

SURVEY ON COACHING PHILOSOPHIES AND TRAINING METHODOLOGIES OF WATER POLO HEAD COACHES FROM THREE DIFFERENT EUROPEAN NATIONAL SCHOOLS

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Abstract:

The ability to change swimming styles and body positions, involving continuous shifting from horizontal to vertical posture and performing jumps, as well as technical skills play a fundamental role in water polo performance. To face with these demands, the coaching staff of elite and sub-elite water polo clubs might adopt a variety of training methods, also based on their specific coaching philosophies. This point has led to an enlargement of the staff, with higher head coaches' responsibilities, who may interpret their professional activity according to their own coaching philosophy, education, and their respective national water polo schools. In fact, based on their international sports achievements, some countries can be identified as recognised water polo national schools. For this reason, the purpose of this study was to survey 40 head coaches of three important national water polo schools (Italy, Greece, and Serbia) to identify and compare their coaching philosophies and training methodologies. The survey was based on five sections (Technical staff composition, Team roster, Weekly periodization, Testing and monitoring, Tactics and strategies). Furthermore, using a detailed descriptive statistic, the current study gives interesting information on how 40 high-ranking elite and sub-elite teams of different national championships organize their training during a typical week of the competitive season. A further improvement of this research line could include more national schools, expanding the sample to more countries from all over the world.

Key words: *team sports, team management, coach education, typical training week, competitive season*

Introduction

Water polo is a very stressful body-contact aquatic team sport played all over the world. It combines high-intensity short-duration efforts and low-duration actions (Ruano, Serna, Lupo, & Sampaio, 2016). The latest worldwide survey, published in 2019 by the Fédération Internationale de Natation (FINA) and based on data supplied by the national federations, shows a number of 24,482 coaches and 22,690 referees, out of which 8,155 and 19,113 are involved in European competitions at all levels, respectively (FINA, 2019). These data pose Europe as the most important geographic area for this sport in terms of the relevance of elite national (e.g., the Italian 'Serie A1', Serbian 'Prva A liga', Hungarian 'OB I', Spanish 'División de Honor', Croatian 'Prva hrvatska liga', Montenegrin 'Prva liga Crne Gore', and Greek 'A1 Ethniki') and elite

continental (e.g., Champions League, LEN Euro Cup, and Adriatic Water Polo League) water polo championships. All these championships include the best European water polo players and clubs, showing a variety of water polo cultures belonging to different parts of Europe. In the last years, the Italian national team won the 2019 World Championship held in Gwangju and the Serbian national team won the last two Olympic Games (Rio de Janeiro in 2016 and Tokyo in 2020). As well, in the history of European tournaments, the Italian clubs won twenty-four and the Serbian eleven editions in both the Champions League and the LEN Euro Cup. At the same time, Greece has currently reached a very high level of water polo development, achieving noticeable results with both the senior national team (silver medal at Tokyo in 2020) and youth national team (gold medal in 2019 at the U20

World championships). Also, Greek clubs usually compete in the final eight of European cups. For this reason, in our study, we surveyed head coaches from these three countries. However, Europe is also the home of other water polo prestigious countries that are very important for this sport, based on the history of their international trophies (i.e., Hungary, Croatia, Spain, Montenegro), and that have highly contributed to the development of water polo in Europe along the years, as we are going to explain in the next paragraph.

Regarding the evolution of the game, two studies have identified five historical stages of its development, characterized by changes in the rules of play, the need for higher levels of physical condition and technical skills, imposed by increased matches' demands, and the coaching philosophies employed by the technical staffs (Donev, & Aleksandrović, 2008; Hraste, Bebić, & Rudić, 2013). The first stage of water polo evolution (from 1869 to 1907) has been marked as the search for identity and unified rules of the game, which was characterized as a sort of an 'unattractive' game played exclusively in conjunction with swimming or rowing competitions. The second evolution stage (from 1908 to 1949) can be considered as the period of restructuring and internationalization of the game, distinguished by a relevant improvement of players' individual technical skills. The third stage (from 1950 to 1969) saw a faster development of both defensive and offensive play phases determined by new game rules. In particular, the defensive phase was characterized by the first forms of man-to-man defence, while the role of the centre forward was significantly changed who became the organizer of the attacking phase. The fourth stage (from 1970 to 1986) transformed the water polo performance by introducing a new attack limit of 35 seconds, thus making it a more dynamic, fluid, and high-tempo game. The fifth and final stage (from 1987 to 2012) can be considered as the period of evolution of the high-intensity game. The new rules allowed the goalkeeper to score, and the team ball possession phase was limited to 30 seconds. Consequently, the total volume of swimming activities increased considerably in both training and matches. Furthermore, due to the rise of the number of contacts and tougher struggling in the duels between players, training with weights and exercise equipment gained much relevance. Nowadays, with the latest changes in the rules of play, established by FINA in 2019 (FINA, 2020), which have had a relevant impact on the core elements of play, we can affirm that water polo is experiencing the sixth phase of its history.

To face the new requirements of game play, in addition to the traditional figure of coach, such continuous game evolution also requires the contribution of other professional figures within the coaching staff, such as strength and condi-

tioning coaches, technical collaborators, goalkeeper coaches, and match analysts. Consequently, the enlargement of the coaching staff has carried out a new culture of management of training and competitions, which is also influenced by the coaches' personal coaching philosophy and the knowledge and traditions of different national water polo schools. The training methodologies are largely influenced by the coaching philosophy of the head coach, which consists of his/her major objectives and values, beliefs and principles he/she wants to achieve during the coaching career (Martens, 2012). The coaches' national schools reflect the cultural diffusion of the sporting environment, which exerts a large influence over coaches in social and sporting terms, through their attitudes to coaching moulded by a national background of common values and experiences. In this regard, specific coaching programmes provided by sports federations are an essential part of the coaches' education. A study commissioned by the Australian Institute of Sport and involving coaches of several sports disciplines, showed how scientific findings provided through appropriate forums, using simple and accessible language, were likely to be useful for coaches' professional development (Williams & Kendall, 2007). However, in water polo, to the best of our knowledge, except for a survey on physical trainers of male and female Spanish First League teams (Reverter-Masía, Jove-Deltell, Legaz-Arrese, & Munguía-Izquierdo, 2012), there are no studies investigating the characteristics of coaching philosophies from national water polo schools of different countries. Indeed, such a kind of study, exploring the real identity of national water polo schools and the coaches' profiles belonging to them, would bring valuable information to professionals by defining what kind of methodologies and educational programmes are used in different areas of the world, how players are selected and sustained, as well as the composition of rosters and coaching-staffs.

Therefore, the purpose of this study was to survey the coaches of three main national water polo schools to identify and compare their coaching philosophies.

Methods

Study design

In reporting this survey study, a Consensus-Based Checklist for Reporting of Survey Studies (CROSS) was followed with the aim of strengthening the quality (Sharma, et al., 2021). All the participants surveyed in this study were head coaches, during the season 2019-2020, of their respective teams playing in the first and/or second divisions of the national championships of the three worldwide recognised water polo national schools

of Italy, Serbia and Greece. After the authors elaborated on the survey's first draft, it was sent to one elite water polo coach from each of the three countries (Italy, Serbia and Greece) to gather information about the questionnaire's clarity and format, as well as to receive any other feedback. These coaches were chosen due to their qualifications and experience and because they closely resembled the actual study participants' profiles; however, they were not included in the actual study.

The final version of the survey was composed of 38 close-ended questions, divided into five sections of inquiry: 1) Technical staff composition (15 items); 2) Team roster (5 items); 3) Weekly periodization (8 items); 4) Testing and monitoring (4 items), and 5) Tactics and strategies (6 items) (see Appendix A).

Participants

Forty male head coaches from the Greek (n=12), Serbian (n=14) and Italian (n=14) national first (n=22) and second division (n=18) teams were recruited for this study.

The study was approved by the Ethical Committee of the University of Rome 'Foro Italico' (number CAR 27/202).

Procedure

The questionnaire was built in digital format through the Google Docs platform and translated into the Italian, Serbian and English language. After receiving their agreement to participate in the study, the link was sent to the head coaches by email.

Statistical analysis

Descriptive statistics of all the parameters, including means, standard deviations and frequencies for all the participants and pooled data were calculated. Because nominal data were gathered in this survey study, a non-parametric Kruskal-Wallis' test was conducted to examine the differences in the answers according to the water polo national schools of the coaches. Descriptive data of the three groups is provided in the report that clearly showed the difference between each pair of groups. The statistical analyses were conducted using the statistical package SPSS (version 26.00; Institute, Inc., Cary, NC), and the criterion for significance was set at a 0.05 alpha level.

Results

Section 1. Technical staff composition

Even 92% of the surveyed head coaches reported being a former water polo player and no significant differences were found regarding their competitive level as former players. The pooled data showed that 52.5% of head coaches (n=21) played

in the second division of their respective national water polo leagues.

Regarding their experience as head coaches, the pooled data showed an average of 12.3 ± 9.7 years of coaching experience. In particular, 50% of respondents indicated being in charge as a head coach for up to 10 years [<5 years (n=8): 20% and 5-9 years (n=12): 30%, respectively], while the rest 50% of them showed over 10 years of experience [10-14 years (n=6): 15%; 15-20 years (n=8): 20% and > 20 years (n=6): 15%, respectively].

No differences were found between the groups (national water polo schools) regarding their highest level of education. Specifically, 32.5% of respondents (n=13) declared to have a high school degree, 25% (n=10) a bachelor's degree, 35% (n=14) a master's degree and two head coaches earned the Ph.D. Out of the 67.5% of coaches with higher education, only four of them (all from the Serbian school) answered to have a degree in sports science.

When the head coaches were asked '*Which of the following aspects have most influenced your current coaching philosophy?*' (multiple choice answers), their answers showed 'had other coaches as mentors' (n= 29 head coaches), 'my own experience as a player' (n= 21), 'years of continuous practice as a water polo coach' (n=18), 'education from my water polo federation' (n= 15), 'the club's philosophy' (n=13), 'having a degree in sport science' (n=4) and 'education from other sports federations (different disciplines)' (n=2). The most frequent head coaches' answers describing the ways of their continuing learning were the following: 'sharing ideas with other coaches' (n=15); 'refresher training courses' (n=14); 'research and courses on the internet' (n=11). Regarding the investigation of whether sports disciplines different from water polo might have influenced their training methodologies (Figure 1), data showed team sport of basketball was their answer with the highest score (n= 22).

Furthermore, 62.5% of head coaches (n=25) stated that water polo was their main professional activity, compared to 37.5% of coaches to whom it was a hobby or a secondary profession. In particular, the Kruskal-Wallis' test showed a significant difference between the three groups (Figure 2).

In the item '*Does your team have a full job technical collaborator (helping the head coach)?*', most of the respondents (n=31) indicated to have at least one technical assistant in their professional staff. Also, in this case, there was a significant difference between the three national water polo schools (Italian school: yes=9, no=5; Greek school: yes=8, no=4; Serbian school: yes=14). Figure 3 shows the item investigating whether their own coaching staff included three specific figures of professional collaborators: a goalkeeper coach, strength and conditioning coach, and match analyst.

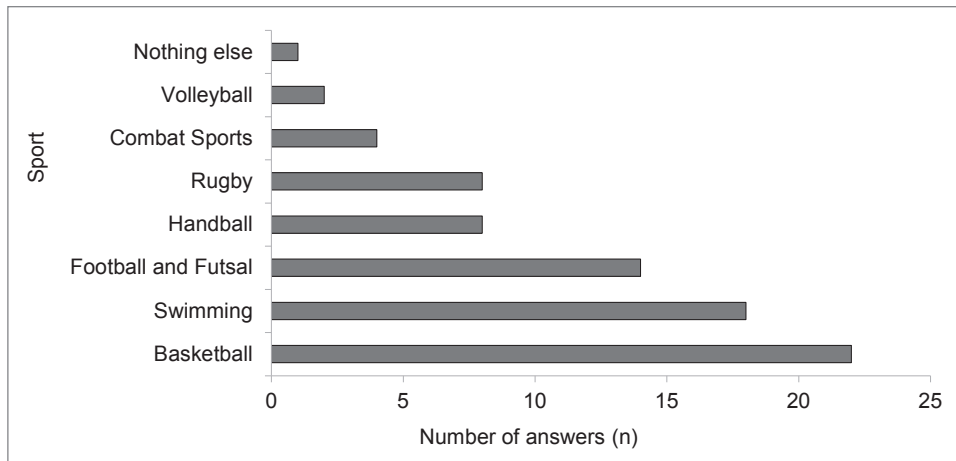


Figure 1. 'In addition to water polo, which of the following sports has influenced your training methodology?'

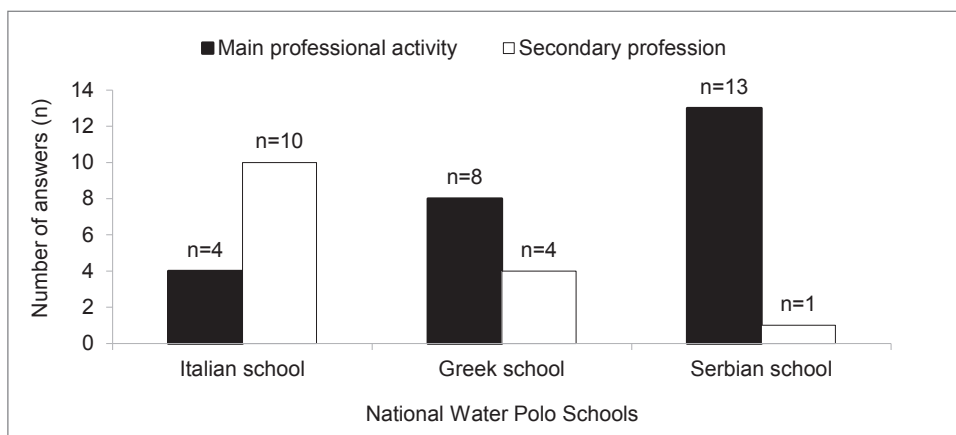


Figure 2. Number of coaches for whom coaching is their main profession.

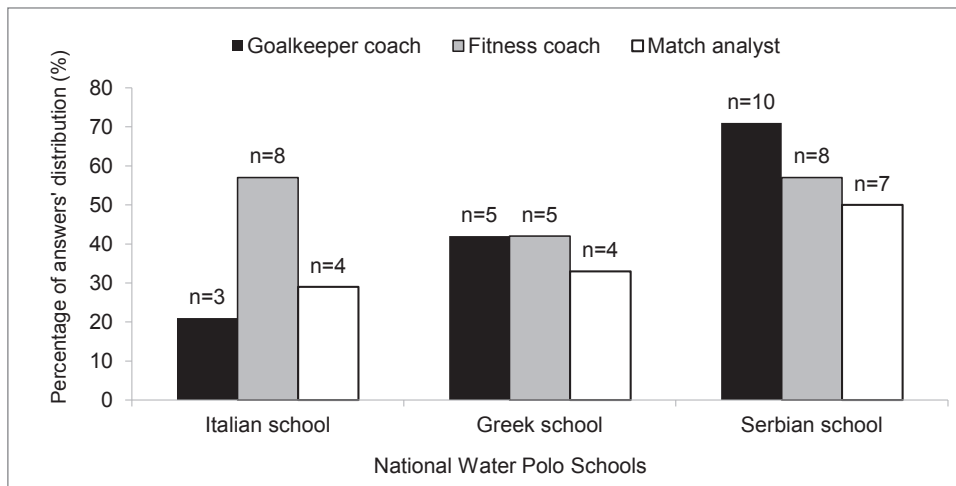


Figure 3. Percentage of professional collaborators for each water polo national school.

Two items investigated the selection of youth players for the first team. The Kruskal-Wallis' test showed no differences between the three national water polo schools, so the results are shown as pooled data. The answers to item 'Who should reach the decision of selecting a player from the youth team to be employed with the first team' showed that 50% of respondents (n=20) indicated that the decision was reached 'as a collaborative choice of

the entire technical staff, 23% (n=9) answered the decision was made by the head coach, 25% (n=10) by 'coaches and clubs', while only one answered 'by the club'. When head coaches were asked what kind of skills related to a tactical phase (defensive or offensive) of the game was preferred when determining to select a youth player for their senior team, most of them answered that they considered more the defensive skills (62.5%) than the offensive (5%)

ones, while 32.5% of respondents answered that their choice was equally influenced by both types of skill. Finally, 30 head coaches indicated an average age of 16 years (16.1 ± 0.9 yr) to be considered as the right age for directing a player from the youth team to train and compete in a senior team.

Section 2. Team roster

The survey's second section inquiries about the roster's composition in terms of the total number of players in it, the number of players in the roster coming from the youth team, employment of foreign players, age (range of years) and the number of professional players in the roster (Table 1). The Kruskal-Wallis' test showed a significant difference between the three national schools only in the number of youth players included in the roster of the senior team.

Section 3. Weekly periodization

The third section investigated the weekly periodization. The pooled data showed an average of 6 ± 2 sessions and 14 ± 4 hours of training per week. No significant differences between the groups were found for the number of two daily training sessions (average of 1 ± 1.5 per week) and for the days of rest (average of 1 ± 0.5 per week). Most of

the head coaches declared to play the official match on Saturday ($n=33$; 82.5%) and to have a day of rest on Sunday ($n=32$; 80%). Figure 4 shows the main activities performed during a typical week (micro-cycle) according to their answers.

All the head coaches ($n=40$) declared to perform at least one session of strength training in the gym. The Kruskal-Wallis' analysis showed a significant difference between the groups regarding the number of sessions conducted in a gym and the number of injury prevention sessions during a typical micro-cycle (Table 2).

Regarding the meeting with players to prepare for an upcoming match, no significant differences among the head coaches of the three national schools were observed. Based on their coaching philosophy, head coaches declared to schedule their pre-match preparation meeting as follows: 40% on the day of the match ($n=16$), 40% on the day before the match ($n=16$), 10% on any previous day ($n=4$), while 7.5% answered that they did not fix the day but decided according to the difficulty of the game ($n=3$). Furthermore, regarding the pre-match meeting preferable duration, seven head coaches considered effective meetings to last up to 10 minutes, 19 head coaches said between 10 and 20 minutes, nine head coaches between 20 and 30

Table 1. Characteristics of teams' rosters

Items	Number of players	National water polo schools		
	(n)	ITA	GRE	SRB
		Number of teams (n)		
Number of players in the roster	< 13	1	0	1
	13-15	6	5	4
	16-18	5	2	5
	>18	2	5	4
Number of players in the youth squads team's roster	<6	2	1	0
	6-10	7	5	4
	11-15	5	6	4
	> 15	0	0	6
Number of professional players employed (players that can live on the club's salary)	Not at all	8	7	8
	1	2	1	5
	2-4	1	4	0
	5-7	1	0	0
	> 7	2	0	1
Players' age distribution	Age (years and range of years)	ITA	GRE	SRB
	< 21	4	4	3
	21-25	8	5	10
	26-30	2	3	1
Presence of foreign players in the roster	> 30	0	0	0
	Yes/No	ITA	GRE	SRB
	Yes	5	3	6
No	9	9	8	

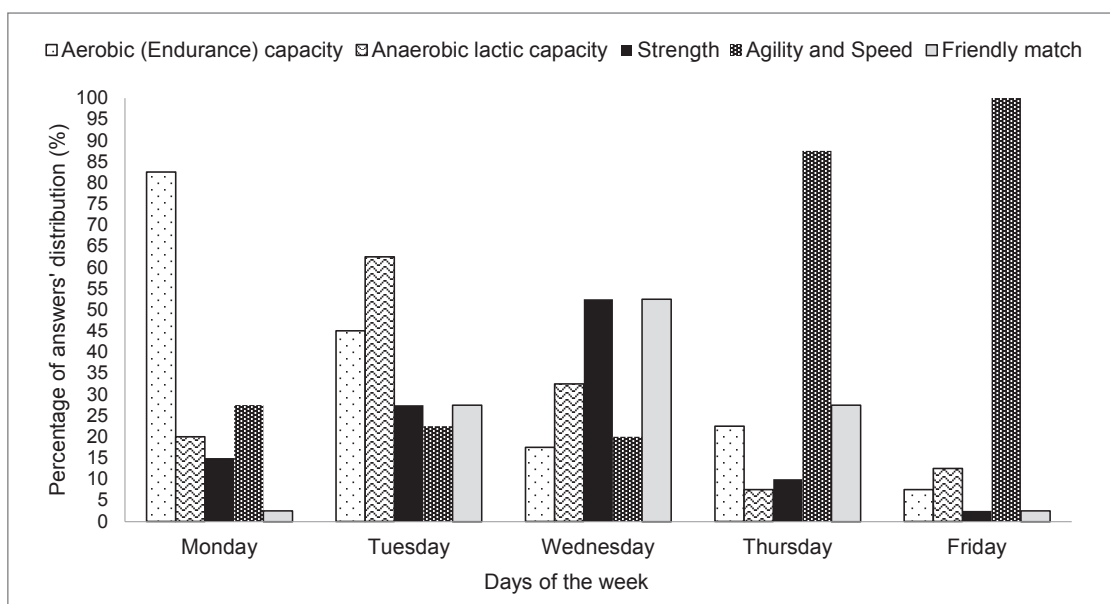


Figure 4. Typical training contents being components of every working day in a week.

Table 2. Planning of strength and injury prevention training sessions during a typical week

Questions	Answers	ITA	GRE	SRB
	Number of sessions	Number of teams (n)		
Strength training sessions	Only body weight load	0	2	2
	1	2	2	0
	2	11	6	2
	3	0	2	10
	Never	1	0	0
Injury prevention sessions before training sessions	1	3	0	0
	2	3	2	0
	3	4	3	0
	4	0	0	0
	5	0	2	1
	Every session	3	5	13

minutes, and only four head coaches believed that the meeting should last more than 30 minutes.

Section 4. Testing and monitoring

The fourth section of the survey focused on the use of physical fitness tests and monitoring of training. The pooled data showed 55% of the head coaches (n=22) used only one tool for monitoring, 27.5% two tools, only one head coach used three monitoring tools, and six head coaches were not monitoring training effects at all. Regarding the specific system of monitoring, a common tool used by 85% of the head coaches was a manual pulse check (n=34), while only three head coaches also used heart rate (HR) monitors. Surprisingly, only four head coaches (10%) pointed out the use of the session-RPE method (and then the use of a modified RPE Borg scale), six head coaches the use of a sort of questionnaire of self-evaluation and only

one head coach used a time motion analysis evaluation. Regarding the use of field tests, 31 head coaches (77.5%) declared to test players during the competitive season; however, only six of them did it regularly each month, whereas the others indicated a range from one to four testing sessions per year.

Turning to match analysis, Figure 5 shows which kind of analysis was carried out in their respective teams.

Section 5. Tactics and strategies

The last survey's section focused on teams' tactics and strategies. In this regard, head coaches indicated carrying out 2±1 tactical training sessions per week. Specifically, 27.5% of the head coaches (n=11) declared to give more importance to the defensive phase, while 72.5% of them (n=29) considered both (defensive and offensive) phases of play equally relevant.

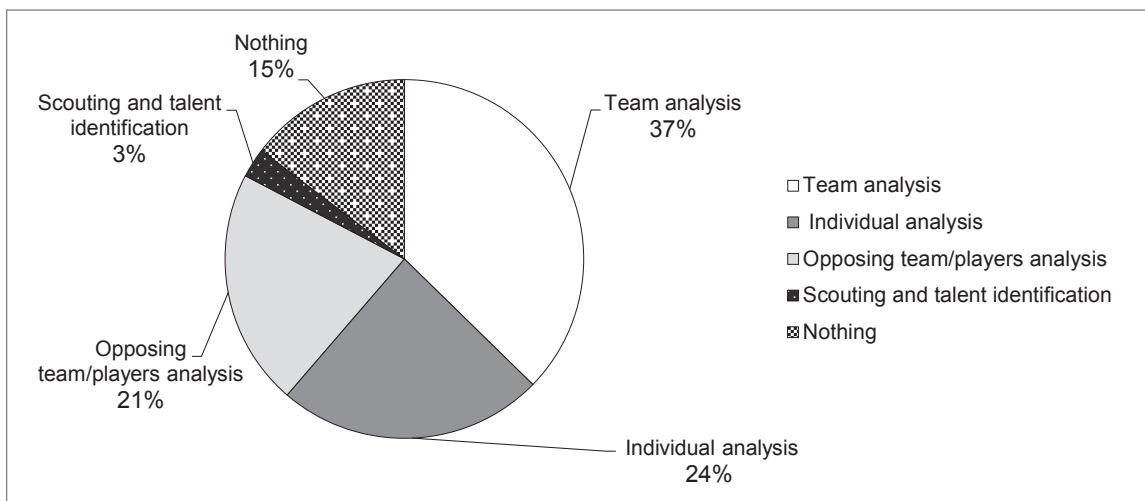


Figure 5. Type of match analysis carried out by the teams.

Table 3. Tactical and strategical schemes

Situation	Number of schemes	ITA	GRE		SRB
			Number of teams (n)		
Even offensive phase	No scheme	1	1	0	
	1-2	1	3	2	
	3-4	7	8	9	
	5-6	3	0	1	
	>6	2	0	2	
Even defensive phase	No scheme	0	0	0	
	1	0	2	0	
	2	6	7	2	
	3	4	3	10	
	4	3	0	1	
Extra-player	No scheme	2	1	0	
	1-2	2	6	2	
	3-4	6	5	9	
	5-6	2	0	2	
	>6	2	0	1	
Player-down	No scheme	1	5	0	
	1	6	4	1	
	2	5	2	6	
	3	2	1	7	
	4	0	0	0	
>4	0	0	0		

In relation to the weekly periodization, Friday (which is the day before the match for most teams) was the day most used by coaches for their tactical sessions. In particular, Table 3 shows the numbers of schemes of play (pre-configured strategies) organized for the three water polo schools in consideration with different game situations: even in offensive phase (6vs6); even in defensive phase (6vs6); extra-player (6vs5), and player-down (5vs6). A significant

difference between the three national schools was found in the schemes for the even defensive situation and extra-player (Table 3).

Discussion and conclusions

Using a 38 close-ended questions survey, this study aimed to survey the head coaches of the three national water polo schools (Serbia, Italy, and Greece) to identify and compare their coaching

philosophies. The survey was based on five sections: 1) Technical staff composition (15 items); 2) Team roster (5 items); 3) Weekly periodization (8 items); 4) Testing and monitoring (4 items), and 5) Tactics and strategies (6 items). The main differences between the three national water polo schools investigated reflect various cultural and environmental aspects of coaching philosophies.

Regarding the section investigating the technical staff, the Kruskal-Wallis' test showed a significant difference between the three schools in terms of the professional and employment status of head coaches. For the majority of Serbian (93%) and Greek (67%) head coaches the profession of water polo head coach was their main job, while in Italy this percentage drops to a threshold below 30%. Another significant difference between the national schools in terms of staff composition is that in Serbia, all the teams' staff investigated employed at least one assistant coach. Based on this result it can be speculated that this country is more prone to value the water polo coach profession.

Regarding the different figures (specializations) of technical collaborators, 52.5% of the pooled sample indicated having a strength and conditioning coach. Such a percentage is still lower compared to the presence of strength and conditioning specialists revealed in surveys from studies covering the period of 25 years in other team sports (Sutherland & Wiley, 1997; Weldon, Duncan, Turner, Lockie, & Loturco, 2021). The full-time employment of strength and conditioning coaches helps head coaches to better understand some physical aspects and plan weekly training strategies, as well as to better interpret data provided using time-motion analysis (Dopsaj & Matković, 1994; Melchiorri, et al., 2021; Platanou, 2004). Furthermore, the percentage (45%) of respondents indicating the presence of goalkeeper coaches in their teams was even lower than the percentage of the strength and conditioning ones. In this case also Serbia showed to be the national water polo school with the highest number of employed goalkeeper coaches. Only 37.5% of total respondents declared to have a match analyst in their teams, which is an emergent professional figure that helps to produce and interpret technical and tactical indices for both their own and opponent teams (Casanova, et al., 2020; Ordóñez, Pérez, & González, 2016; Perazzetti & Tessitore, 2021; Takagi, Nishijima, Enomoto, & Stewart, 2005).

In terms of water polo coaches' education, the latest FINA general survey (FINA, 2019) shows that only 38% of the 209 national federations affiliated with the international federation provide specific water polo educational programmes. All the head coaches surveyed in our study declared to have a water polo specific certification delivered by their national federations (Greece, Serbia

and Italy), whilst 37.5% of the pooled sample also stated that having attended these courses has been fundamental to driving and expanding their coaching skills. Indeed, considering the fundamental role of learning as a lifelong process, it is also very important to promote education initiatives for coach developers, to focus on proper planning of coach developer courses, which are in turn responsible for conceptualizing formal coach education courses (Ciampolini, Tozetto, Milan, Camiré, & Milistetd, 2020), to face new challenges posed by the coach profession that emerge from dealing with new generations of athletes.

Another important aspect of the profession of coaching is to develop its own coaching philosophy, which provides a set of principles to guide its decision-making to overcome practical problems and to favour consistency in coaching (Cassidy, Jones, & Potrac, 2009; Lyle, 2002). A coaching philosophy changes over time as coaches' life experiences impact their practice. To inquire about this aspect, we asked the head coaches in our study how relevant, to build their own coaching philosophy, it had been *'to have other coaches as mentors'* (72.5%), *'to rely on their own experience as a player'* (53%), as well as what was the influence of *'years of continuous practice as a water polo coach'* (45%), in terms of positive influence, respectively. Moreover, we also investigated whether other sports disciplines different from water polo might have influenced our head coaches' training methodologies. Surprisingly, with respect to the well-known habits of water polo coaches that included frequent use of methodologies based on swimming distances (Reed, 2019; Smith, 1998), the head coaches of our survey indicated to be more influenced by methodologies driven by other team sports.

The section of our study that investigated the teams' composition, showed a significant difference between the groups in terms of the number of players in the first team coming from the youth teams of the same club. In particular, six head coaches from Serbian teams indicated having more than 15 players from the youth teams in their current rosters, which is a relevant number. For youth players, the opportunity to debut in the first team of their club could bind the players in a very strong way to the club, the head coach's philosophy, and teammates, tremendously improving their sense of belonging. In turn, the clubs that employ many players from their youth teams might receive advantages in terms of economic sustainability by reducing the budget for expensive players from other clubs or foreign players. In this regard, we also asked our head coaches the following question *'Based on your coaching philosophy, at which age a young talent is ready to play and train with the first team?'*. The answers to this question showed that most head coaches from Serbia and Greece

suggested a specific age as opposed to most Italian head coaches ($n=8$) who argued (in a generic way) on the necessity to wait until the youth player 'is ready'. Such generic decisions could slow down the young athletes' process of growth and lead to a situation in which the club is forced to buy and find other players. Generally, grouping by players' chronological age is a common strategy in sports competitions for organizing and managing young talents of the same categories and January the 1st is often used as the cut-off date for each selection year (Boccia, Rainoldi, & Brustio, 2017). This aspect, also named the relative age effect (RAE), has been investigated in different fields, including academic and sports performance. The results of previous studies conducted in other team sports by Lupo et al. (2019), suggested that relatively older players had more chances to join senior teams, especially at the beginning of their adult careers. However, in water polo, the RAE has not been revealed either in male or in female elite water polo players, probably due to the lower popularity of this sport (Barrenetxea-Garcia, Torres-Unda, Esain, & Gil, 2019).

In terms of training periodization, despite planning proper training contents that combine loads and recovery might enhance athletes' preparedness (Mujika, Halson, Burke, Balagué, & Farrow, 2018), information related to the strategies used to plan training in water polo is still limited compared to other team sports (e.g., soccer, basketball, rugby) (Botonis, Toubekis, & Platanou, 2019a). For this reason, in our study, we investigated the organization of the 'standard' in-season weekly microcycle. All the three national schools indicated to adopt a microcycle periodization characterized by an undulation design of training workloads to reduce loads and prevent the accumulation of fatigue in the days close to the competition (Issurin, 2010). In particular, our head coaches showed training strategies based on endurance activities and aerobic capacity development implemented mainly in training programmes at the beginning of the week; further, anaerobic lactic activities were mainly scheduled on Tuesdays and Wednesdays (away from the match), while alactic activities mainly characterized training programmes scheduled for Thursdays and Fridays, the days close to the competition.

Regarding strength training, all head coaches answered that they plan specific training sessions, most of which are performed using an equipped gym to this scope. In particular, most Serbian head coaches usually planned three training sessions in the gym per week, while most of the Italian and Greek teams planned two sessions. However, it can also be speculated that the number of training sessions scheduled with exercises performed outside the water (as for example some strength training) is also determined by the characteristics

of the training facilities, which are frequently available only for limited hours to the water polo clubs (as it is the main case in Italy).

The limited sports science background in coaches' profiles (for instance, only 10% of our entire sample of head coaches, all from Serbia, had a degree in sport science) could also explain a low use of monitoring of training strategies, including physiological, psychological, and tactical parameters (Clemente, 2016; Sansone, et al., 2020). Indeed, in our study, most of the respondents declared to use only the manual pulse measurement method, while only a few teams provided regular monitoring using tools and methods indicated by the relevant literature (Botonis, Toubekis, & Platanou, 2019b; Lupo, Capranica, & Tessitore, 2014). Furthermore, most of our respondents showed a lack of regular and calendarized use of physical and swimming tests. This aspect is in contrast with previous literature that suggested choosing different protocols to apply water polo specific tests (Chirico, Tessitore, & Demarie, 2021).

To understand how water polo is played at different competitive levels and to investigate the relationship between game demands and players' individual skills, it is useful to use notational analysis (Hughes, 1995), a tool that provides coaches with accurate and comprehensive information on technical and tactical aspects of play demonstrated by own team and the opponents (Lupo, Condello, & Tessitore, 2012; Lupo, Tessitore, Minganti, & Capranica, 2010). However, despite the usefulness of these feedback, the results of our survey showed that 11 out of 40 head coaches were not using match analyses at all.

In the end, in terms of training tactics and strategies, we asked our head coaches which one of game phases, offence or defence (Lupo, et al., 2011) received more attention or did they consider them of same relevance. Most of the respondents answered that both phases were of same relevance to them, only 11 highlighted defence as more important. None of the head coaches answered that they paid more attention to offence. In support of this choice, most of the head coaches declared that they relied more on the players' defensive skills when selecting young players for their debut in the first team.

Talking about team strategic schemes, significant differences were found in the player-up situation and even defensive phase. In this regard, the Greek school seems to be the one with fewer schemes of play than the other two schools, probably due to the creativity that usually characterizes Greek players, as could be seen in play that Greek young categories demonstrated during the last youth international competitions.

Based on the survey's results, our research can offer an objective indication of differences and simi-

larities in training methodologies and competition management derived from the coaching philosophies of the interviewed head coaches as well as from the different water polo national schools. Indeed, how a sport discipline develops in a country can be seen in a complex interaction of social relevance, sports achievements, media coverage, financial resources, and so on, in addition to the country's historical link to that specific sport. In the latter respect, for instance, water polo has expanded in Serbia starting from a single Central School in Belgrade and in the main cities of the former Yugoslavia (Bratuša, 2021); in Greece, it has developed from the main clubs in the Greater Piraeus area,

while in Italy, it could be speculated that the Italian school has been developed in parallel with different and original features between the various Italian regions (mainly Liguria, Lazio, Campania and Sicily). To further improve this line of research, the sample must be expanded involving more head coaches from water polo clubs all over the world and including the head coaches of the U18 and U20 teams. In fact, in our opinion, the same questions posed to a wider audience of head coaches from different countries and from different national water polo schools would expand the scientific data available to researchers and favour the transferability of knowledge to the coaches of this discipline.

Appendix A

Section 1: Technical staff composition

1. Is water polo coaching your main job?
2. Does the team you train have technical collaborators to help the head coach?
3. Does the team you train have a goalkeeper coach?
4. Does the team you train have a fitness coach?
5. Does the team you train have a match analyst?
6. Based on your coaching philosophy: who should reach the decision of selecting a player from the youth team to be employed with the first team?
7. Based on your coaching philosophy: considering a player from the youth team, which one of the following game phases could determine his/her higher employment in the first team?
8. Based on your coaching philosophy: at which age is a young talented player considered "ready" to play and train with the first team?
9. Have you been a water polo player?
10. If your answer is "Yes": which one of the following has been your highest competitive level?
11. How many years have you been coaching in water polo?
12. Which is your highest educational level?
13. Which one of the following aspects has mostly influenced your coaching philosophy?
14. In addition to water polo, which one of the following sports has influenced your coaching philosophy in regard to training methodologies?
15. Based on your personal experience: indicate the most used way for continuing learning.

Section 2: Team roster

1. Indicate how many players are in the roster of your first team.
2. Indicate how many players of the roster of your first team were in the youth teams of your club the year before.
3. Indicate the range of players' age of your first team.
4. How many foreign players has the roster of your first team?
5. For how many players in the roster of your first team is water polo the main job?

Section 3: Weekly periodization

1. Indicate the weekly hours of training of your first team (including also the workouts performed in the gym).
2. Indicate how many times per week your team has two training sessions a day.
3. Indicate how many times per week your team has a full day rest (without training).

4. Considering the typical training week of your team: indicate how many resistance training sessions per week are performed in the gym.
5. Considering the typical week of your team: indicate how many times per week injury prevention or pre-activation activities are performed.
6. Considering the typical week of your team: indicate which is the main workload of each daily training session.
7. Based on your coaching philosophy: indicate on which day of the week the pre-match meeting with players is scheduled.
8. Based on your coaching philosophy: indicate how long should the pre-match meeting last.

Section 4: Testing and monitoring

1. Which ones of the following methods are used to monitor training loads?
2. Does your team use tests to assess players' fitness?
3. Considering the entire water polo season: indicate the period in which tests are usually executed.
4. Indicate what kind of match analysis is carried out in your team.

Section 5: Tactics and strategies

1. Which phase of play (defensive or offensive) receives more attention in your training periodization?
2. Based on your coaching philosophy: indicate how many strategies and tactics (pre-configured) has your team to attack in a player-up situation.
3. Based on your coaching philosophy: indicate how many strategies and tactics (pre-configured) has your team to attack in a common situation with equal number of players.
4. Based on your coaching philosophy: indicate how many types of defence (pre-configured) has your team to defend in a player-down situation.
5. Based on your coaching philosophy: indicate how many types of defence (pre-configured) has your team to defend in a common situation with equal number of players.
6. Considering the typical week of your team: indicate on which days the focus of a training session is mainly on game strategies and tactics.

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