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Original

Re-warm-up practices in elite and sub-elite Spanish men's and women's basketball team: practitioners' perspectives

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ABSTRACT

Objective: Research suggests that an active re-warm-up (RW-U) during half-time improves performance capacity in team sports, despite limited evidence in basketball. This study aimed to identify the practice of RW-U activities during the half-time period in elite and sub-elite Spanish men's and women's basketball teams.
Methods: We asked strength and conditioning coaches from all teams competing at ACB, LF, LF2, LEB Oro, LEB Plata and EBA leagues during the 2020/21 season to fill in a web survey.
Results: All respondents reported familiarization with the RW-U concept, although 45% only reproduced traditional strategies. Half of the coaches indicated that they always performed some activity, while the other half pointed out lack of time (45.7%) and player demands (62.9%) as the main constraints impeding its regular use.
Conclusion: Spanish basketball teams continue to reproduce traditional practices of active re-warm-up during half-time, regardless of their competitive level.
Keywords: Coaches; Half-time; Performance; Survey; Team sport.

Prácticas de re-calentamiento en equipos de baloncesto masculino y femenino de élite y sub-élite españoles: perspectivas de los profesionales

RESUMEN

Objetivo: La investigación sugiere que un recalentamiento activo (RW-U) durante el descanso mejora la capacidad de rendimiento en los deportes de equipo, a pesar de que la evidencia en el baloncesto es limitada. Este estudio tiene como objetivo identificar la práctica de actividades de RW-U durante el periodo de descanso en equipos de baloncesto españoles de élite y sub-élite.
Métodos: Se pidió a los preparadores físicos de todos los equipos que compiten en las ligas ACB, LF, LF2, LEB Oro, LEB Plata y EBA durante la temporada 2020/21 que rellenaran una encuesta web.
Resultados: Todos los encuestados declararon estar familiarizados con el concepto RW-U, aunque el 45% sólo reprodujo las estrategias tradicionales. La mitad de los entrenadores indicó que siempre realizaba alguna actividad, mientras que la otra mitad señaló la falta de tiempo (45,7%) y la exigencia de los jugadores (62,9%) como las principales razones que limitan su uso regular.
Conclusión: Los equipos de baloncesto español siguen reproduciendo prácticas tradicionales de re-calentamiento activo durante el medio tiempo, independientemente de su nivel competitivo.
Palabras clave: Entrenadores; Medio tiempo; Rendimiento; Encuesta; Deportes de equipo.

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Práticas de reaquecimento nas equipas de elite e subelite espanholas de basquetebol masculino e feminino: perspectivas dos praticantes

RESUMO

Objectivos: A investigação sugere que um reaquecimento activo (RW-U) durante o intervalo melhora a capacidade de desempenho nos desportos de equipa, apesar das provas limitadas no basquetebol. Este estudo visava identificar a prática de actividades de RW-U durante o intervalo nas equipas de elite e subelite espanholas de basquetebol masculino e feminino.
Métodos: Pedimos força e condicionamento aos treinadores de toda as equipas que competiram nas ligas ACB, LF, LF2, LEB Oro, LEB Plata e EBA durante a época de 2020/21 para preencher um inquérito na web.
Resultados: Todos os inquiridos relataram familiarização com o conceito de RW-U, embora 45% reproduzissem apenas estratégias tradicionais. Metade dos treinadores indicaram que sempre realizaram alguma actividade, enquanto a outra metade apontou a falta de tempo (45,7%) e as exigências dos jogadores (62,9%) como os principais constrangimentos que impedem a sua utilização regular.
Conclusão: As equipas espanholas de basquetebol continuam a reproduzir práticas tradicionais de reaquecimento activo durante o intervalo, independentemente do seu nível competitivo.
Palavras-chave: Treinadores; Intervalo; Desempenho; Inquérito; Esportes de equipa.

Introduction

Basketball is a court-based team sport with a broad array of physical, physiological, mechanical, technical, and tactical demands.[1] Namely, the intermittent high-intensity nature of most actions and basketball-specific movements (e.g. accelerating, decelerating, changing direction, jumping, shuffling, cutting, etc.) stress the aerobic and anaerobic energy systems.[2] Ultimately, this can lead to a considerable fatigue level,[3] where the ability to resist the development of fatigue could positively influence critical aspects of basketball performance.[4]

Basketball matches, by regulation, have a 10-minute break between halves that might not allow for a complete recovery from fatigue. Moreover, the passive activities that generally occur during these breaks could be detrimental to second-half performance.[5] Indeed, research has shown that passive half-time practices are not an optimal strategy for both professional[6] and amateur [7] players. For instance, there appears to be a relatively rapid decline in jumping and sprinting performance when elite male and female basketball players remain inactive after warm-up.[8]

In order to avoid a decline in the ability to perform high-intensity activities, in other intermittent team sports such as association football, it seems advisable to perform brief exercise bouts (e.g. running, cycling, or leg press) during the half-time break, usually known as re-warm-up (RW-U) activities.[9] However, despite scientific evidence indicating the positive impact RW-U activities had on the players' subsequent physical and technical performance,[10] most coaches continue to design their half-time strategies based on experience.[11]

In basketball, few investigations have sought to analyse the effects of RW-U practices on the players' physical performance.[12] Indeed, it seems that no research has informed about the prevalence of this practice during basketball half-time period. In addition, no study has sought to describe how basketball practitioners are applying RW-U activities. The lack of information poses a challenge when identifying whether RW-U strategies are usually implemented in basketball and determining which activities should be conducted during half-times. Making available such details would allow coaches and practitioners to make better-informed decisions about RW-U and develop half-time strategies that help basketball players meet the physical demands to compete at the highest level.

In light of the above, this study has a double-fold objective. Firstly, it aims to determine the prevalence, and main characteristics of RW-U practices typically carried out by the strength and conditioning (S&C) coaches of elite and sub-elite Spanish basketball teams. A secondary aim is to identify the reasoning and situational factors that underpin this practice in the prominent Spanish basketball leagues.

Methods

Design

A cross-sectional study was developed following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[13]

Participants

Strength and conditioning coaches of men's and women's basketball teams from the Spanish elite (ACB and Liga Femenina) and sub-elite (LEB Oro, LEB Plata, Liga Femenina 2, and EBA) leagues participated in this study. The first author of the current work identified the teams' contact information through the website of the Spanish Basketball Federation. A letter of invitation and guidelines for the online survey were distributed electronically and via mail to each team. Invitations to the survey were circulated in March of the 2020/21 basketball season, as we assumed that the coaching staff already had the half-time protocols. Two hundred fifty-two S&C coaches of teams competing in the ACB (men's top professional league, n = 19), LEB Oro (men's second professional league, n = 19), LEB Plata (men's third professional league, n = 28), EBA (men's fourth professional league n = 128), Liga Femenina (women's top professional league, n = 16) and Liga Femenina 2 (women's second professional league n = 42) were contacted, meaning that the total population was targeted. Namely, the person responsible for the player's conditioning level in the first team squad of the selected teams was asked to complete the survey. All participants were informed of the study requirements and provided written informed consent. The Local Ethics Committee of the Faculty of Education and Sports Science (University of Vigo) approved the study protocol with code 06-0721.

Procedure

Four authors of this manuscript (three doctors and one PhD student in Physical Activity and Sports Sciences), with expertise in basketball S&C research and practice, designed an ad-hoc survey to collect data on RW-U practices. The first author of this investigation initiated the survey development process by determining the key areas of the questionnaire. A second author supervised this process. These two researchers developed an initial questionnaire including 14 items after some debate on how

best to gather information through a survey. They deemed RW-U as the warm-up strategies carried out during half-time to mitigate physical performance decline and reduce injury risk. Subsequently, another two authors revised this preliminary version of the survey and then argued that the questionnaire should be shorter, brief, and concise. A substantive discussion took place, resulting in a survey comprising nine items considered the final version by these four authors. The survey was pre-tested with five Spanish S&C coaches from professional leagues in other countries to ensure face validity, using the Google Forms web survey platform. As a result of the pilot testing, the survey was slightly modified to clarify and improve the wording of a small number of questions. Additionally, some questions were shortened to create a survey that could be easily read and answered through a smartphone.

Survey

The refined version of the questionnaire consisted of nine dichotomous, categorical, or multiple-choice questions. The S&C coaches could choose the time (about 4 minutes or less) and mode (e.g. via computer or mobile phone) to fulfil it, and the web link remained open to the participants for one month. All data were collected anonymously without identifiers to ensure privacy.

The initial section of the questionnaire involved items regarding S&C coaches' age, how long they had been coaching, and the team's competitive level. After that, the survey evaluated the current status of the RW-U practice from the participant's perspective. It focused on four themes: 1) Knowledge about the concept of RW-U, 2) Strategies to improve the performance during the second half, 3) Motivations for performing RW-U; and 4) Time allocated to RW-U.

Data analysis

The analysis and presentation of data are predominantly descriptive due to the characteristics of this study. All statistical analyses were performed using SPSS 15.0. (SPSS Inc., Chicago, IL, USA). Summary statistics were calculated as dichotomous or categorical variables and presented as percentages.

Contingency tables were calculated to detect systematic associations of the assessed variables. All variables were analysed using a Chi-Square Test of Independence or Fisher's exact test when the contingency table was 2x2 ($\alpha = 0.05$). Adjusted standardized residuals were applied to isolate sources of variation among groups (using $\alpha = 0.05$). Adjusted standardized residuals were applied to isolate sources of variation among groups.[14] Responses from open-ended questions and other voluntary comments from respondents were transcribed and underwent content analysis for common themes.

Results

Thirty-three per cent of the invited teams responded to the survey with the highest response rate in ACB (84.2%) and the lowest in LEB Silver (17.9%). Contradictory answers were eliminated after data collection (n = 9). Therefore, 72 S&C coaches and three head coaches who also performed the role of S&C coach were finally included.

Table 1 shows the main findings of the research. Most of the respondents (94.7%) reported knowledge about the RW-U concept, although 45.3% of them recognized performing only traditional activities (e.g. shooting drills, 1x1). Aerobic and strength exercises were the most common RW-U activities mentioned by those who employed less conventional activities.

Technical and tactical activities (e.g. shooting drills, 1x1) were predominant, with 86.7% of the teams conducting them as part of their half-time routine. In contrast, static stretching/mobility was the least used strategy (12.0%). Finally, four respondents indicated that they carried out nutritional strategies.

Half of the respondents reported that they usually perform the same RW-U routine, while 40% tailored this practice according to the players' demands. In this aspect, sub-elite S&C coaches were more prone to modify the RW-U routine than their elite counterparts (44.4% vs 28.6%). Almost half of the respondents (46.7%) administered an R-WU routine of 1-3 minutes.

The fundamental rationale behind carrying out RW-U activities was "mental preparation" (74.7%), "increase body temperature" (61.3%), and "set a good rhythm in the third quarter" (53.3%). Conversely, "post-activation potentiation (PAP)" (38.6%), "decrease muscle and joint stiffness" (40.0%) and "injury prevention" (1.3%) were considered the least essential motives. Thirty-five teams not always conducted RW-U activities, with their S&C coaches detailing that the lack of time (45.7%) or letting the players do their preferred RW-U practice independently (62.9%) were reasons for it.

The statistical analysis indicated that years of coaching experience and age influence the level of the team they coached ($p = 0.045$ and $p < 0.01$, respectively). Despite this, no significant differences between elite and sub-elite teams were observed in all the variables analysed.

Discussion

This study aimed to determine the current RW-U practices during half-time in elite and sub-elite Spanish men's and women's basketball teams. Although several investigations have been conducted to date on this topic, we are not aware of any that have described the practices used by basketball S&C coaches in their teams. The present study provides information and recommendations in this regard, which could be helpful for those coaches and practitioners interested in improving their half-time RW-U activities. Besides, sports scientists might identify critical points for future research concerning RW-U practices.

Previous research indicates that passive rest is not an optimal strategy to use during the break.[11] Most of our respondents reported being familiar with the concept of RW-U and, interestingly, we observed that all the practitioners administered some active RW-U. At the same time, it must be noted that many S&C coaches continue to use traditional strategies exclusively, perhaps reflecting historical practices or the players' and coaches' preferences. However, when dealing with high-level teams, updating and designing evidence-based RW-U routines should be a paramount concern to basketball practitioners to ensure optimal player performance during the initial stages of the second half.

In recent years, some research has suggested that RW-U activities based on strength[15] or aerobic exercise[16] could improve muscular power and sprint performance, which may be suitable strategies for basketball. Nonetheless, only 41.3% of our participating teams reported implementing strength exercise, and this percentage dropped to 22.7% for aerobic exercise. Furthermore, only half of the respondents utilized passive RW-U strategies (e.g. heated jacket or tracksuit) combined with other active RW-U practices at half-time. These responses may be in line with Russell et al.[6], who demonstrated that integrating both types of strategies had additional positive performance effects, perhaps due to attenuated heat loss, although evidence is lacking in basketball.

Towlson et al.[17] point out that it is crucial to design short-time RW-U routines (~3 minutes) in association football. In addition, some research argues that very brief exercise bouts (1 minute) at high intensity may be sufficient to elicit physiological and performance benefits in the second half of intermittent team sports.[18,19] The latter is interesting, as more than half of the elite coaches surveyed reported spending between 1-3 minutes on this type of activity, even though the half-time period is shorter in Spanish basketball than in English association football.

Table 1. Summary of the survey responses of strength and conditioning coaches of Spanish men's and women's basketball teams according to competitive level (elite or sub-elite).

	Elite (n = 21)	Sub-elite (n = 54)	Total (N = 75)	*P*-value
Age (years)				**< 0.01**
21-45	**71.4 (15)**	**94.4 (51)**	**88.0 (66)**	
46-65	**28.6 (6)**	**5.6 (3)**	**12.0 (9)**	
Coaching experience (years)				**0.04**
1-3	**4.8 (1)**	**16.7 (9)**	**13.3 (10)**	
4-6	**14.3 (3)**	**33.3 (18)**	**28.0 (21)**	
7-11	**28.6 (6)**	**27.8 (15)**	**28.0 (21)**	
≥ 12	**52.4(11)**	**22.2 (12)**	**30.7 (23)**	
Knowledge about the concept of RW-U				0.89
Yes	95.2 (20)	94.4 (51)	94.7 (71)	
No	4.8 (1)	5.6 (3)	5.3 (4)	
Frequency of implementation RW-U activities				0.63
Always	61.9 (13)	46.3 (25)	50.7 (38)	
Only with those players starting the second half	0 (0)	1.9 (1)	1.3 (1)	
Depending on match context	4.8 (1)	1.9 (1)	2.7 (2)	
Depending on the head coach	4.8 (1)	5.6 (3)	5.3 (4)	
Depending on the player's demands	28.7 (6)	44.4 (24)	40.0 (30)	
Time allocated to RW-U practice (minutes)				**0.044**
1-3	**52.4 (11)**	**44.4 (24)**	**46.7 (35)**	
4-8	**38.1 (8)**	**55.6 (30)**	**50.7 (38)**	
≥ 8	**9.5 (2)**	**0 (0)**	**2.7 (2)**	
RW-U strategies				
Technical and tactical activities	90.5 (19)	85.2 (46)	86.7 (65)	0.53
Heated jacket or tracksuit	38.1 (8)	53.7 (29)	49.3 (37)	0.22
Tactical instructions	38.1 (8)	37.0 (20)	37.3 (28)	0.93
Strength exercise	52.4 (11)	37.0 (20)	41.3 (31)	0.23
Aerobic exercise	28.6 (6)	20.4 (11)	22.7 (17)	0.45
Static stretching/mobility	23.8 (5)	7.4 (4)	12.0 (9)	0.06
Nutritional strategies	14.3 (3)	1.9 (1)	5.3 (4)	0.06
Use of traditional RW-U strategies				0.79
Yes	42.9 (9)	46.3 (25)	45.3 (34)	
No	57.1 (12)	53.7 (29)	54.7 (41)	
The rationale for conducting the RW-U strategies				
Mental preparation	76.2 (16)	74.1 (40)	74.7 (56)	0.85
Increase body temperature	61.9 (13)	61.1 (33)	61.3 (46)	0.95
Set a good rhythm in the third quarter	52.4 (11)	53.7 (29)	53.3 (40)	0.92
Decrease muscle and joint stiffness	47.6 (10)	37.0 (20)	40.0 (30)	0.40
Post-activation potentiation (PAP)	33.3 (9)	37.0 (20)	38.7 (29)	0.64
Injury prevention	0 (0)	1.9 (1)	1.4 (1)	0.42
Reasons for not carrying out RW-U strategies*				
Lack of time	62.5 (5)	40.7 (11)	45.7 (16)	0.75
Avoid player's fatigue	12.5 (1)	11.1 (3)	11.4 (4)	0.89
Lack of space and/or material	12.5 (1)	3.7 (1)	5.7 (2)	0.51
Players are free to perform their preferred activities	37.5 (3)	70.4 (19)	62.9 (22)	0.06

** Elite (n = 8); Sub-elite (n = 27); Total (N = 35). Bold denotes statistical significance (P < 0.05).*

When asked about the most important reasons for performing RW-U practices, coaches indicated that they were "mental preparation" and "increased body temperature." The latter explanation seems to be supported by previous research showing that RW-U effectively preserved body temperature compared to passive rest.[20] Notably, only one coach detailed that "injury prevention" was a relevant factor, yet it seems that RW-U strategies could help to reduce the risk of injury during the second half in soccer.[21]

Time pressures and player demand were the main limiting factors mentioned by coaches who did not always perform the RW-U. In this sense, Galazoulas *et al.*[8] questioned the need for all players to warm up before the match because of the rapid drop in temperature when players are in passive rest. Hence, individualizing the RW-U according to the demands of the players could be an appropriate strategy to alleviate this situation during the break period, allowing those players who are going to start the third quarter to do it and respecting those players who demand to warm up for psychological reasons. Future research could shed light on this issue during the half-time in basketball.

Basketball is one of the most popular intermittent team sports globally, including Spain.[22] This popularity could explain why lack of space or equipment was not recognized as a limiting factor by most high-level S&C coaches participating in this research.

Sports scientists, coaches and practitioners should interpret the findings of this survey considering possible recall bias, the potential reluctance to share current practice and errors with a retrospective survey methodology. The questionnaire was designed to be user-friendly and straightforward to encourage the participation of the S&C coaches, despite the risk of losing information. However, we did not gather detailed information regarding specific RW-U strategies other than aerobic or strength exercise due to the short length of the questionnaire. Finally, we reached most of the top-level Spanish basketball teams, overcoming the challenge of accessing the physical conditioning practitioners working in them. Indeed, a strength of this research is that more than 80% of S&C coaches in ACB (the top professional basketball division of the Spanish basketball league system) teams answered the questionnaire. Nevertheless, the survey response rate might be deemed low, as it seems to be when web surveys are delivered.[23] In any case, it was still higher than that detected in other studies with similar target populations.[24] Therefore, we consider that our final sample was sufficiently representative.

In conclusion, although widespread in elite and sub-elite Spanish men's and women's basketball teams, our results suggest that active RW-U strategies continue to reproduce traditional practices by many teams. Therefore, the RW-U activities implemented during half-time do not reflect evidence-based practice in all cases. It does not seem that the competitive level of the teams influences the type of RW-U strategies performed during the half-time period.

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References

1. Petway AJ, Freitas TT, Calleja-González J, Leal DM, Alcaraz PE. Training load and match-play demands in basketball based on competition level: A systematic review. PLoS One. 2020;15(3):1–21.
2. Stojanović E, Stojiljković N, Scanlan AT, Dalbo VJ, Berkelmans DM, Milanović Z. The Activity Demands and Physiological Responses Encountered During Basketball Match-Play: A Systematic Review. Sport Med. 2018;48(1):111–35.
3. Edwards T, Spiteri T, Piggott B, Bonhotal J, Haff GG, Joyce C. Monitoring and Managing Fatigue in Basketball. Sports. 2018;6(1):19.
4. Mulazimoglu O, Yanar S, Tunca Evcil A, Duvan A. Examining the effect of fatigue on shooting accuracy in young basketball players. Anthropol. 2017;27(1–3):77–80.
5. Lovell RJ, Kirke I, Siegler J, Mcnaughton LR, Greig MP. Soccer half-time strategy influences thermoregulation and endurance performance. J Sports Med Phys Fitness. 2007;47(3):263–9.
6. Russell M, Tucker R, Cook CJ, Giroud T, Kilduff LP. A comparison of different heat maintenance methods implemented during a simulated half-time period in professional Rugby Union players. J Sci Med Sport. 2018;21(3):327–32.
7. Fashioni E, Langley B, Page RM. The effectiveness of a practical half-time re-warm-up strategy on performance and the physical response to soccer-specific activity. J Sports Sci. 2020;38(2):140–9.
8. Galazoulas C, Tzimou A, Karamousalidis G, Mougios V. Gradual decline in performance and changes in biochemical parameters of basketball players while resting after warm-up. Eur J Appl Physiol. 2012;112(9):3327–34.
9. Hammami A, Zois J, Slimani M, Russel M, Bouhlel E. The efficacy and characteristics of warm-up and re-warm-up practices in soccer players: A systematic review. J Sports Med Phys Fitness. 2018;58(1–2):135–49.
10. Russell M, West DJ, Harper LD, Cook CJ, Kilduff LP. Half-Time Strategies to Enhance Second-Half Performance in Team-Sports Players: A Review and Recommendations. Sport Med. 2015;45(3):353–64.
11. Silva LM, Neiva HP, Marques MC, Izquierdo M, Marinho DA. Effects of Warm-Up, Post-Warm-Up, and Re-Warm-Up Strategies on Explosive Efforts in Team Sports: A Systematic Review. Sport Med. 2018;48(10):2285–99.
12. Pociūnas R, Pliauga V, Lukonaitienė I, Bartusevičius D, Urbonavičius T, Stuknys A, et al. Effects of Different Half-Time Re-Warm Up on Vertical Jump During Simulated Basketball Game. Balt J Sport Heal Sci. 2018;2(109):35–40.
13. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol. 2008;61(4):344–9.
14. Haberman SJ. The analysis of residuals in cross-classified tables. Biometrics. 1973;29:205–20.
15. Zois J, Bishop D, Fairweather I, Ball K, Aughey RJ. High-intensity re-warm-ups enhance soccer performance. Int J Sports Med. 2013;34(9):800–5.
16. Yanaoka T, Kashiwabara K, Masuda Y, Yamagami J, Kurata K, Takagi S, et al. The effect of half-time re-warm up duration on intermittent sprint performance. J Sport Sci Med. 2018;17(2):269–78.
17. Towlson C, Midgley AW, Lovell R. Warm-up strategies of professional soccer players: Practitioners' perspectives. J Sports Sci. 2013;31(13):1393–401.
18. Yanaoka T, Iwata R, Yoshimura A, Hirose N. A 1-Minute Re-warm Up at High-Intensity Improves Sprint Performance During the Loughborough Intermittent Shuttle Test. Front Physiol. 2021;11.
19. Yanaoka T, Hamada Y, Fujihira K, Yamamoto R, Iwata R, Miyashita M, et al. High-intensity cycling re-warm up within a very short time-frame increases the subsequent intermittent sprint performance. Eur J Sport Sci [Internet]. 2020;0(0):1–33.
20. Mohr M, Krustrup P, Nybo L, Nielsen JJ, Bangsbo J. Muscle temperature and sprint performance during soccer matches - Beneficial effect of re-warm-up at half-time. Scand J Med Sci Sport. 2004;14(3):156–62.
21. Lovell R, Barrett S, Portas M, Weston M. Re-examination of the post half-time reduction in soccer work-rate. J Sci Med Sport [Internet]. 2013;16(3):250–4.
22. Reverter-Masía J, Legaz-Arrese A, Munguía-Izquierdo D, Barbany JR, Serrano-Ostáriz E. A profile of the resistance training practices of elite spanish club teams. Strength Cond. 2009;23(5):1537–47.
23. Van Mol C. Improving web survey efficiency: the impact of an extra reminder and reminder content on web survey response. Int J Soc Res Methodol. 2016;20(4):317–27.
24. Wilke J, Niederer D, Vogt L, Banzer W. Head coaches' attitudes towards injury prevention and use of related methods in professional basketball: A survey. Phys Ther Sport. 2018;32:133–9.