

Original Article

Conditioning services in elite Spanish water polo clubs

JOAQUÍN REVERTER-MASÍA¹, M. CARMEN JOVE-DELTELL², ALEJANDRO LEGAZ-ARRESE³,
DIEGO MUNGUÍA-IZQUIERDO⁴

^{1,2}Sports and Physical Education Section. University of Lleida, Lleida, SPAIN.

³Sports and Physical Education Section. University of Zaragoza, Zaragoza, SPAIN.

⁴Sports and Physical Education Section. University Pablo de Olavide, Sevilla, SPAIN.

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Abstract

The aim of this research was to determine the conditioning services available to male and female Spanish top division league water polo teams. Our research was based on information obtained from a survey conducted on fitness coaches with a survey response rate of 91.6% (22 of 24 agreed to participate in our research). The survey groups were divided into two categories: group “A” and group “B”, the former being that showing the best performance. This superiority may derive from the fact that a high percentage of group A water polo teams had a physical conditioning coach (PCC) with optimal academic and federate training. However, only a low percentage of PCCs had higher academic education or consulted scientific journals. Also, only 9% of them did not report on any work-related deficiencies but rather included deficiencies related to strength training material, fitness evaluation experts and training facilities. Group B teams reported significant deficiencies in almost all the variables within the training environment which, in turn, indicated the existence of significant deficiencies in conditioning practices that coaches offered their players. The study concluded that the fitness levels of teams could be substantially improved by means of better PCCs’ academic profiles, training promotion and training environment.

Key words: coaches, formal education programme, training, team sports.

Introduction

Traditionally, efforts to improve team sports performance often focus on technique and tactics at the expense of physical fitness (Stolen et al., 2005). However, physical conditioning can be effective for the improvement of speed in specific team sports skills (Gorostiaga et al., 1999; Newton et al., 1999; Gonzalez-Badillo et al., 2011). In addition, optimal physical preparation is necessary to delay fatigue during multiple sprint work (Glaser, 2005; Spencer et al., 2005), prevent injuries (Wedderkopp et al., 1999; Caraffa et al., 1996), and maintain optimal levels of physical capacity during season (Bangsbo et al., 2006; Cardoso and Gonzalez-Badillo, 2006).

Current recognition of the importance of physical conditioning practices indicates that many teams have become aware of the need to hire the services of competent physical conditioning coaches (henceforth, PCCs) in an attempt to improve their training environment and contribute to the optimal development of the physical condition (Reverter-Masia et al., 2009). In view of this, we hypothesized that one of the essential requirements that any PCC should meet was to be a degree holder in Sports Studies and Physical Education. In fact, specific sports training and playing experience probably required developing more specialised types of training. Like in all fields of knowledge, continuous scientific training through specialised courses, master’s programmes and research in specialised journals are essential if the physical conditioning programmes are to be based on the practical application of scientific knowledge (Reverter-Masia et al., 2008).

In addition to the above, the importance of the training environment should not be underestimated, as it comprises several factors that were especially relevant in our research: (i) time needed to develop physical conditioning (availability of players and PCCs); (ii) access to essential and necessary training facilities, material and equipment (e.g. training facilities, strength and fitness evaluation equipment, recovery measures, etc.); (iii) travelling in optimal conditions; (iv) access to a multidisciplinary team of sports studies professionals which, besides fostering the players’ maximum performance, enables a PCC to concentrate solely on his/her job; as a consequence of the above, (v) the PCC may feel appreciation for his/her work (Reverter-Masia et al., 2008).

Despite existing research on some aspects of conditioning practices and PCC profiles in National Baseball Leagues (Ebben et al., 2005; Sutherland and Wiley, 1997), American football (Ebben and Blackard, 2001; Sutherland and Wiley, 1997), basketball (Simenz et al., 2005; Sutherland and Wiley, 1997), ice hockey (Ebben et al., 2004; Sutherland and Wiley, 1997), handball, volleyball, indoor soccer, soccer and field hockey (Reverter-Masia et al., 2009), no studies focused on water polo teams. The purpose of this research was to

determine the differences in physical conditioning coaches' profiles and training environments in male and female high-ranking Spanish water polo clubs.

Methods

Participants

The survey was conducted among those responsible for physical conditioning programmes of male and female teams who had participated in the National (Spanish) top division water polo league during the 2009/10 season. Twenty-two coaches out of the 24 approached agreed to collaborate in the study (Table I).

Table I. Conditioning coaches' response rate.

Table I		
Conditioning coaches' response rate		
League	Male water polo teams Honour Division	Female water polo teams Honour Division
Number of teams n = 24	12	12
Number of teams surveyed n = 22	10	12
Overall survey response rate 91.6%	91.6%	100.0%

For this study, the teams were divided into "Group A" (henceforth, group A team), which included the highest performing teams of their respective leagues (> 50% percentile of the ranking), and "Group B" (henceforth, group B team), which included the remaining teams.

Survey

The survey was adapted for this application based on the Reverter-Masia et al. (2008) survey and focused on two lines of inquiry: (a) PCC profiles: academic level, assessed through their habit of reading specialised journals and their specific sports experience; (b) training environment: affiliation to a multidisciplinary team of Sports Studies professionals, duties performed by the PCC, his/her level of attendance to training sessions and competitions, work environment deficiencies, evaluation of the level of recognition that the PCC received for his/her job. Both the survey instrument and the research design had been approved by the Committee on Biomedical Ethics of the Regional government of Aragon (Spain).

Reliability

The survey's reliability rate was measured on the consistency between the original test results and those of a retest conducted a week later on 8 of the PCCs from the original test.

Statistical analysis

We analysed statistically the data gathered using the Statistical Package for Social Sciences (version 14.0), and converted the results into percentages. To determine the differences between male, female and team groups (A or B), we used the Chi-square or Fisher and the Mann-Whitney U tests in an attempt to obtain both the qualitative and quantitative ordinal variables for each test. Additionally, we used the Spearman test to check the reliability of quantitative ordinal variables and the McNemar test for qualitative variables. The α level was set at 0.05.

Results

Reliability

In the reliability analysis, the correlation coefficients between test and retest were 1, and the P-value was between 0.50 and 1.

Profile of physical conditioning coaches

Differences between male and female teams

Level of formal education

Most PCCs of male water polo teams held a degree in Physical Activity and Sports Studies (80%); by contrast, only 50% of PCCs of female water polo teams held this merit ($p < 0.001$). It should be noted though that, while a large number of coaches of female teams held a certificate issued by the National (Spanish) Federation (75% vs. 25%); fewer coaches of male teams held this certificate (70% vs. 30%). As regards the question about the time elapsed since graduation (10.2 ± 6.4 years), there was no difference between coaches of

female and male teams. Additionally, 20% of PCCs held master's degrees and 1% of them held doctoral degrees in fields related to human performance.

Information sources

While a high percentage of PCCs had attended, at least, one course of more than 20 hours (90.9%), were acquainted with the physical preparation work developed by at least one team of their league (81.8%) and consulted specific journals (72.7%), only 9% of them were usual readers of journals listed on the Science Citation Index. No gender differences were found in these variables.

Specific sports experience

Although a high percentage of PCCs of male water polo teams had coaching (60% vs. 40%) and playing (90% vs. 30%) experience in National Leagues ($p < 0.001$), the number was higher among PCCs of female water polo teams, where most of them (83.3% vs. 16.7%) had both coached and played (91.6% vs. 8.4%) in National Leagues ($p < 0.001$). In spite of this, no differences were found between male and female National League PCC experience (5.3 ± 4.1 years).

Differences according to team performance level (class "A" or "B" team)

The percentage of female water polo PCCs holding a degree in Physical Activity and Sports Studies was higher in group A than in group B teams (50% vs. 16.2%, $p < 0.05$). On the other hand, no differences between group A and group B teams were found for any of the variables related to information sources and specific sports experience. The percentage of male water polo degree-holding PCCs was also higher in group A than in group B teams (60% vs. 20%).

Training environment

Differences between male and female teams

Multidisciplinary teams of Sports Studies professionals

All the teams under survey had a coach. In fact, a high number of teams (>80%) also included a physical therapist, a physician, a PCC and a coaching assistant. Masseurs and kit men, however, were not usually part of the technical staff ($p < 0.001$). Similarly, the teams rarely counted on the support of a sports psychologist ($p < 0.01$). At this point, it is interesting to note that most teams with a coach, a coaching assistant and a PCC engaged the services of these professionals on a full time basis. Most teams, though, did not require a full-time physician (Table 2).

Table II. Percentage of teams with professional services hired on a full time basis

Table II		
Percentage of teams with professional services hired on a full time basis		
	Male water polo teams N = 10	Female water polo teams N = 12
Coach	100	100
Physiotherapists	20.0	16.6
Physical Conditioning Coaches	70.0	58.3
Assistant Coaches	60.0	58.3
Physicians	10.0	00.0
Kit Men	0.0	0.0
Masseurs	0.0	0.0
Psychologists	0.0	0.0
Other Professionals	30.0	66.3

Data expressed in percentages

Duties performed by the PCC

Most PCCs (90.9%) either performed the duties of a second coach or coached specific positions (e.g. goal-keeper). They reported that they often performed duties other than those specified in their job description,

with 72.7% of them stating that they were expected to take on other roles (e.g. team delegate, nutritionist and/or interpreter).

Conditioning coaches' degree of attendance to training sessions and competitions

The average number of PCCs who attended every training session in group A teams was high (81.8%) when compared with the 54.5% attendance rate reported by PCCs in group B teams ($p < 0.05$). We obtained similar results when comparing their PCC attendance rate to all the games in the sports competitions (81.8% vs. 63.6%, $p < 0.05$).

Work environment deficiencies

Table 3 shows the percentage of PCCs who believed that improvements on the various aspects analysed might result in increased player physical fitness. The main deficiencies were associated with improving strength training material (57.5%), fitness evaluation experts (67.5%) and training facilities (59.1%), all of which could be improved. However, no differences were found in basic equipment and recovery measures. A significantly higher percentage of PCCs in group B teams reported on deficiencies in fitness evaluation equipment, basic training material ($p < 0.001$) and trips ($p < 0.05$). In general, the main deficiencies were related to the time devoted to physical conditioning, player availability and team-coach relationships.

Table III. Work environment deficiencies

Table III			
<i>Work environment deficiencies</i>			
	Male water polo teams N = 10	Female water polo teams N = 12	Mean n = 22
Strength Material	40.0	75.0	57.5
Training Facilities	60.0	83.3	71.6
Fitness Evaluation Equipment	20.0	25.0	22.5
Time Devoted to Physical Conditioning	20.0	50.0	35.0
Physical Fitness Assistants	20.0	33.3	26.6
Trips	40.0	50.0	45.0
Players' Availability	20.0	41.6	30.8
Fitness Evaluation Experts	60.0	75.0	67.5
Basic Equipment	30.0	33.3	31.6
Relationship with the Coaching Body	20.0	25.0	22.5
Recovery Measures	10.0	25.0	22.5
Other Aspects	40.0	41.6	40.8

Data is expressed in percentages

Only 1 PCC did not report any work environment deficiency. The average number of deficiencies was higher for group B (4.5 ± 1.4) than for group A teams (2.4 ± 1.9) ($p < 0.05$).

Do PCCs feel recognized for their professional work?

Most PCCs felt highly valued by both players (90.9%) and coaches (81.8%). However, with regard to recognition from the club's management staff and the press, only 22.7% of them felt properly recognized; 18.1% of those surveyed considered themselves as being well-paid for their work, and only 9% said they felt appreciated in all the variables under analysis.

Differences according to performance level

The overall analysis of the teams indicated significant differences between group A and group B teams as regards the multidisciplinary sports professional staff, probably due to the fact that the former had access to other professionals who had not been analysed (45.4% vs. 18.1%, $P < 0.05$). For example, while

remarkable differences were found between those physicians from group A teams and those from group B teams (72.7% vs. 27.2%, $P < 0.05$), no differences were found on the performance level of the team's physical fitness instructors for either group. Nevertheless, it is worth noting that a lower percentage of group A PCCs combined their duties with those of team first coach (18.1% vs. 63.6%). We also found significant differences as regards the PCCs' attendance rate to training sessions and competition games (81.8% vs. 59.0%); in other words, a higher percentage of group A PCCs attended training sessions and competition games.

In response to the question about work environment deficiencies, significant differences were observed between group A and group B teams regarding availability (9.1% vs. 54.5%, $p < 0.01$) and time devoted to physical fitness training (18.1% vs. 54.5%, $p < 0.05$). Most differences between male and female water polo teams were related to deficiencies in strength training material (40% vs. 75%, $p < 0.05$), evaluation equipment (30.0 vs. 58.3%, ns) and training facilities (60.0% vs. 83.3%, ns). The average number of complaints was noticeably higher in group B teams than in group A teams (3.5 ± 1.4 vs. 2.4 ± 1.9 , $p < 0.05$).

With regard to whether PCCs felt appreciated for their work, we only found significant differences between their salaries (63.6% vs. 27.2%, $P < 0.01$). The percentage of PCCs who reported satisfaction on all the variables analysed was significantly higher for group A teams (81.1% vs. 36.3%, $p < 0.05$).

Discussion

The research represents the only published survey to date on water polo conditioning services within Europe. Its main objective was to detect and outline water polo PCC profiles. The study has established three clearly differentiated profiles: (i) PCCs of male teams holding both a degree in Physical Activity and Sports Studies and an official certificate issued by the National (Spanish) Federation; (ii) Most PCCs of female group A teams holding both a degree in Physical Activity and Sports Studies and the certificate by the National Federation; and (iii) Most PCCs of female group B teams holding only the certificate by the National Federation. In theory, the different PCC profiles would suggest that the teams' physical conditioning programmes do not share a common training programme. On the one hand, it leads to the assumption that most female group B teams cannot possibly have adequate physical conditioning programmes due to deficiencies in their PCC's basic academic formation. On the other, it implies that the PCC's lack of specific sports experience and training both entails, in some cases, greater difficulty in developing an integrated physical fitness programme and creates a division between physical conditioning and technical-tactical activities. Consequently, from this point of view, a high percentage of male group A PCCs can easily develop an integrated physical fitness programme. These differences are, therefore, the only determining factor to be taken into account when hiring a PCC.

It is also worth noting that an extremely low percentage of PCCs pursued further academic training or frequently read specialised journals, including those on the Science Citation Index, in the years following graduation. The percentage of PCCs holding a master's degree is lower in Spain than in American and Canadian professional leagues for baseball, basketball, American football and ice hockey during the 1994-1995 season (Sutherland and Wiley, 1997), and also lower for American university PCCs (Durrell et al., 2003). These differences may be due to Spain's slower progress in the field of scientific knowledge (Reverter-Masià et al., 2008), greater difficulty to access journals and language-related difficulties. Based on these findings and those of Durrell et al. (2003), we conclude that there is a strong possibility that many Spanish physical conditioning programmes might be based on sources lacking scientific credibility.

The second objective of this work was to determine the training environment in which physical conditioning programs were performed. Deficiencies found in many teams as regards multi-disciplinary work, as well as shortage in degree-holding PCCs, assistant coaches and physicians, explain why a high percentage of those responsible for the implementation of physical fitness programs end up carrying out tasks that are not specifically related to physical fitness.

Especially relevant was the fact that a high number of PCCs of female group B teams failed to attend training sessions and competition games. Likewise, a large percentage of PCCs complained about player availability. This lack of constant involvement between PCCs and players during training sessions hampered proper monitoring of the training load and, therefore, impeded optimal physical fitness development. A similar conclusion was reached on the high number of PCCs of male water polo teams who reported that insufficient time was spent on the team's physical fitness programmes.

Out of those surveyed, only 9% of PCCs said that their team had the right environment for developing the players' physical fitness, but even they reported on deficiencies in strength training equipment. These results were probably influenced by the increasing importance currently given to strength development as part of team sports performance (Legaz-Arrese et al., 2007; Reverter-Masià et al., 2009). On the other hand, the percentage

of PCCs who reported no deficiencies on fitness evaluation equipment and recovery measures was surprisingly low. It is difficult for a team that does not have the ideal conditions for basic strength work to have adequate fitness evaluation equipment and recovery measures, due to budget limitations for acquiring this equipment. A likely explanation for these results lies on the PCCs' ignorance of the importance of fitness evaluation equipment and recovery measures in improving the players' physical fitness and/or deficiencies in operating such equipment. Consequently, player evaluation and recovery processes are bound to be deficient. Additionally, there is a close match between these results and those related to the PCCs' insufficient continuous scientific formation.

Deficiencies in basic strength training machines and training facilities have been identified as a problem by all teams. Although budget limitations might justify these deficiencies in some cases, it is likely that in others, club management and/or coach ignorance are to blame. Additionally, a large number of PCCs felt the management undervalued their work, and felt highly recognized by their coaches and players, which may indirectly account for the team's appreciation of the PCC's role in improving the team's performance. Certainly, apart from feeling generally undervalued by the management, PCCs were dissatisfied with their financial rewards. This could suggest, on the one hand, that the management did not attach enough importance to the physical fitness programme; on the other, this indicated that there was a high level of awareness in each PCC about his/her work environment, depending on the type of club they worked for. Besides, only 13.6% of those responsible for physical fitness programmes felt their performance was valued in all the analysed variables.

One of the most outstanding aspects for the variables analysed in this study was that the physical fitness environment was significantly better in group A teams. Significant differences were found in variables especially relevant to physical fitness development such as PCC availability and attendance to training sessions and competition games, player availability, time spent on the physical fitness programme, strength training equipment and PCC work recognition. The differences between group A and group B teams, in all probability, were caused by their level of professionalization and overall budget.

Conclusions

This study establishes a comparison between conditioning services of male and female National (Spanish) top division league water polo teams. Our findings indicate serious deficiencies in PCC profiles and their training environment. We therefore suggest that improvements in PCCs profiles (e.g. encouraging continuous formation) and training practices are likely to increase the teams' levels of physical fitness.

It is hoped that this research may provide feedback for both the scientific community at large as well as coaches, PCCs and sports management on different aspects of conditioning services, namely (i) knowledge of physical conditioning services in most sports specialities for teams which have proved successful in European competitions; (ii) the need for team management to rethink the PCCs' hiring criteria and promote their scientific formation; (iii) the need for improvement strategies in transmitting team coaches and management the importance of physical conditioning in team sports performance, in an attempt to provide better physical conditioning facilities and better salaries to PCCs; (iv) the analysis conducted in this study may be used as a model for further research on conditioning services in other countries and additional changes of the teams analyzed in this study.

Conflicts of Interest: Nothing to declare.

References

- Bangsbo, J., Mohr, M. & Krstrup, P. (2006). Physical and metabolic demands of training and match-play in the elite soccer players. *J Sports Sci*, 24, 665-674.
- Caraffa, A., Cerrulli, G., Projetti, M., Aisa, G. & Rizzo, A. (1996). Prevention of anterior cruciate ligament injuries in soccer. A prospective controlled study of proprioceptive training. *Knee Surg Sports Traumatol Arthrosc*, 4, 19-21.
- Cardoso-Marques, M.A. & González-Badillo, J.J. (2006). In-season resistance trained and detrained in professional team handball players. *J Strength Cond Res*, 20, 563-571.
- Durrell, D.L., Pujol, T.J. & Barnes, J.T. (2003). A survey of the scientific data and training methods utilized by collegiate strength and conditioning coaches. *J Strength Cond Res*, 17, 368-373.
- Ebben, W.P., Hintz, M.J. & Simenz, C.J. (2005). Strength and conditioning practices of Major League Baseball strength and conditioning coaches. *J Strength Cond Res*, 19, 538-546.
- Ebben, W.P., Carroll, R.M. & Simenz, C.J. (2004). Strength and conditioning practices of National Hockey League strength and conditioning coaches. *J Strength Cond Res*, 18, 889-897.
- Ebben, W. P. & Blackard, D.O. (2001). Strength and conditioning practices of National Soccer League strength and conditioning coaches. *J Strength Cond Res*, 1, 48-58.

- Glaister, M. (2005). Multiple sprint work: physiological responses, mechanisms of fatigue and the influence of aerobic fitness. *Sports Med*, 35, 757-777.
- González-Badillo, J.J., Marques, M.C. & Sanchez-Medina, L. (2011). The importance of movement velocity as a measure to control resistance training intensity. *J Hum Kinet Special Issue*, 15-19.
- Gorostiaga, E.M., Izquierdo, M., Iturralde, P., Ruesta, M. & Ibáñez, J. (1999). Effects of heavy resistance training on maximal and explosive force production, endurance and serum hormones in adolescent handball players. *Eur J Appl Physiol Occup Physiol*, 80, 485-493.
- Legaz-Arrese, A., Reverter-Masià, J., Munguía, D. & Ceballos-Gurrola, O. (2007). An analysis of resistance training based on the maintenance of mechanical power. *J. Sports Med Phys Fit*, 4, 427-436.
- Reverter-Masià, J., Legaz-Arrese, A., Munguía, D. & Barbany, J.R. (2008). The conditioning services in elite Spanish clubs of team sports. *Int J Sports Sci Coach.*, 3, 431-443.
- Reverter-Masià, J., Legaz-Arrese, A., Munguía, D., Barbany, J.R. & Serrano-Ostáriz, E. (2009). A profile of the resistance training practices of elite spanish club teams. *J Strength Cond Res*, 23, 1537-1547.
- Simenz, C.J., Dugan, C.A. & Ebben, W.P. (2005). Strength and conditioning practices of National Basketball Association strength and conditioning coaches. *J Strength Cond Res*, 19, 495-504.
- Stolen, T., Chamari, K., Castagna, C. & Wisloff, U. (2005). Physiology of soccer: an update. *Sports Med*, 35, 501-536.
- Sutherland, T.M. & Wiley, J.P. (1997). Survey of strength and conditioning services for professional athletes in four sports. *J Strength Cond Res*, 11, 266-268.
- Wedderkopp, N., Kalføft, M., Lugaard, B., Rosendahl, M. & Froberg, K. (1999). Prevention of injuries in young female players in European team handball. A prospective intervention study. *Scand J Med Sci Sports*, 9, 41-47.