuals, real-life examples, and expert instruction. Most preferred blended learning formats, combining online and in-person delivery. Many proposed that education should be role-differentiated, offering more in-depth content for coaches and medical staff, and more accessible material for parents or beginners. Suggestions included gamified elements, audiovisual materials, and interactive tools such as "virtual athlete" simulations to enhance engagement.

Interviewee 11 says: "I'd like a 3-month synchronous seminar, ideally with game elements and expert-led sessions." Interviewee 14 adds: "You can begin with eLearning, then follow with in-person seminars. Professionals need deeper knowledge than parents." Interviewee 22 proposes: "A short video

series of 3 to 5 hours, with expert lectures, would be ideal." In terms of duration and structure, suggestions ranged from weekend workshops and short 2–3 day modules to longer-term programs spread over weeks or months, depending on the complexity of the participant's role. Key requested features included:

- Specialist trainers (e.g., doctors, nutritionists, scientists);
- Opportunities for interactive Q&A, discussion, and reflection;
- Realistic time commitments (e.g., 2–3 hours per week or 45-hour total programs);
- Credible and accessible platforms, ideally endorsed by national authorities such as EOF or sports federations.

Several ASP also emphasized the need to address misinformation and build stronger trust between athletes and support staff. Interviewee 16 emphasized: "Trust between ASP and athletes should be explored in relation to supplement decisions." Interviewee 22 stressed: "Each federation should inform both athletes and coaches about the benefits and risks of supplement use." In conclusion, ASP envision an educational system that is credible, adaptable, and empowering, one that equips them with the knowledge and confidence to protect athlete health, support ethical sports practices, and make sound, science-informed decisions regarding supplement use.

4.4 Lithuania

4.4.1 ASP's role and interaction with athletes

The interviewees described a diverse range of roles in supporting athletes, including physiotherapists, coaches, doping control officers, sports center directors, and parents. Their interaction with athletes varies from daily hands-on involvement during training and competitions to providing crucial support during doping control procedures or medical decision-making. Interviewee 6, a former professional athlete turned doping control officer, stated: "I am currently a doping control officer after finishing my professional sports career." Interviewee 7, a physiotherapist, explained: "I work with athletes during competitions and in clinical work." Interviewee 8, a figure skating coach, emphasized a close and supportive relationship with her athletes: "I use time outside the rink to communicate more closely, hear their concerns, give advice, and answer their questions." From a parent's perspective, Interviewee 9 supports her son's sports journey, saying: "My son has been playing tennis for 5 years, and I support him, mostly through communication with doctors or pharmacists when needed." Finally, interviewee 10 combines administrative responsibilities with elite athletic experience, highlighting: "I currently work with athletes from basic training to professional level." Overall, the ASP role is multi-dimensional and pivotal in shaping the athletic and educational environment of both youth and elite athletes.

4.4.2 ASP's experience with doping control

The interviewees' experiences with doping control varied greatly depending on their roles. Some had direct involvement with anti-doping procedures, either through personal testing or professional responsibilities, while others had limited or no exposure. Interviewee 6 shared significant firsthand experience: "I was a top-level athlete and now I'm a doping control officer, so I participate in the procedures in my daily work." Interviewee 10 also had extensive exposure, stating: "I was on the RTP lists and doping control checked me both in training and in competitions." Conversely, some interviewees reported minimal engagement. Interviewee 7 mentioned: "During a game, I usually lead the player to the doping control station. That's basically it." Meanwhile, interviewee 8, a coach, noted: "I have no direct experience with doping controls for my athletes, but I know it could happen." Parents, such as interviewee 9, typically had only indirect knowledge: "I haven't had any training myself, but I've heard a lot from other athletes' parents." These varied experiences highlight a gap in exposure and education regarding doping control among ASP, particularly those in indirect or non-medical roles.

4.4.3 ASP's knowledge and education on doping and nutritional supplements

The level of knowledge and education among ASP regarding doping and nutritional supplements was highly variable. While some interviewees had extensive formal training, others relied solely on personal experience or informal sources. Several interviewees had received structured education on doping. Interviewee 10 shared: "I have participated in training courses from both the international federation and the national anti-doping agency, also WADA, more than 10 times." Similarly, interviewee 6, now a doping control officer, noted: "As an athlete, no, but now as a DCO, yes, several times." Interviewee 7 recalled university-level doping education and additional training before the Olympics. In contrast, interviewee 9, a parent, said: "No, I haven't received any education about doping or

supplements." Interviewee 8, a coach, had attended only one anti-doping seminar and commented that the topic of supplements was covered briefly.

Regarding nutritional supplements, most interviewees reported little or no formal education. Interviewee 7 said: "I haven't directly received education on supplements. I gather information from colleagues and scientific research." Interviewee 10 was an exception, describing participation in sessions with nutritionists covering both benefits and risks of supplement use.

Overall, the interviews reveal a significant disparity in training opportunities. Formal anti-doping education is more common among elite athletes and professionals, while education on nutritional supplements remains scarce or informal for many ASP. The lack of standardized training leads to inconsistent knowledge and potentially risky decisions regarding supplement use.

4.4.4 Ways of selecting nutritional supplements for athletes

The selection of nutritional supplements among ASP is often based on informal sources, personal judgment, or advice from trusted professionals, though this varies considerably across roles and levels of expertise. Some ASP rely on medical professionals to guide supplement use. Interviewee 10 emphasized: "I never chose any for myself. Sports doctors always recommended them to us." Similarly, interviewee 9 stated: "I don't buy food supplements on my own. If my son feels weak, we talk to the family doctor." These responses suggest a cautious approach grounded in medical consultation.

In contrast, others rely more on peer networks or personal research. Interviewee 6 reflected on their athletic past: "I trusted other athletes I was training with... the information was collected from other athletes I know and my coaches." Interviewee 8, a coach, distances herself from making recommendations, explaining: "I never recommend any supplements to my athletes... I also highly recommend that parents not rush into taking additional chemical preparations unless a doctor has determined there is a real need." Interviewee 7, a physiotherapist, applies a multi-criteria approach: "First, I evaluate the athlete's level, then assess blood level, and I consult with colleagues and a dietician before suggesting anything." Interviewee 9 echoed this caution: "If it is really necessary... I choose pharmacies. I trust that the products there will be suitable for consumption."

However, limited access to expert guidance or distrust of certain sources also influences selection practices. Interviewee 8 emphasized: "I would never consult with skater's parents, my friends, or especially other coaches." Instead, she seeks information via trusted websites like the national anti-doping agency's learning platform. Overall, the methods of supplement selection among ASP vary significantly, ranging from informed, medically guided decisions to more ad hoc approaches based on peer advice or internet searches. Many emphasize the importance of trusting reliable sources, while others demonstrate a lack of clarity or access to structured guidance.

4.4.5 Health and doping safety of nutritional supplements

Across interviews, ASP demonstrated a mix of awareness and misconceptions regarding the health impacts and doping risks of nutritional supplements. Some now recognize the potential dangers, while others still believe supplements are inherently safe. Interviewee 10, a former elite athlete, was very clear: "Not all supplements are safe. They can also cause a positive doping test, which could cost an athlete their career." Similarly, interviewee 6 acknowledged a shift in understanding: "When I was playing sports, it seemed like it couldn't really have any effect... Now, as a DCO, I know that supplements can be contaminated." This highlights how professional experience can lead to more nuanced views.

On the other hand, Interviewee 8 initially believed supplements were safe, stating: "I really think, they are. It is not so?" Her uncertainty suggests limited education on this matter. Interviewee 9 echoed this confusion: "I'm not strong in this. Probably not, if you're asking this I don't know."

Many respondents made a clear distinction between the theoretical health benefits and the risks posed by improper or excessive use. Interviewee 7 explained: "Food supplements can be both – healthy and unhealthy... hypervitaminosis, allergic reactions, and digestive problems can occur." Similarly, Interviewee 6 emphasized that "improper use of supplements, like drugs, is of no benefit and can cause harm." Some also touched on the potential for contamination. Interviewee 7 warned: "If an athlete buys supplements from unknown companies or from Amazon... there is a high chance that these supplements can be harmful." Interviewee 9 mentioned hearing from other parents that "some dietary supplements may contain additives... that are prohibited in sports."

In sum, while some ASP, especially those with professional or medical experience, are aware of the health and doping risks associated with supplements, others still operate under incomplete or outdated assumptions. Education on both safety and regulatory Aspects remains critical.

4.4.6 Checking the quality of nutritional supplements

Most ASP expressed uncertainty or lack of knowledge about how to verify the quality and safety of nutritional supplements. While a few were familiar with official procedures or consultation options, the majority lacked access to reliable tools or platforms and relied heavily on personal networks or intuition. Interviewee 10, a former elite athlete and sports director, emphasized the limits of individual efforts: "I think that the athlete himself cannot. Only persons directly related to sports science, sports, pharmaceutical research, etc. can recommend based on certain official research results." He stressed that supplement verification should be left to experts.

In contrast, Interviewee 6 admitted a lack of clarity on quality assurance: "Tested in a laboratory, but only if there is already a positive doping test. You must check the information before purchasing... I don't know, I'm missing information here." This highlights the need for proactive educational outreach, as even those working in doping control are not always fully informed. Interviewee 7 was slightly more informed, noting the value of consulting specialists: "An athlete or any other person using supplements can consult with specialists, dieticians, sports physiotherapists, or sports medicine doctors... They continue to work with those supplements or recommend them because they've been tested." She also mentioned having heard of platforms for checking supplement certification, though without specific names.

Other interviewees relied more on intuition or informal checks. Interviewee 8 reported: "At first I must check supplements labels, inspect all ingredients, and always read reviews." However, she also admitted, "I'm not sure. I think I would ask the Lithuanian Anti-Doping Agency." Similarly, Interviewee 9 trusted pharmacists or doctors but had not used any platforms herself: "Probably in the official website of the Anti-Doping Agency. I never checked... But I believe there must be [a law] for checking medication." Overall, the interviews revealed significant information gaps among ASP regarding supplement quality assurance. While some rely on expert consultation, many lack awareness of specific tools, protocols, or official certification platforms. Clearer guidelines and wider dissemination of trusted resources are urgently needed.

4.4.7 Perceptions of supplement safety, health benefits, and potential health risks

Across the interviews, ASP exhibited mixed views on the safety and health benefits of nutritional supplements. While several believed supplements could be beneficial when used properly, most expressed concerns about contamination, misuse, and potential health risks, especially for younger athletes. Interviewee 6, now a doping control officer, reflected on her change in understanding: "When I was playing sports, it seemed like it couldn't really have any effect, because they are food supplements and if you buy them anywhere, everything is fine. Now, as a DCO, I know that supplements can be contaminated and that you shouldn't buy them anywhere." Interviewee 7 offered a nuanced view: "I think that food supplements can be both healthy and unhealthy… If food supplements are used for their intended purpose… it is healthy to use them. But if you take too many or contaminated supplements, they can cause hypervitaminosis, allergic reactions, digestive problems." She stressed that supplementation should be individualized and informed by medical testing. Interviewee 9, a parent, echoed these concerns from a lay perspective: "I know for sure that too much of anything can be harmful… I think there can definitely be various side effects." She emphasized the importance of nutrition, rest, and recovery before considering supplements. For interviewee 10, the dangers were clearer due to firsthand experience: "Not all supplements are safe. They can also cause a positive doping test… Especially when they are taken without any need for the body, without research or a doctor's recommendation." He emphasized that supplements should never be self-prescribed or based on peer advice.

On the other hand, interviewee 8 expressed more trust in supplements, stating: "Most of them, I would say yes. I strongly believe in this." Yet she admitted uncertainty when asked whether they could harm health: "I am really not sure, but maybe? I guess it could if they have not been through inspection." Overall, while some ASP maintain a generally positive view of supplement safety and benefits, most are cautious, especially when it comes to unsupervised use, contamination, or use among young athletes. The majority acknowledged that misuse can result in serious health consequences, reinforcing the need for increased awareness and education.

4.4.8 Enhancing ASP knowledge and preferred learning formats

Most ASP expressed a strong desire for more education on nutritional supplements, emphasizing the need for accessible, clear, and trustworthy information. Their preferences varied depending on their roles and prior exposure to educational programs, but there was a shared understanding that targeted training is essential for ensuring athlete safety and informed decision-making. Interviewee 6 suggested that education should be "remote via the internet, there would be greater accessibility. It would be good to have a presentation type with the possibility of discussion; visual material is easier to remember." She emphasized that interactive and stage-based delivery, tailored to the learner's age and role, would make the material more impactful.

Similarly, interviewee 7 supported a blended approach: "Maybe live training is more appropriate and during it I would like to hear experiences, observations from different specialists in my field… If these are adult athletes, it can be both remote and live, depending on what's more convenient. For young persons, maybe video or games." She advocated for practical examples and engaging delivery, citing that education must go beyond theory. Interviewee 8 preferred flexible, online formats: "For me, education must be online, it's the most convenient way. It would be the best solution to join online learning anytime, not just scheduled sessions. So I would choose video from your examples." She

highlighted that flexibility is key due to training schedules and recommended using real-life stories to increase engagement and relatability. Interviewee 9, a parent, shared this sentiment, noting: "If there was a learning platform where information was presented visually, with the help of videos, I think I would definitely use it. I would also be interested in seeing the stories of real athletes." She stressed the importance of practical advice and relatable content for families. Interviewee 10 emphasized the role of structured in-person training, especially within formal institutions: "Education should take place in schools for both parents and children. Then, for sports federations and clubs… Live personal, group training is the most effective." He advocated for repeated sessions involving visual aids, examples, and tailored content based on age and role.

Across the interviews, ASP consistently called for learning formats that are age-appropriate, flexible in delivery, and rooted in real-world practice. There was a clear demand for trusted experts, such as sports doctors, nutritionists, and anti-doping agency representatives, to deliver or validate content. Additionally, visual and interactive learning materials were preferred across roles, with many requesting the integration of case studies, videos, and opportunities for discussion.

4.4.9 Desired learning outcomes from supplement education

ASP identified several specific learning goals they would like supplement-related education to address. These goals reflect their diverse roles, ranging from physiotherapists and coaches to parents and sports directors, but converge on the need to understand not only what supplements are but also how, when, and why they should be used safely and effectively. Interviewee 6 emphasized the importance of understanding supplement interactions: "I would like to learn about combining supplements. How to know that taking one does not reduce the effectiveness of the other and that taking them together is possible." Interviewee 7 was particularly interested in the physiological mechanisms of supplements and potential harms: "I would like to learn more about physiological things, how supplements affect body systems, what are the dangers of overdosing. There should be brief, clear videos explaining how and why things happen to the body." She also wanted learning content to include "scientific articles and specialist commentary" to support evidence-based practice. Interviewee 8 (coach) focused on decision-making and critical evaluation: "I would like to get more information about where to find information, who to trust, and who's information I should avoid." She also stressed the importance of real-life stories to illustrate the long-term risks of misuse. Interviewee 9 (parent) wanted practical guidance: "I would like advice on what age athletes can and should start taking supplements, what they do, and whether all supplements can be taken together." She also expressed interest in dietary advice from nutritionists and a clearer understanding of supplement benefits and risks. Interviewee 10 (sports director and former elite athlete) focused on age-specific effects and scientific clarity: "I would personally be interested in the effects of different supplements, their mix, on the bodies of children, teenagers, and adults, how they work, why they work, what not to do, and how to distinguish what is good."

In summary, ASP across roles want education that delivers more than just definitions. They are asking for detailed, science-backed insights into supplement function, safety, interaction, and age-appropriateness. Many are also calling for practical examples, visual tools, and trustworthy reference materials that empower them to support athletes effectively and responsibly.

4.4.10 Educational design preferences and final reflections

Across the ten interviews, ASP consistently emphasized that education on nutritional supplements should be practical, flexible, and tailored to the needs of different audiences (athletes, parents, coaches, and healthcare professionals). They agreed that information should be easy to understand, evidence-based, and presented in varied formats to accommodate different learning preferences.

Format and delivery: Most participants preferred a combination of formats. Interviewee 6 proposed "remote via the internet" delivery with "presentation-type material, visual content, and the option for discussion." Interviewee 7 also supported blended formats, stating: "I think I would like training both, distance and live training… Live training is more appropriate when hearing specialists' experiences and scientific reviews." Interviewee 8 stressed the importance of flexibility and accessibility, stating: "Education must be online, it's the most convenient. Video is best because we train a lot, and I could join anytime, not only during scheduled sessions." Interviewee 9 emphasized the importance of simplicity and engagement: "The information should be clear, not in the language of doctors. Use specific examples and visuals. The material must be interesting, not just useful." She suggested modular content with concise lessons and links to deeper resources. Interviewee 10 favored face-to-face formats and structured progression: "Live personal or group training is the most effective… It would take several sessions of up to an hour and a half." He also emphasized the value of "statistics, examples, and group sessions."

Trainers and presenters: There was strong consensus that educators should be qualified specialists. Interviewee 7 stated: "Training should be conducted by people who work with supplements, sports medicine doctors, nutritionists, and even toxicologists." Similarly, interviewee 9 remarked: "All material should be prepared by specialists, doctors, physiotherapists, anti-doping experts." Interviewee 10 agreed: "Training should be delivered by people directly related to the field, sports doctors, scientists, and teachers."

Targeted content by audience: Many ASP noted that different types of learners, such as youth athletes, parents, and professionals, need content tailored to their knowledge levels. Interviewee 7 recommended dividing training "into categories, healthcare professionals, athletes, parents, coaches, so the complexity of the material matches each group." Interviewee 9 added that "the form of presentation should differ depending on the audience, even if the information is the same."

In conclusion, ASP want supplement education that is flexible, visually engaging, clear, and credible, delivered by experts and adapted to audience needs. They value real-life examples, layered content (from basic to advanced), and on-demand access that allows them to learn at their own pace and apply knowledge directly to athlete support.

4.5 Malta

4.5.1 ASP's role and interaction with athletes

The participants in this focus group brought diverse experiences from various sports, yet all emphasized a close and consistent interaction with athletes across different age groups and performance levels. Most of them work in youth development environments, particularly within football academies, where they contribute in multiple support roles ranging from psychology to coaching and performance science. Interviewee 1 from the focus group explained: "My experience with athletes has mainly been in football academy settings, working as a support practitioner in a sport psychology capacity. That involves supporting training sessions and match days." Similarly, Interviewee 2 highlighted his transition from direct coaching to a more developmental role, stating: "I'm an ex-coach, not currently coaching, but I still work closely with athletes through coach support work. Most of that is within academy football, focusing on youth development."

Their involvement extends beyond football; several participants coach in sports like swimming, rugby, and hockey, often combining roles in education, performance development, and athlete welfare. For example, Interviewee 3 described a dual-role perspective: "I'm also an active swimming coach, coaching people from five-year-olds to adults," emphasizing the broad age range and continuous athlete interaction. Interviewee 4 brought a university and international pathway perspective to the discussion, stating she works with "student-athletes", particularly those "eligible to represent Scotland but living elsewhere." This variety in sporting backgrounds enriched the group's reflections, offering insights into how ASP function not only as instructors but also as ethical role models and mentors across different competitive and developmental contexts.

4.5.2 ASP's experience with doping control

The focus group participants demonstrated varied levels of familiarity with doping controls, shaped largely by personal experience, media exposure, and professional involvement. Some had indirect contact with anti-doping through their athletic careers or early professional roles. Interviewee 4 reflected on her dual role as a former international athlete and coach, stating: "I played international rugby and, although I was never personally tested, teammates of mine were. We received quite a bit of education around it." She later extended this experience into youth education initiatives while working for a national governing body. Others encountered doping control in more observational or even incidental ways. Interviewee 2 recalled: "My first awareness of anti-doping came from media stories, Ben Johnson, for example… My first real-life exposure was at a first-team training ground where testers came in and cordoned off exits. It felt quite intense and serious."

Despite their experience, most participants acknowledged uncertainty around formal definitions or guidelines, revealing knowledge gaps even among those who had undergone basic training. As interviewee 3 admitted: "My understanding also comes mostly from media, Olympics coverage, commentators discussing who's clean and who isn't. I also watched documentaries like Icarus, really powerful stuff." Similarly, interviewee 5 shared a limited professional connection to doping, saying: "I've mostly encountered the concept as an observer, watching TV and reading media. I haven't experienced it directly in coaching or athlete support." Across the board, there was a sense that anti-doping remained an issue associated with elite-level sport, often removed from grassroots settings where these

professionals primarily operate. This perceived distance contributed to the idea that doping education and control mechanisms are inconsistently embedded across sports and athlete development levels.

4.5.3 ASP's knowledge and education on doping and nutritional supplements

Participants consistently acknowledged that their knowledge of doping and nutritional supplements was fragmented, shaped more by personal initiative and circumstantial exposure than by structured education. Several described having minimal formal training, often relying instead on media sources, peer discussions, or isolated learning moments. Interviewee 1 openly stated: "I don't have a clear idea of what's legal or illegal... I've had conversations with my 16-year-old players about creatine, which isn't banned, and also substances like snus or nicotine." This confusion highlights the blurred lines many coaches navigate between banned, legal, and ethically questionable substances. Interviewee 2 emphasized the complexity of staying informed, noting: "The banned list changes all the time. It's a minefield for elite athletes, let alone teenagers. That makes education hard too." Participants agreed that the rapid pace of scientific development and regulation leaves many support personnel underprepared. Interviewee 3 added a systemic critique, observing: "The way we frame anti-doping education for coaches doesn't help. It's often treated like an 'add-on' or 'top-up' instead of a core ethical practice." Despite this, they acknowledged a growing need to address these topics proactively, as doping-related dilemmas increasingly surface in youth and developmental sport settings. This theme revealed an underlying concern: while ASP are key figures in shaping young athletes' attitudes and choices, they often lack the foundational knowledge to confidently guide discussions around doping and supplements. As such, their ability to fulfil this responsibility remains limited without targeted and ongoing education.

4.5.4 Ways of selecting nutritional supplements for athletes

When it came to the process of selecting nutritional supplements for athletes, the participants unanimously described a diffuse and unstructured system of shared responsibility, often lacking clear guidelines or a single point of accountability. The selection of supplements was rarely systematic, and instead highly dependent on context, individual judgment, and available resources. Interviewee 3 from the focus group described this ambiguity, stating: "I don't think it falls to one individual. It's a bit of everything, a collective responsibility. Coaches, parents, sport scientists… everyone plays a role." This fragmentation, while understandable in today's complex sports environments, often left athletes exposed to unverified or unsafe advice, particularly in grassroots or early talent development contexts. The commercialization of sport and increasing parental involvement were also cited as complicating factors. As interviewee 3 further explained: "You've got parents hiring private coaches or sport scientists just to help their child get the edge. It becomes transactional, 'What can I pay for that will make my kid better?'"

Such pressures can lead to decisions made in isolation or without adequate expertise, increasing the risk of uninformed supplement use. Interviewee 1 also noted that conversations around supplements did happen, especially with older youth players, but not always from a position of authority or clarity: "I've had conversations with my 16-year-old players about creatine... but I honestly don't have solid knowledge in this area." Overall, the group highlighted that while supplement use is increasingly part of the conversation with athletes, the pathway to informed and safe decision-making remains unclear and inconsistently supported. Coaches often feel uncertain, and athletes, especially young ones, are left to navigate a confusing landscape without strong, coordinated guidance.

4.5.5 Health and doping safety of nutritional supplements

The focus group participants expressed significant concern regarding the health and doping risks associated with nutritional supplements, particularly for young or inexperienced athletes. Despite widespread recognition of supplements as part of the modern athletic environment, ASP often felt underprepared to evaluate their safety or communicate clear guidance. Interviewee 4 emphasized the potential for unintentional harm, stating: "There's this fear of being caught unintentionally, like if something in your protein shake isn't clean, you could be banned, shamed, and your coach could be penalized too." This fear was especially acute in team sports settings, where one mistake could affect not just the athlete but the broader support team. Interviewee 2 underscored the unpredictable nature of supplement safety, explaining: "The science is always evolving, substances that are legal now can become banned later… It's confusing, the banned list changes all the time."

This constant flux adds another layer of complexity, especially for coaches and support staff without access to up-to-date information or formal training. The concern was not limited to performance-enhancing substances, but extended to general health and wellbeing, with some substances, like nicotine or snus, seen as legal yet questionable in terms of athlete welfare. Interviewee 3 captured this ethical tension by noting: "The speed of scientific change makes it hard to keep up… But of course, the problem is: where does it stop? There's always another topic we're expected to cover." Collectively, these reflections revealed that while ASP recognize the health and doping risks posed by supplements, they often feel unequipped to manage them. Without a consistent system of education, regulation, or shared responsibility, they are left navigating a space where well-intentioned guidance could inadvertently result in harm.

4.5.6 Checking the quality of nutritional supplements

The participants widely acknowledged that verifying the quality of nutritional supplements is a critical but often overlooked or misunderstood task within grassroots and youth sport settings. There was a general consensus that many athletes, and even support staff, do not possess the knowledge or tools required to assess supplement safety properly. Interviewee 2 illustrated this knowledge gap through a personal reflection: "I was diagnosed with celiac disease last year, and until then, I had never looked at an ingredients label in my life. Suddenly I had to read and understand what's in everything, and it was hard." He linked this experience to the broader issue of supplement literacy among young athletes, questioning: "How many of our athletes do the same with their food or supplements? Probably very few." This lack of ingredient awareness was seen as symptomatic of a wider educational shortfall, where athletes and their support networks are not adequately prepared to scrutinize what they consume.

Interviewee 2 suggested that "If we want to support anti-doping, we need to improve general awareness of what we're putting in our bodies. That's not just athletes, that's everyone." Interviewee 3 also emphasized the importance of reframing coaching to include these responsibilities, noting that current systems are too fragmented: "Maybe it's about building ethical layers into coaching development, making it normal to discuss these things from early on." There was agreement that ensuring supplement quality requires more than just isolated advice, it demands a cultural shift toward shared accountability, critical thinking, and continuous education. In the absence of institutional

structures for quality control, ASP often rely on informal conversations or assumptions, which participants admitted could be unreliable or inconsistent.

4.5.7 Perceptions of supplement safety, health benefits, and potential health risks

Across the focus group, perceptions of supplement safety and their associated risks varied widely, reflecting a mix of caution, confusion, and cultural contradictions. While participants generally recognized that supplements could offer health or performance benefits, they also emphasized the ethical and health-related uncertainties surrounding their use, particularly when such use occurs without expert guidance. Interviewee 1 captured this tension clearly: "You have to question whether they're healthy. I honestly don't have solid knowledge in this area." This uncertainty was not limited to banned substances, but extended to widely available and legal products like creatine or nicotine-based stimulants, which participants felt straddled a blurry ethical line. There was also concern that athletes, especially young ones, are bombarded with misleading or incomplete information about supplements, often through unregulated online sources. Interviewee 2 highlighted the influence of digital content, noting: "You click on one video about supplements, and suddenly your feed is full of similar things. If you see it enough, you might believe it."

This algorithm-driven exposure complicates efforts to promote critical thinking and informed decision-making, as athletes may prioritize anecdotal or influencer-based advice over evidence-based guidance. The group also reflected on the broader social context in which supplement use takes place. Interviewee 3 observed: "There's this other cultural narrative around 'gaining the edge,' which is kind of the opposite [of ethical coaching]." This comment underscores how performance culture often conflicts with health-first messaging, making it harder for ASP to promote safe and responsible supplement use. Ultimately, participants felt that unless young athletes are equipped to question the safety and necessity of supplements, and unless those guiding them have the tools and confidence to do so, the potential risks may outweigh the perceived benefits.

4.5.8 Enhancing ASP knowledge and preferred learning formats

The participants agreed that the current educational provision for ASP regarding doping and supplement use is insufficient, fragmented, and often treated as peripheral rather than integral to coaching practice. They expressed a strong desire for more accessible and ongoing learning opportunities that are relevant to real-world coaching contexts. Interviewee 2 emphasized the need for at least basic awareness, sharing: "In my experience with TAS... there's an online course that raises awareness, not super in-depth, but useful. You have to complete it before you can work as a support practitioner. So I think that should be a minimum, at least knowing where to find accurate information." At the same time, there was recognition that overloading coaches with standalone modules or generic content may be counterproductive. Interviewee 3 explained: "Maybe instead of treating it as a stand-alone subject, like a separate 3-hour workshop, we should frame it as part of what makes someone a good coach."

This view reflects a growing call to embed ethics and health awareness into the core of coach education, rather than treating it as an external add-on. However, the practical challenges of delivering such education were also acknowledged. Interviewee 4 noted the time and resource constraints in grassroots environments: "Especially in community sport, where many coaches are volunteers just doing their best. They're struggling to find time to plan a basic safe session, let alone dive into nutrition and

doping education." The group suggested that future learning formats must be realistic, flexible, and tailored, perhaps through micro-learning, integrated prompts in certification pathways, or continuous professional development aligned with coaches' existing workloads.

4.5.9 Desired learning outcomes from supplement education

The focus group participants expressed clear ideas about what they believed ASP should gain from education on supplements and doping. Foremost among these were improved confidence, foundational knowledge, and the ability to guide athletes toward safe, ethical decisions. Interviewee 1 emphasized the connection to broader safeguarding principles, stating: "I think doping education overlaps with things like safeguarding, which gives it a higher priority. So maybe it deserves more attention than it currently gets." This framing reflects the desire to integrate supplement and anti-doping literacy into the ethical backbone of coaching, rather than treating it as optional expertise. Interviewee 2 stressed that even a basic understanding can make a difference in supporting athletes: "Coaches are a really important part of athlete development. They're a trusted figure. So, even just basic awareness or guidance is helpful."

This suggests that learning outcomes do not necessarily need to include deep scientific knowledge, but should at least enable ASP to identify risks, ask informed questions, and know where to direct athletes for further support. Interviewee 4 offered a practical suggestion about integrating awareness into existing training: "When you do your first coaching award, there's mandatory content about safety, things like concussion management. It would be easy to add something there: a prompt like 'Did you know you should also think about what players are eating?'" Overall, the desired outcomes were not just cognitive (knowing facts), but also behavioural (being able to act on that knowledge), and cultural (normalising these conversations as part of everyday coaching practice).

4.5.10 Educational design preferences and final reflections

In their final reflections, participants advocated for anti-doping and supplement education that is practical, integrated, and adaptable to real coaching contexts, especially at the grassroots level. There was broad agreement that educational content should not be delivered as isolated, intensive modules, but rather woven into existing coaching development structures. Interviewee 3 expressed this clearly: "When we help grassroots coaches, we focus on fun, enjoyment, safety, and development. This fits right into the 'safe' part. Athletes enjoy sport more when they're healthy and well." This framing connects anti-doping directly to athlete welfare, reframing it not as a compliance issue but as a key part of positive coaching. Nonetheless, participants recognized the limitations faced by volunteer and community-based coaches, who often operate under severe time constraints. As Interviewee 4 pointed out: "They're struggling to find time to plan a basic safe session, let alone dive into nutrition and doping education." This reality led to calls for flexible and lightweight educational format, such as embedded tips within coaching certifications, short online modules, or prompts that lead coaches to reliable resources. In terms of overall responsibility, the group leaned toward a multi-stakeholder approach. Interviewee 1 explained: "Within academy football, I wouldn't say it's solely the coach's job either. There's a full support team: nutritionists, physios, sport scientists. It's a multi-stakeholder responsibility, not just the coach." Several participants also emphasized the need to equip young athletes with critical thinking skills to assess information themselves, especially in the digital age where supplement content is algorithmically amplified. Ultimately, the group called for a shift in culture: from reactive, punitive

measures toward proactive, ethics-based education that is embedded across sport systems. As Interviewee 2 concluded: "A key part of this is teaching young people, and adults, to be critical of the information they consume. That helps them make better, healthier choices, not just in sport, but as students, workers, parents… in all aspects of life."

4.6 Serbia

4.6.1 ASP's role and interaction with athletes

All participants emphasized that their role involves direct and ongoing engagement with athletes across different age groups and sports disciplines. Their responsibilities include injury prevention, physical and mental preparation, and advising on health-related decisions, including the use of supplements. Interviewee 2 stated that they are "always at the service" of athletes, a sentiment echoed by interviewees 4, 5, and 6. Interviewee 3 mentioned they often "consult athletes and discuss supplementation decisions together," indicating collaborative practices. From the Serbian focus group, participants reported experience ranging from under 10 to over 40 years, covering elite competitions like the Olympic Games and working with both cadet-level and professional athletes. Their role includes supporting daily routines, handling doping controls, and addressing athletes' questions on supplement use.

Interviewee 9 (physiotherapist) emphasized the dual perspective of being both a support professional and an endurance athlete, highlighting the practical relevance of their advice. Meanwhile, interviewee 10 underlined that interaction occurs "when needed," suggesting a more selective approach but still grounded in athlete welfare. Across responses, ASP framed their role as multifaceted, requiring trust, competence, and availability to provide accurate, evidence-based support.

4.6.2 Education related to doping

Most interviewees reported having received at least some form of education related to doping, although the frequency and depth of this education varied. The primary providers mentioned include national anti-doping organizations (NADO), international federations, and specialized seminars. Several interviewees, including interviewees 1, 2, and 5, indicated repeated participation in such programs, sometimes yearly, while others, like Interviewees 7 and 9, noted they had only limited or self-directed exposure. Interviewee 4 explained that most of their education on the topic came from discussions with experienced colleagues on the ATP Tour, rather than through formal sessions. Interviewee 10 mentioned that despite attending multiple doping-related seminars through the NADO, the focus had remained solely on prohibited substances rather than supplements.

From the Serbian focus group, members consistently stated that they had attended antidoping sessions through NADO, WADA, and national federations, though some pointed out that the coverage of supplements was limited or informal. One physician emphasized that while theoretical knowledge is solid, practical challenges arise due to a lack of comprehensive, up-to-date training on supplement risks and contamination. Interviewee 8 shared that their takeaway from prior training was that everything must be double-checked, even over-the-counter medications. Interviewee 3 valued learning the distinctions between doping substances and legal supplements. In general, ASP recognized the importance of continued, credible antidoping education but also highlighted the need to expand these efforts to include evidence-based content on supplements and related health implications.

4.6.3 Selection of supplements

The process of selecting supplements among ASP is generally cautious and relies on multiple sources, including scientific literature, personal experience, and consultations with trusted professionals. Many interviewees, such as interviewees 1, 2, 3, and 8, reported relying on expert opinions (e.g., nutritionists, sports doctors) and published research before recommending or approving

any supplements. Interviewee 4 emphasized that supplement use should be based on physiological needs, determined through screenings such as bloodwork or performance demands. Others, like interviewees 6 and 7, indicated that athletes often come already using supplements provided by their clubs, and that ASP engage in follow-up consultations to assess safety and relevance. Interviewee 5 mentioned that supplement choices are often informed by discussions with strength and conditioning coaches or club medical staff, depending on the context and duration of athlete interaction. Interviewee 9 pointed out the importance of reading labels and understanding supplement content through reliable sources.

The Serbian focus group echoed similar views. They described supplement selection as a process grounded in professional judgment, involving doctors, physiotherapists, and other qualified experts. However, it was also noted that some athletes continue using supplements for long periods without informing ASP, which raises concerns about transparency and risk. Across the responses, ASP expressed a preference for verified, single-ingredient products with a clear composition, avoiding those with complex or unknown formulations. Overall, they value evidence-based selection processes and prioritize athlete safety above marketing claims or peer recommendations.

4.6.4 Safety of supplements

Across the interviews and the Serbian focus group, ASP demonstrated an informed but cautious stance regarding supplement safety. While most acknowledged the potential health and performance benefits of nutritional supplements, this confidence was conditional on proper use, professional supervision, and verified product quality. Interviewee 2 emphasized that supplements can be harmful if not used correctly, citing potential health issues like liver strain or hormonal imbalances. Interviewee 6 described a real case where misuse of supplements and restrictive dieting resulted in serious bone injuries, underlining the need for balanced intake and food-first approaches. Interviewee 4 added that problems often arise when athletes self-prescribe supplements or exceed recommended dosages. Similarly, Interviewee 10 pointed out that while supplements may support performance, misuse or reliance on low-quality products poses reputational and physiological risks.

The Serbian focus group confirmed these concerns, emphasizing that ASP often err on the side of caution, sometimes advising athletes to avoid supplements altogether in the absence of reliable information. They stressed that while some supplements aid recovery and immunity, others, particularly multicomponent or unverified products, may contain contaminants or banned substances, risking inadvertent doping. The overarching perspective among ASP is that supplements can be safe and beneficial, but only when their use is individualized, evidence-based, and regularly reviewed by qualified professionals.

4.6.5 Verification of supplement quality

Verification of supplement quality was identified as a complex and often inconsistent process. Most ASP rely on scientific literature, professional networks, or institutional guidance, though many acknowledged that this process is still fragmented. Interviewees 1, 3, and 8 noted that they prefer products with certifications (e.g., doping-free labels, pharmaceutical-grade manufacturing) and consult registries like the Cologne List or WADA-endorsed platforms when available. Interviewee 4 stressed the importance of purchasing only from verified producers that provide transparent quality control documentation. Interviewee 6 said she only trusts supplements listed in official registries like those of

the Ministry of Health or National Anti-Doping Agencies. However, others like interviewee 7 admitted not knowing many verification platforms, and instead rely on expert opinion or literature.

The Serbian focus group echoed these sentiments, reporting mixed practices: some ASP use formal platforms and certifications, while others rely on trust-based sources due to lack of access or awareness. They underscored the need for centralized, accessible tools that clearly identify safe supplements, especially for avoiding contamination and ensuring compliance with anti-doping standards.

4.6.6 Enhancing ASP knowledge and preferred learning formats

Most ASP expressed a strong desire for more structured, continuous, and practically relevant education about supplements. Interviewees consistently requested up-to-date training grounded in scientific evidence, delivered by trusted professionals. Interviewee 2 emphasized interactive seminars, while interviewee 5 favored flexible online modules with case studies. Interviewees 6 and 8 highlighted the value of short videos, webinars, and audio-visual tools that accommodate busy schedules. Interviewee 9 suggested integrating quizzes and gamified elements for better retention.

The Serbian focus group added that ASP would benefit from modular content tailored to their specific roles, with deeper coverage for medical personnel and simplified guidance for coaches or parents. They also recommended including workshops, case examples, and real-world applications that go beyond abstract theory. Across the board, ASP agreed that education should be easily accessible, visually rich, and structured to foster both knowledge and practical decision-making confidence.

4.6.7 Desired learning outcomes from supplement education

ASP consistently identified key learning goals for supplement education. These include the ability to:

- Distinguish legal from banned substances,
- Understand short- and long-term health effects,
- Interpret supplement labels,
- Know who is qualified to make supplement recommendations.

Interviewee 4 emphasized learning the physiological interaction between supplements and training. Interviewee 7 stressed understanding recovery-supportive versus performance-enhancing supplements. Interviewee 8 advocated for role-specific education that addresses the different responsibilities of doctors, coaches, and parents.

The Serbian focus group further emphasized that training should help ASP identify high-risk substances, understand regulatory frameworks, and make safe, evidence-informed recommendations. They also suggested using real case studies and athlete testimonials to connect theory with practice.
Ultimately, ASP seek education that empowers them to make informed choices and guide athletes safely, not just to memorize lists of banned substances.

4.6.8 Structure of education

There was strong consensus that effective education should be structured but flexible. Interviewees preferred blended formats combining online learning with occasional in-person workshops. They requested modular programs with short, digestible sessions, ideally ranging from 2–3 hours per week to weekend intensives. Interviewee 3 preferred repeated short sessions, while interviewee 9 recommended sessions led by specialists from different domains (e.g., sports medicine,

pharmacology, nutrition). Interviewee 7 emphasized that education should not be too time-consuming due to workload pressures, but still deep enough to be meaningful.

The Serbian focus group supported these preferences and emphasized the importance of Q&A opportunities, expert-led discussions, and hands-on components such as simulations or real-life product evaluation. They favored courses delivered by credible professionals with direct experience in elite sport.

4.6.9 Extended insights into asp involvement with supplements

ASP viewed their role as critical in overseeing supplement use and ensuring athletes make safe, ethical choices. Several interviewees, including Interviewees 1, 5, and 9, emphasized that ASP must not only advise athletes, but also serve as gatekeepers against misinformation and risky practices. Interviewee 6 underlined that ASP should communicate the risks of using supplements without supervision, especially in relation to doping. Interviewee 4 added that clear, science-based information must be shared with athletes to build trust and compliance.

The Serbian focus group advocated for a more official recognition of ASP responsibilities in supplement decisions. They called on organizations like AntiDop to institutionalize the ASP role in athlete education and policy-making. Many also reported a lack of formal training in their academic background, suggesting the need for updated curricula in sports medicine and physiotherapy programs. Collectively, ASP want to be empowered through training and systemic support, so they can actively promote safe supplementation and contribute to clean sport practices.

4.7 Synthesis of results across the countries

Based on the analysis of results across Belgium, Croatia, Germany, Greece, Hungary, Italy, Lithuania, Malta, The Netherlands, Poland, Serbia and Spain, several commonalities emerged regarding the roles, experiences, and needs of Athlete Support Personnel (ASP) in the context of anti-doping and supplement use. A consistent finding across all countries was the limited exposure to structured and formal anti-doping education. Most ASP relied on self-directed learning, outdated university curricula, or informal peer networks, and only a minority had participated in formal training through national anti-doping organizations. Nutritional supplement education was more frequently encountered but remained largely fragmented and inconsistently applied. Across all countries, ASP expressed concern over supplement safety, particularly regarding product contamination, lack of transparency in labelling, and misleading marketing practices. Tools such as Informed Sport or the Cologne List were either unknown or underused, and many ASP relied on unverified sources (e.g., Google, pharmacies, coaches). Across contexts, there was a strong and repeated call for accessible, practical, and role-specific education delivered through engaging formats such as short videos, interactive modules, infographics, podcasts, and real-life case studies. ASP emphasized the importance of multilingual resources and centralized, trustworthy platforms for ongoing updates, as well as the need for education to reflect their specific professional realities and constraints. They also supported the inclusion of certification or recognition for completed training, indicating that educational efforts should not only inform but also empower and legitimize their involvement in doping prevention.

Despite these overarching similarities, there were notable cross-country differences in how ASP interact with anti-doping and supplement-related issues, shaped by national systems, cultural contexts,

and institutional structures. In Belgium, ASP, particularly sports doctors and physiologists, adopted a scientific and evidence-based approach, often relying on HACCP-like risk assessment models and consulting national regulatory authorities when selecting supplements. Team-based support structures were more common, especially in elite sport settings. In contrast, German ASP, particularly those working in residential sports schools, emphasized holistic athlete development and pastoral care but had limited formal involvement in doping education or supplement decisions. Their support roles were more psychosocial than technical, and reliance on informal web searches was prevalent. Greek ASP, including coaches and physical educators, often combined roles as educators and athletic trainers, with limited access to consistent anti-doping education. They showed some reliance on pharmacy-purchased products and the national medicine agency, though without systematic tools or platforms for checking product integrity. Lithuanian ASP included former elite athletes and doping control officers, some of whom had received WADA-aligned education and demonstrated higher awareness of risks and policies. However, supplement use decisions remained inconsistent, often split between medical referrals and peer advice. In Malta, ASP reported very limited structured education, with most knowledge being acquired through informal channels, and they noted a lack of national anti-doping initiatives tailored to their roles. Their involvement in supplement-related decisions was minimal and reactive. Serbian ASP frequently held multiple roles, such as coach, administrator, or even parent, often in under-resourced environments. They displayed a strong willingness to support athletes but had very limited access to formal anti-doping education or scientific information on supplements, relying instead on personal experience and trust-based relationships. This variability underscores the need for a harmonized yet flexible educational strategy that accounts for these national differences by offering culturally relevant content, differentiated learning pathways, and adaptable resources to support ASP's evolving roles in doping prevention.

5. Discussion

5.1 ASP's role and interaction with athletes

The findings across the twelve participating countries (Belgium, Croatia, Germany, Greece, Hungary, Italy, Lithuania, Malta, The Netherlands, Poland, Serbia and Spain) reveal that Athlete Support Personnel (ASP) play varied but consistently important roles in athletes' daily lives, ranging from technical and nutritional advisors to mentors and holistic caretakers. These roles include coaches, physiotherapists, sports dietitians, sports psychologists, federation staff, doping control officers, and even parents, depending on the national context. While the intensity and nature of their involvement differ depending on the national context and sport setting, ASP across all countries reported frequent and trusted interactions with athletes, often extending beyond training to include emotional, educational, and logistical support.

These findings underscore the ASP' potential as key influencers in shaping athletes' values, behaviors, and decisions regarding supplement use and ethical conduct. In countries like Belgium, Hungary,Lithuania, and the Netherlands ASP sometimes operate within multidisciplinary teams and adopt structured, evidence-based approaches to athlete support. In contrast, ASP in Germany and Serbia serve in more pastoral or multi-role capacities, often without formal training or standardized procedures. In Greece and Malta, ASP described their interaction with athletes as close and continuous, with coaches and educators often assuming dual roles that blend athletic development with values-based mentorship. The diversity in ASP roles reflects differing levels of institutional support, professionalization, and access to continuing education, which in turn affects their readiness to engage in anti-doping education and supplement-related decision-making. Importantly, the presence of close, trust-based relationships between ASP and athletes highlights a significant opportunity for these personnel to serve as credible messengers in promoting clean sport practices.

From a practical standpoint, future educational interventions should be tailored to reflect the multifaceted roles ASP occupy within different national and sport-specific ecosystems. Training programs must not only provide scientific and regulatory knowledge but also equip ASP with communication and ethical coaching skills that leverage their existing influence. Supporting ASP in building confident, evidence-based guidance, especially in informal or under-resourced contexts, could significantly enhance their capacity to safeguard athlete health and integrity in sport.

5.2 ASP's experience with doping control

The results indicate that ASP across all participating countries have limited direct experience with doping control procedures. While some individuals, particularly in Hungary, Lithuania and Serbia, have encountered doping-related processes through formal roles or personal athletic backgrounds, the majority of ASP in Croatia, Germany, Greece, Italy, Malta and Poland reported minimal involvement or familiarity with doping control practices. In many cases, they acknowledged knowing that testing occurs but lacked structured knowledge or training on how to support athletes during such events. In Serbia and the Netherlands, several ASP had attended anti-doping seminars or had direct experience in elite competitions, but even there, education on supplements was often missing or informal. In Hungary and Lithuania, some respondents had served as doping control officers or had personal experience with doping tests as athletes, offering more detailed insights. In contrast, ASP in Germany, Italy, Malta and Poland often reported no formal preparation, with some finding out about testing only after it had

occurred. This limited engagement reflects a broader disconnect between ASP and institutional anti-doping systems, highlighting a missed opportunity for these professionals to actively contribute to doping prevention and athlete protection. The absence of formal protocols or training creates uncertainty and undermines ASP's confidence in managing doping-related situations, particularly in educational or developmental sport settings where their influence is most critical. Moreover, the variability in exposure across countries suggests unequal access to resources and training pathways, often depending on the national anti-doping authority's reach and the level of competition. Importantly, the few ASP who had structured involvement, such as doping control officers or those in Olympic support roles, expressed greater clarity and readiness, emphasizing the impact of role-specific education. In some countries, annual certification requirements for ASP improved awareness and engagement, suggesting a best-practice model. This overall detachment from the doping control system points to a disconnect between ASP and anti-doping authorities, particularly at the grassroots or amateur level. Where formal education is lacking, ASP often relies on assumptions or second-hand information, which undermines their confidence in responding appropriately and ethically during a doping control situation. Notably, those few ASP who had formal roles in Olympic programs or national federations (mainly in Hungary and Lithuania) expressed greater clarity and preparedness, emphasizing the importance of structured exposure and training.

These findings point to the urgent need for standardized, accessible training on doping control procedures for ASP, regardless of their sport or setting. Training should clarify their responsibilities during testing, outline key procedures and rights, and emphasize how to support athletes ethically and emotionally throughout the process. Content should also address how to prevent inadvertent doping through supplement use and medication. Integrating this content into broader anti-doping education initiatives would empower ASP to act as informed advocates for clean sport and provide critical guidance to athletes navigating the often complex landscape of doping control.

5.3 ASP's knowledge and education on doping and nutritional supplements

Findings across all countries show that ASP possess differing and generally limited knowledge of doping and nutritional supplements, with formal education on these topics being inconsistent, outdated, or entirely absent. While some ASP, particularly in Lithuania, Belgium and Serbia, reported exposure to structured training through academic or professional channels, the majority relied on self-directed learning, informal discussions, or non-scientific sources such as YouTube, peers, or product vendors. In Greece and Germany, ASP frequently mentioned a lack of formal training, especially on supplements, with many relying on magazine articles, internet content, or advice from colleagues. In Malta, education was often ad hoc and delivered through personal initiative rather than institutional programs. Several ASP across countries also noted that doping and supplements were rarely addressed together, resulting in fragmented understanding of how the two intersect.

This disparity underscores a significant educational gap that limits ASP's capacity to provide informed and safe guidance to athletes. The over-reliance on unverified sources and the absence of continuous professional development contribute to misinformation and increase the risk of supplement misuse or unintentional doping violations. In countries with limited institutional support, such as Malta, Serbia, and parts of Greece, this gap is especially pronounced, reinforcing existing inequalities in clean sport education. Even those with academic backgrounds often reported outdated or overly theoretical knowledge, lacking practical application.The situation is further exacerbated by the fast-evolving nature

of supplement science and doping regulations, leaving even well-intentioned ASP without up-to-date knowledge.

There is a clear need for comprehensive, role-specific training programs that integrate both scientific content and practical applications. These programs should be co-developed with anti-doping authorities and sport science experts, and be delivered through accessible, modular formats that support ongoing learning. Content should also address how to critically assess supplement claims, navigate regulatory frameworks, and communicate risks clearly to athletes and families. By ensuring that ASP have a solid foundation in both supplement safety and anti-doping policies, sport systems across Europe can enhance the quality of athlete support and reduce preventable doping-related risks.

5.4 Ways of selecting nutritional supplements for athletes

The results indicate that ASP across countries adopt highly varied and often informal approaches to selecting nutritional supplements for athletes. In some contexts, particularly Belgium, Serbia and parts of Lithuania, supplement choices are guided by scientific principles, performance needs, and consultation with medical professionals or dieticians. However, in countries such as Germany, Malta, Greece, Serbia and to some extent Lithuania, decisions are frequently made based on personal experience, peer advice, athlete preference, or generic online information, with limited use of standardized guidelines or evidence-based protocols. In Greece, some ASP deferred entirely to doctors or pharmacists, while others made informal recommendations based on training volume, age, or personal judgment. In Serbia and Lithuania, medical referrals and physiological indicators such as bloodwork were often cited, though not uniformly. In Germany and Malta, ASP rarely made recommendations themselves, and supplement use was largely athlete-driven or unmonitored.

These findings reveal a lack of consistent decision-making frameworks and underline the vulnerability of athletes to uninformed or unsafe supplement use. In many cases, ASP expressed discomfort or uncertainty in making supplement-related recommendations, citing inadequate training and limited authority. This inconsistency can lead to inappropriate supplement use, increased risk of contamination, and unintentional doping violations, particularly in systems where medical or nutritional support is not integrated into athlete development. The disparity in practices also reflects broader structural inequalities in access to expert guidance and regulatory oversight across countries.

To address these issues, practical interventions should prioritize the development of clear, evidence-based guidelines for supplement selection that are accessible to ASP across sport levels and national contexts. Educational tools should emphasize critical evaluation of supplement claims, reliance on third-party testing or certification systems, and collaboration with qualified nutrition professionals. Case studies and decision trees could help ASP navigate real-life situations more effectively, especially in settings where specialist access is limited. Moreover, training should empower ASP to engage in informed conversations with athletes and refer them appropriately, promoting both performance optimization and doping risk reduction through safe, transparent decision-making processes.

5.5 Health and doping safety of nutritional supplements

Across all participating countries, ASP expressed a high level of concern regarding the health risks and doping safety of nutritional supplements. While most recognized that supplements can be beneficial when used appropriately, they also acknowledged the potential for contamination, overuse, and misinformation. Commonly cited risks included gastrointestinal issues, long-term organ stress,

psychological dependency, and inadvertent doping due to undeclared or mislabeled ingredients. These concerns were consistent across settings, with many ASP, particularly in the Netherlands, Germany, Hungary and Lithuania, emphasizing the need to verify supplement quality and legality, even though they lacked systematic methods to do so.

In Greece and Serbia, ASP emphasized their fear of contamination and unregulated substances, especially in products purchased online or abroad. Several interviewees expressed that they avoid recommending supplements altogether due to these risks. In Malta, some ASP working with youth athletes were particularly concerned about the absence of clear regulations and the long-term effects of early supplement exposure.

These findings highlight the dual challenge ASP face: safeguarding athlete health while navigating a poorly regulated supplement market. The widespread awareness of risks contrasts with the lack of standardized procedures or tools to mitigate them, revealing a disconnect between knowledge and practice. This tension is especially evident in countries with limited access to qualified nutrition professionals or national anti-doping support, where ASP must rely on personal judgment or informal sources. Moreover, the ambiguity surrounding product labeling and varying national regulations further complicate efforts to ensure safe use, increasing the burden on individual ASP to make critical decisions without adequate institutional backing.

From a practical standpoint, anti-doping and sport organizations should provide ASP with clear, actionable resources for assessing supplement safety. This includes access to verified databases (e.g., Informed Sport, Cologne List), standardized risk-checking protocols, and education on interpreting ingredient labels and identifying red flags. Additionally, training should emphasize how to communicate risks effectively to young athletes and parents, especially in grassroots sport settings where fear or misinformation may prevail. Integrating this content into ASP training, alongside health education and ethical consideration, would enhance their capacity to protect athletes from both performance and health-related risks associated with unsafe supplement use.

5.6 Checking the quality of nutritional supplements

The results reveal that ASP across all countries face significant challenges when it comes to verifying the quality and safety of nutritional supplements. While some, particularly several participants interviewed by EFAD and in Lithuania, Greece and Serbia, reported occasional use of third-party certification systems such as Informed Sport or national platforms, most ASP expressed uncertainty about where or how to check a supplement's legitimacy. In Greece and Serbia, even well-intentioned ASP admitted that they lacked formal knowledge of verification tools and often defaulted to trusting products from pharmacies or doctors' recommendations. In Germany, ASP largely avoided advising on supplements altogether due to fear of contamination and liability. In Malta and Lithuania, some ASP cited attempts to consult online sources or rely on anecdotal evidence, but without access to systematic guidance. Many relied on superficial strategies such as reading labels, using Google searches, or trusting products from pharmacies, methods that, while well-intentioned, lack consistency and scientific rigor. The absence of universally accessible, user-friendly verification tools was a recurring concern.

These findings underscore a critical gap between ASP's awareness of supplement-related risks and their ability to take protective action. Even when ASP are motivated to ensure safety, the lack of practical guidance, centralized platforms, or institutional support leaves them vulnerable to making uninformed decisions. Moreover, inconsistent regulations across countries contribute to confusion,

particularly when athletes travel or purchase products online. In less-resourced settings like Serbia and Malta, ASP appeared especially reliant on word of mouth or informal trust networks, heightening the risk of inadvertent doping violations and health consequences for athletes.

These findings point to the urgent need for sport systems and anti-doping organizations to develop and promote standardized tools for supplement verification. Creating multilingual, centralized platforms endorsed by trusted institutions, where ASP can cross-check supplements, ingredients, and brand certifications, would significantly improve their capacity to guide athletes safely. Additionally, practical training should include real-life case scenarios, tutorials on interpreting certification logos, and tips for verifying online-purchased supplement. These issues were raised in several interviews. Training should also include practical modules on how to use these tools effectively and critically assess manufacturer claims, empowering ASP to make confident, evidence-informed decisions in a rapidly evolving supplement market.

5.7 Perceptions of supplement safety, health benefits, and potential health risks

The findings across countries indicate that ASP generally view nutritional supplements as potentially beneficial but remain cautious about their safety, especially when used without professional guidance. Most ASP acknowledged that supplements can support recovery, performance, and overall well-being when properly used and integrated into a balanced diet. However, there was also widespread concern about health risks, such as organ strain, toxicity from overuse, and psychological dependency, as well as the possibility of inadvertent doping due to contamination or misleading labeling. This nuanced perception was consistent across all countries, with ASP in Greece, Germany, and Lithuania frequently emphasizing the importance of dosage control, certification, and professional supervision. In The Netherlands and Hungary, several ASP noted that supplements could be valuable tools for maintaining energy and motivation, especially in elite settings, but emphasized that this should occur under medical or dietetic monitoring. In Serbia, some ASP reported seeing benefits in athletes' recovery and strength with certain products but remained wary of aggressive marketing and lack of independent control. In Malta, ASP working with young athletes raised ethical concerns about early exposure to supplements, stressing that health promotion should precede any performance focus.

These results reflect an encouraging level of critical thinking among ASP but also highlight the impact of inconsistent education and regulatory ambiguity. The simultaneous recognition of both benefits and risks suggests that ASP are not opposed to supplement use per se but lack the tools and training to confidently manage its safe implementation. In lower-resourced contexts, such as Serbia and Malta, ASP appeared particularly concerned about misinformation and the influence of commercial interests, noting that athletes often trust marketing claims or peer recommendations without understanding the underlying science. In both countries, ASP expressed the need for clear national guidance and trusted channels to validate supplement safety and necessity.This reinforces the need to bridge the gap between awareness and action through structured support and knowledge development.

To respond effectively to these concerns, educational initiatives should equip ASP with clear criteria for evaluating supplement benefits and risks, including health-based, ethical, and regulatory dimensions. Training should emphasize practical strategies for minimizing harm, such as consulting qualified professionals, prioritizing food-first approaches, and recognizing red flags in supplement marketing. It should also provide age-appropriate guidance, especially for those working with adolescent or developing athletes. By enhancing ASP's ability to critically assess supplements in context,

sport organizations can foster safer and more informed decision-making that prioritizes athlete health and upholds clean sport principles.

5.8 Enhancing ASP knowledge and preferred learning formats

Across all countries, ASP expressed a strong and consistent interest in improving their knowledge of nutritional supplements and anti-doping practices. A key theme was the preference for practical, concise, and easily accessible learning formats that fit their demanding and varied schedules. ASP favored short videos, infographics, podcasts, interactive modules, and mobile-accessible content over lengthy theoretical lectures or dense academic texts. Many also emphasized the importance of periodic updates and the inclusion of real-world case studies, athlete testimonials, and scenario-based learning. The desire for certified training and centralized, multilingual platforms was particularly strong among ASP in Belgium, Greece, Hungary, Lithuania, Poland and the Netherlands while those in Italy, Malta and Serbia highlighted the need for beginner-friendly, foundational education. In Germany, ASP preferred hands-on approaches and emphasized the need to connect education to everyday practice, rather than abstract theoretical knowledge.

Across countries, ASP underlined the importance of receiving information from credible professionals such as doctors, sports dieticians, and anti-doping experts. Some ASP expressed concern about unreliable educators or oversimplified messages, especially in commercial or non-regulated training settings. These preferences reflect a clear demand for education that is not only scientifically accurate but also usable and relevant to the realities of ASP's professional roles. The varied responsibilities and backgrounds of ASP from coaches and physiotherapists to parents and administrators, necessitate differentiated learning pathways that account for their level of expertise and access to resources. Importantly, ASP showed high motivation to learn when the content was delivered by credible experts (e.g., doctors, sports dietitians, anti-doping professionals) and when it addressed both scientific content and emotional or ethical aspects of supporting athletes. This was particularly emphasized in Greece, Serbia, and Lithuania, where ASP asked for support in how to communicate with athletes, deal with dilemmas, and handle uncertainty. This reinforces the importance of designing education that is engaging, context-specific, and role-sensitive, rather than relying on a one-size-fits-all model.

In practice, these insights suggest that future training efforts should adopt a blended learning approach, combining online microlearning modules with optional in-person sessions or webinars. Resources should be modular, visually engaging, and available in multiple languages, with options for certification and periodic updates. Including coaching strategies, communication skills, and emotional intelligence training alongside scientific knowledge would better prepare ASP to support athletes holistically and responsibly in navigating supplement use and anti-doping compliance.

5.9 Desired learning outcomes from supplement education

The findings show that ASP across all participating countries share a clear and practical vision for what they want to gain from educational programs on nutritional supplements. Core desired outcomes include the ability to identify which supplements are evidence-based, understand appropriate dosages and protocols, recognize sport- and age-specific applications, and distinguish between safe and risky products. ASP also expressed interest in learning how to guide athletes effectively, including how to address emotional concerns, support informed decision-making, and prevent misuse. Many emphasized

the need to better understand how supplements interact with training demands, health status, and potential doping risks, with a particular focus on minimizing unintentional violations.

In Lithuania, Serbia, and Malta, ASP working with youth or amateur athletes stressed the importance of learning how to educate athletes and parents early on, using accessible and trustworthy messages. In Germany, ASP requested practical tools for evaluating product legitimacy, while in Greece and Belgium, ASP favored real-life examples to support coaching-based conversations. These preferences reflect a strong demand for education that moves beyond abstract or purely scientific content and focuses on real-world, athlete-centered application. ASP want to be equipped with clear, actionable knowledge that enables them to engage confidently with athletes, parents, and colleagues. They also value training that includes ethical, emotional, and contextual dimensions of supplement use, not just ingredient lists and regulations. Several ASP across countries highlighted the need to learn how to talk about supplements responsibly, especially in settings where they serve multiple roles (e.g., coach, advisor, parent) and may be the primary or only source of guidance. This is particularly important in settings where ASP often serve multiple roles (e.g., coach, advisor, parent) and may be the primary source of guidance for young or amateur athletes. The inclusion of case studies, real-life examples, and interdisciplinary collaboration (e.g., between dietitians and anti-doping experts) was frequently mentioned as a way to enrich learning and foster practical application. In Serbia and Malta, ASP also expressed interest in learning how to identify marketing-based claims versus science-based evidence, and how to deal with peer or athlete pressure to approve questionable supplements.

Practically, these findings suggest that educational programs should be built around clear learning outcomes that prioritize decision-making competence, communication skills, and ethical awareness. Supplement education should be structured to help ASP evaluate products critically, understand regulatory implications, and support athletes' health and performance with evidence-based recommendations. Programs should also include tools that enable ASP to personalize advice based on sport type, training phase, and athlete maturity, empowering them to serve as trusted and knowledgeable figures in the athlete's support system. Finally, offering tiered learning paths, for beginners, experienced practitioners, and those working in specific sports, could ensure that all ASP gain the knowledge they need in a format that matches their context.

5.10 Educational design preferences and final reflections

The findings reveal strong and consistent preferences among ASP across all countries for flexible, modular, and user-friendly educational formats. ASP favored short, on-demand learning sessions, such as micro-videos, interactive infographics, podcasts, and concise e-learning modules, that could be easily integrated into their busy schedules. There was broad support for blended learning models that combine asynchronous online content with optional live sessions, webinars, or workshops. Many ASP expressed a desire for regular updates, certification of completion, and access to centralized, multilingual platforms endorsed by credible institutions. Moreover, ASP highlighted the importance of tailoring educational content to their specific roles and experience levels, suggesting that training for coaches, parents, medical staff, and dietitians should differ in depth and focus.

These preferences reflect a growing recognition that effective education must be accessible, engaging, and professionally relevant. ASP do not simply seek theoretical knowledge; they value content that is practical, visually rich, and rooted in their day-to-day realities. Importantly, ASP in countries with limited resources or institutional support (e.g., Italy, Malta, Poland and Serbia) expressed the need for

content that is easy to navigate and grounded in basic principles, while those in more structured environments (e.g., Croatia, Lithuania and Spain) emphasized the value of advanced, evidence-based modules. Several ASP in Greece also highlighted the need for introductory-level content and clearer educational pathways, particularly for those without formal academic backgrounds in nutrition or sport science.There was also a strong call for including real-world tools, such as product-checking guides, digital resources for supplement safety, and interactive case studies, to help ASP translate knowledge into practice. Additionally, ASP across countries expressed interest in participating in the co-design of training materials to ensure that educational tools are relevant, sport-specific, and context-aware.

In practical terms, these insights should guide the development of a tiered educational system that offers core modules for all ASP alongside optional, specialized content based on professional role and context. Educational design should prioritize visual clarity, interactivity, and mobile compatibility, while incorporating assessments, certifications, and feedback mechanisms to ensure engagement and retention. Including features such as scenario-based learning, virtual athlete simulations, and real-time decision-making challenges could further support critical thinking and ethical reasoning. Integrating features such as virtual athlete simulations, role-specific learning paths, and co-designed content with ASP themselves will further enhance the relevance and impact of the educational experience. Ultimately, empowering ASP through well-designed, accessible training is a critical step toward strengthening the athlete support ecosystem and fostering clean, ethical sport environments.

6. Epilogue

6.1. Conclusions

This study provides a comprehensive overview of the current knowledge, experiences, and educational needs of Athlete Support Personnel (ASP) across 12 European countries, Belgium, Croatia, Germany, Greece, Hungary, Italy, Lithuania, Malta, the Netherlands, Poland, Serbia and Spain, with regard to doping prevention and the safe use of nutritional supplements. Despite differences in professional roles and national contexts, ASP across all countries demonstrated high levels of motivation to support athletes but reported significant gaps in formal training, standardized procedures, and access to trustworthy information. Their knowledge was often self-acquired, and their involvement in doping control processes and supplement decision-making was inconsistent and largely informal.

The findings highlight the dual role of ASP as both technical advisors and trusted figures in athletes' lives, placing them in a strategic position to influence attitudes and behaviors related to clean sport. However, the lack of systematic education and institutional support undermines their potential impact. Concerns about supplement safety, health risks, and inadvertent doping were widespread, yet most ASP lacked the tools and confidence to assess product quality or provide evidence-based guidance.

The study also reveals a clear and consistent preference for flexible, practical, and role-specific learning formats that are accessible, engaging, and tailored to ASP's diverse backgrounds. ASP expressed a desire for educational programs that go beyond scientific content to include ethical, emotional, and real-world dimensions of athlete support. Their input emphasizes the importance of co-designed learning pathways and centralized resources that can support both foundational and advanced knowledge development.

In conclusion, empowering ASP through well-designed, evidence-based, and accessible education is essential for strengthening the athlete support system and enhancing doping prevention efforts across Europe. This study provides valuable insights that should inform the design of future educational interventions, with a focus on flexibility, inclusivity, and practical application to ensure that ASP are equipped to act as informed, ethical, and effective guardians of clean sport.

6.2. How the findings will support the AntiDop Project

The findings from the AntiDop learning gaps analysis directly support the overall objectives and planned activities of the AntiDop Project, as outlined in the Erasmus+ Sport proposal. The project aims to strengthen the role of Athlete Support Personnel (ASP) in doping prevention through education, capacity building, and development of innovative tools. The results of the report confirm the urgent need for such interventions, revealing widespread gaps in ASP's knowledge of doping and nutritional supplements, limited involvement in doping control processes, and a strong desire for practical, accessible education. These insights validate the project's foundational assumption that ASP are underutilized but highly influential actors in clean sport promotion.

The study's emphasis on ASP's educational preferences, such as short, flexible, and role-specific learning formats, will be instrumental in guiding the design of the AntiDop training modules and digital learning resources. The call for modular content, mobile accessibility, and real-life case studies is fully aligned with the project's commitment to developing innovative, user-centered tools. Moreover, the reported need for centralized, multilingual, and certified learning platforms supports the project's plan to create a digital resource hub that addresses the diverse needs of ASP across different countries, sporting contexts, and levels of experience.

Importantly, the cross-country findings reinforce the project's transnational approach by demonstrating both common learning needs and contextual differences among ASP in countries such as Belgium, Croatia, Germany, Greece, Hungary, Italy, Lithuania, Malta, the Netherlands, Poland, Serbia, Spain. These differences, ranging from institutional support structures to cultural attitudes, highlight the importance of offering differentiated learning pathways and ensuring that training is adaptable to local realities. This evidence will support the development of country-specific recommendations, helping project partners co-design educational materials that are both universally relevant and locally effective.

In summary, the results of the learning gaps analysis will serve as a crucial evidence base for all phases of the AntiDop Project, from the creation of the training curriculum to the testing and refinement of learning tools. By anchoring the project's design in real-world data from ASP, the findings will ensure that AntiDop interventions are both targeted and impactful, ultimately enhancing the capacity of ASP to act as informed, ethical, and proactive agents in the fight against doping in sport.

7. References

Backhouse, S. H., Whitaker, L., & Petróczi, A. (2013). Gateway to doping? Supplement use in the context of preferred competitive situations, doping attitude, beliefs, and norms. *Scandinavian journal of medicine & science in sports*, *23*(2), 244-252.

Barkoukis, V., Elbe, A. M., Lazuras, L., Moustakas, L., Ntoumanis, N., Palamas, G., & Stanescu, M. (2021). Virtual reality against doping: The case of project VIRAL. In *Interactive Mobile Communication, Technologies and Learning* (pp. 487-496). Cham: Springer International Publishing.

Barkoukis, V., Kaffe, S., Atkinson, A., Sumnall, H., Koskelo, J., Jussila, H. K., ... & Banyte, R. (2022). Fitness professionals' perceptions of acceptability and usability of anti-doping education tools for recreational sports. *Drugs: Education, Prevention and Policy*, *29*(6), 726-736.

Barkoukis, V., Lazuras, L., Ourda, D., & Tsorbatzoudis, H. (2020). Are nutritional supplements a gateway to doping use in competitive team sports? The roles of achievement goals and motivational regulations. *Journal of Science and Medicine in Sport*, *23*(6), 625-632.

Barkoukis, V., Tsiatsos, T., Politopoulos, N., Stylianidis, P., Ziagkas, E., Lazuras, L., & Ypsilanti, A. (2019b). A serious game approach in anti-doping education: The game project. In *Proceedings of the 15th International Scientific Conference" eLearning and Software for Education": New technology and redesigning learning spaces* (Vol. 3, pp. 451-455). eLSE.

Dimeo, P., & Møller, V. (2018). *The anti-doping crisis in sport: Causes, consequences, solutions*. Routledge.

Guo, L., Liang, W., Baker, J. S., & Mao, Z. X. (2021). Perceived motivational climates and doping intention in adolescent athletes: The mediating role of moral disengagement and sportspersonship. *Frontiers in Psychology, 12*, 611636.

Hardwick, B., Madigan, D. J., Hill, A. P., Kumar, S., & Chan, D. K. (2022). Perfectionism and attitudes towards doping in athletes: The mediating role of achievement goal orientations. *International Journal of Sport and Exercise Psychology, 20*(3), 743-756.

Hurst, P., Kavussanu, M., Boardley, I., & Ring, C. (2019). Sport supplement use predicts doping attitudes and likelihood via sport supplement beliefs. *Journal of sports sciences, 37*(15), 1734-1740.

Hurst, P., Schiphof-Godart, L., Kavussanu, M., Barkoukis, V., Petroczi, A., & Ring, C. (2023). Are dietary supplement users more likely to dope than non-users?: A systematic review and meta-analysis. *International Journal of Drug Policy*, *117*, 104077.

Huybers, T., & Mazanov, J. (2012). What would Kim do: A choice study of projected athlete doping considerations. *Journal of sport management, 26*(4), 322-334.

Kavussanu, M., Barkoukis, V., Hurst, P., Yukhymenko-Lescroart, M., Skoufa, L., Chirico, A., ... & Ring, C. (2022). A psychological intervention reduces doping likelihood in British and Greek athletes: A cluster randomized controlled trial. *Psychology of Sport and Exercise*, *61*, 102099.

Kavussanu, M., Yukhymenko-Lescroart, M. A., Elbe, A. M., & Hatzigeorgiadis, A. (2020). Integrating moral and achievement variables to predict doping likelihood in football: A cross-cultural investigation. *Psychology of Sport and Exercise, 47*, 101518.

Kavussanu, M., Rubaltelli, E., Leo, I., Hurst, P., Giovannoni, M., Barkoukis, V., ... & Ring, C. (2025). A psychological intervention reduces doping likelihood in Italian athletes: A replication and extension. *Psychology of Sport and Exercise, 77*, 102761.

Lazuras, L., Barkoukis, V., Rodafinos, A., & Tzorbatzoudis, H. (2010). Predictors of doping intentions in elite-level athletes: a social cognition approach. *Journal of Sport and Exercise Psychology, 32*(5), 694-710.

Lazuras, L., Barkoukis, V., Mallia, L., Lucidi, F., & Brand, R. (2017). More than a feeling: The role of anticipated regret in predicting doping intentions in adolescent athletes. *Psychology of Sport and Exercise, 30*, 196-204.

Nicholls, A. R., Fairs, L. R., Plata-Andrés, M., Bailey, R., Cope, E., Madigan, D., & Chanal, B. (2020a). Feasibility randomised controlled trial examining the effects of the Anti-Doping Values in Coach Education (ADVICE) mobile application on doping knowledge and attitudes towards doping among grassroots coaches. *BMJ Open Sport & Exercise Medicine, 6*(1), e000800.

Nicholls, A. R., Morley, D., Thompson, M. A., Huang, C., Abt, G., Rothwell, M., ... & Ntoumanis, N. (2020b). The effects of the iPlayClean education programme on doping attitudes and susceptibility to use banned substances among high-level adolescent athletes from the UK: A cluster-randomised controlled trial. *International Journal of Drug Policy*, *82*, 102820.

Ntoumanis, N., Ng, J. Y., Barkoukis, V., & Backhouse, S. (2014). Personal and psychosocial predictors of doping use in physical activity settings: a meta-analysis. *Sports medicine, 44*, 1603-1624.

Ntoumanis, N., Quested, E., Patterson, L., Kaffe, S., Backhouse, S. H., Pavlidis, G., ... & Gucciardi, D. F. (2021). An intervention to optimise coach-created motivational climates and reduce athlete willingness to dope (CoachMADE): a three-country cluster randomised controlled trial. *British journal of sports medicine, 55*(4), 213-219.

Ntoumanis, N., Dølven, S., Barkoukis, V., Boardley, I. D., Hvidemose, J. S., Juhl, C. B., & Gucciardi, D. F. (2024). Psychosocial predictors of doping intentions and use in sport and exercise: a systematic review and meta-analysis. *British Journal of Sports Medicine, 58*(19), 1145-1156.

Ourda, D., & Barkoukis, V (2025, in press). Preventing Doping in Sport: Evidence, Innovation, and Policy in the European Context. In: N. Scelles, A.M. Strittmatter, P. Downward, & E. Manoli (Eds), *Research Handbook on Sport in Europe*. Edward Elgar.

Overbye, M., Elbe, A. M., Knudsen, M. L., & Pfister, G. (2015). Athletes' perceptions of anti-doping sanctions: the ban from sport versus social, financial and self-imposed sanctions. *Sport in society, 18*(3), 364-384.

Pope Jr, H. G., Wood, R. I., Rogol, A., Nyberg, F., Bowers, L., & Bhasin, S. (2014). Adverse health consequences of performance-enhancing drugs: an Endocrine Society scientific statement. *Endocrine reviews, 35*(3), 341-375.

Raynor, K. (2015, September 8). *Powell, Simpson settle case with nutrition company*. Reuters. https://www.reuters.com/article/us-athletics-jamaica-powell-idUSKCN0R90A820150908

Wang, K., Xu, L., Zhang, J., Wang, D., & Sun, K. (2020). Relationship between perfectionism and attitudes toward doping in young athletes: The mediating role of autonomous and controlled motivation. *Substance abuse treatment, prevention, and policy, 15*, 1-8.

World Anti-Doping Agency. (2021a). *World Anti-Doping Code*. Retrieved from https://www.wada-ama.org/en/resources/the-code/world-anti-doping-code

World Anti-Doping Agency (WADA). (2021e). *International Standard for Education*. Montreal, Canada: WADA.

World Anti-Doping Agency. (2021b). *World Anti-Doping Code*. Retrieved from https://www.wada-ama.org/en/resources/the-code/world-anti-doping-code

World Anti-Doping Agency. (2021b). *International Standard for Testing and Investigations (ISTI)*. https://www.wada-ama.org/en/resources/world-anti-doping-code-and-international-standards/international-standard-testing-and

World Anti-Doping Agency. (2021c). *International Standard for Laboratories (ISL)*. https://www.wada-ama.org/en/resources/world-anti-doping-code-and-international-standards/international-standard-laboratories

World Anti-Doping Agency. (2021d). *International Standard for Therapeutic Use Exemptions (ISTUE)*. https://www.wada-ama.org/en/resources/world-anti-doping-code-and-international-standards/international-standard-therapeutic-use

World Anti-Doping Agency. (2021f). *International Standard Prohibited List.* www.wada-ama.org/sites/default/files/2024-09/2025list_en_final_clean_12_september_2024.pdf

8. Appendix

INTERVIEW MATRIX

INVITATION TO PARTICIPATE IN THE ANTI-DOP ERASMUS+ Project

Why have we contacted you?

Dear participant,
With this letter we would like to invite you to participate in the ANTI-DOP which is funded by Erasmus+ Sport Action and aims to develop educational material to educate ASP about the use of nutritional supplements.

What is ANTI-DOP Project about?

The project aims to enhance awareness and equip ASP with the knowledge and skills to proactively research and verify the legality of dietary supplements before offering guidance to athletes.
The specific project objectives include:
1. Design and develop an innovative eLearning Platform to deliver Massive Open Online Courses (MOOCs) as training interventions for Athlete Support Personnel (ASP) for appropriate Nutritional Supplement use against Doping.
2. Search for scientific updates and employ innovative methodological techniques in Training Missions development to support ASP in managing nutritional supplements and pharmaceutical products and enhance their engagement with athletes.
3. Design and develop prototype interactive and media-enhanced training content in the form of highly reusable Open Educational Recourses.
4. Validate the AntiDop Platform and Training Missions under real-world conditions.

What is your commitment?

In order to assist us in preparing the learning, teaching training materials of the project, we would like you to participate in the following interview.

Informed Consent for Participation in ANTI-DOP Project

I declare that, based on the information provided in this letter, I am willing to participate in the interview for the ANTI-DOP Project.

□ YES □ NO

Name: …….. Signature: ……..

Date: ……

Definition of Athlete Support Personnel (ASP)

Athlete Support Personnel (ASP) refers to individuals who work closely with athletes, providing guidance, care, and expertise to support their training, performance, and overall well-being. The World Anti-Doping Agency (WADA) defines ASP as **"any coach, trainer, manager, agent, team staff, official, medical, paramedical personnel, parent, or any other person working with, treating, or assisting an athlete in their sporting career."**

ASP encompasses a diverse group of individuals involved in an athlete's development and performance, including:

- **Coaches & Trainers** – Responsible for designing training programs, providing technical and tactical guidance, and optimizing performance.
- **Medical & Paramedical Personnel** – Physicians, physiotherapists, nutritionists, and other healthcare providers who manage injuries, rehabilitation, and overall athlete health.
- **Sport Scientists & Psychologists** – Professionals who support physical and mental preparation through data analysis, psychological resilience training, and performance enhancement techniques.
- **Team Managers & Administrators** – Individuals overseeing logistics, competition planning, and ensuring adherence to regulations.
- **Parents & Guardians** – Particularly in youth sports, they play a crucial role in influencing attitudes, motivation, and ethical decision-making.
- **Agents & Sponsorship Representatives** – Those managing an athlete's professional contracts, sponsorships, and financial interests.
- **Anti-Doping Officials & Ethics Committees** – Personnel ensuring compliance with anti-doping regulations and fair play principles.

ASP members have a responsibility to promote **clean sport** by educating athletes on anti-doping regulations, encouraging ethical decision-making, and preventing prohibited substance use. They are subject to anti-doping regulations and can be held accountable for violations if they contribute to or fail to prevent doping practices.

With this information in mind, please respond to the following interview questions.

Table 1. Interview themes and questions for project ANTI-DOP

Topic of inquiry	**Interview question used to elicit perceptions and beliefs about the use of nutritional supplements by athletes**	**Probes**
Information on what anti -doping is	1. Do you know what doping is?	What is the difference between doping and nutritional supplement use?
Previous Anti Doping Knowledge Previous Nutritional Supplement Knowledge	2. Have you received any education related to doping? 3. Have you received any education related to use of	Who provided this education? What this education was about? What is the most important

	nutritional supplements?	information you learnt from this education?
Selection of supplements	4. How do you select the supplements you consume?	Who do you get advice from? Where you get information about nutritional supplements? Who to consult? Who not to consult? What criteria you use to select your supplements?
Risk perceptions: What are the risks of nutritional supplements?	5. Are nutritional supplements safe? 6. Do you think that nutritional supplements may undermine the users' health?	What may be the health risks from using nutritional supplements? What may be the sport-related risks from using nutritional supplements?
Supplements checks	7. How can an ASP check the quality of a supplement?	Are there any platforms or entities that check supplements? How can an ASP get information about the quality of a supplement?
Educational needs	8. How can we help ASP be more knowledgeable about nutritional supplements?	What type of education you think would be more appropriate for ASP
Content of education	9. What would you like to learn by using this education?	What type of information you would like this material to include? What learning material do you find more suitable to support you?
Duration and delivery mode of the education	10. What should be the characteristics of this education?	How this material should be presented? How long should the education be? Who should deliver the education?