SPORT TK: Revista Euroamericana de Ciencias del Deporte, vol. 9 n.º 1, (Supl. 1).
Monográfico: Turismo de aventura y deportes al aire libre, 27-32
Recibido: Octubre 2018
Aceptado: Agosto 2019

ISSN edición web (*http://revistas.um.es/sportk*): 2340-8812

Training profile and performance in elite bodyboarders

Perfil de entrenamiento y rendimiento en bodyboarders de élite

Bruno Silva[1, 2, 3, 4]*, and Gonçalo Cruz[4, 5]

[1] *Instituto Politécnico de Viana do Castelo, Escola Superior de Desporto e Lazer (Portugal).*
[2] *Faculty of Education and Sport Sciences,University of Vigo, Pontevedra (Spain).*
[3] *Research Center in Sports Sciences, Health and Human Development (CIDESD),Vila Real (Portugal).*
[4] *Surfing Viana High Performance Center, Viana do Castelo (Portugal).*
[5] *Faculdade de Motricidade Humana, Lisboa (Portugal).*

Abstract: Surfing can be considered an intermittent activity with different intensities, were fitness level of surfing athletes contributes to a better performance in both training and competition. Despite some knowledge about the fitness levels of elite surfers, there is limited published research examining the training profile of elite Bodyboarders and is influence in competition outcomes. During the Viana World Bodyboard Pro in Viana do Castelo, 49 elite bodyboarders, replied a retrospective questionnaire that include training habits. Spearmen correlation and Mann-Whitney test was applied to determine possible associations and comparation between groups. The ending ranking in the world tour is influenced by the practice of Physical Training and the fact that have a coach ($p< 0.05$). Bodyboarding is more than a recreational sport needing a new insight regarding sports specific season plan, that allow athletes compete at higher level. Specially for Junior athlete's, physical training is key factor for accomplish better performance.
Key words: Bodyboard; training, sports performance, junior athletes.

Resumen: El surf puede considerarse una actividad intermitente, con el nivel de condición física a contribuir para un mejor rendimiento tanto en el entrenamiento como en la competición. A pesar de algunos conocimientos sobre los niveles de aptitud de los surfistas de élite, la investigación que examina el perfil de entrenamiento de Bodyboarders de elite y su influencia en los resultados de la competición es limitada. Durante el Viana World Bodyboard Pro, 49 bodyboarders de élite respondieron un cuestionario retrospectivo. La correlación de Spearmen y la prueba de Mann-Whitney se aplicaron para determinar posibles asociaciones y comparaciones entre grupos. La clasificación final en lo circuito mundial está influenciada por la práctica de Entrenamiento Físico y tener entrenador ($p<0.05$). El bodyboard es más que un deporte recreativo que necesita una nueva visión sobre la planificación específica. Especialmente para atletas junior, el entrenamiento físico es un factor clave para lograr un mejor rendimiento.
Palabras clave: Bodyboard; entrenamiento, rendimiento deportivo, atletas juveniles.

Introduction

Bodyboarding is a surfing discipline which has developed rapidly in the last 10 years and is now considered one of the world's fastest-growing water sports (Rodríguez-Matoso et al., 2015) this exponential growth as lead to an increase the number and level of competitive athletes.

Surfing is a sport characterised by intermittent exercise bouts of varying intensities and durations involving different body parts and numerous recovery periods (Mendez-Villanueva & Bishop, 2005) previous studies reported that a surfer spends between 44% and 54% of the time paddling, 28% and 53% waiting, 2.2% and 16% on other activities (duckdiving, recovering of board, …) and only 3 to 8% wave riding per session (Farley, Harris, & Kilding, 2012; Meir, Lowdon, & Davie, 1991; Mendez-Villanueva, Bishop, & Hamer, 2006; Secomb, Sheppard, & Dascombe, 2015), from the authors knowledge only one Time-motion analysis investigation concerning competitive bodyboard was carried out but the results are similar (Heck & Borgonovo-Santos, 2016) (53% of the time paddling, 35% stationary, 8% miscellaneous and 2% wave riding). These results suggest a similarity between surf and bodyboard, although further investigation is needed. Training and competition can be held in a wide range of environmental conditions, that impact the underlying physiological demands of surfing practice (Mendez-Villanueva & Bishop, 2005) and on the activity profile.

Competitive bodyboard involves groups from 2 to 4 surfers in each 20 to 40 minutes competitive heat, dependent on the format of the competition and conditions (Mendez-villanueva, Bishop, & Hamer, 2006). Competitive success is determined by judging criteria applied to the act of wave riding only (Peirão & dos Santos, 2012). The criteria examine the athlete's ability to ride the waves and perform controlled complex manoeuvres (Surfing Australia, 2017). Normally, the athlete's highest-scoring 2 waves in each heat are used to determine the heat outcome (Sheppard et al., 2011).

In surfing there is a strong association between physical variables and performance (Farley, Abbiss, & Sheppard, 2017; Sheppard et al., 2012; Silva, Clemente, & Lourenco Martins, 2017), being a key factor to a better performance both in training and competition (Farley et al., 2016; Silva & Clemente, 2017).

Dirección para correspondencia [Correspondence address]: Bruno Silva: Complexo Desportivo e Lazer Comendador Rui Solheiro, Monte de Prado, Zip Code 4960-320, Melgaço, (Portugal).
Email: silvabruno@esdl.ipvc.pt

When exploring the APB Mens World Tour calendar (https://apbtour.com), bodyboard competitions are related to some of the world's heaviest spots, due to the type of breaks, with more hollow waves with barrelling shape. This kind of waves carry more energy becoming some of the most demanding waves in the world (Guisado, 2003; Mead & Black, 2001). In addition, bodyboarding scoring potential places strong emphasis on aerial manoeuvres on bigger and heavier sections of waves (Surfing Australia, 2017). In order to undertake complex high-risk manoeuvres in such situations, high technique levels are required and whole-body strength and power characteristics needed to tolerate the physical demands of such movements (Tran et al., 2015) and landings.

Despite Bodyboarding require the ability to adapt to dynamic environments, exceptional whole body physical skills, technique and mental aptitude (Mendez-Villanueva & Bishop, 2005) and the huge growth of the sport the last couple of years, there is still a lack of research regarding those matters in this particular sport (Farley, Harris, & Kilding, 2012). Furthermore and when compared to other sport's training methodology is still a rather new concept for bodyboarders (Moreira, Clemens, & Peixoto, 2013).

Despite some knowledge about the fitness levels of elite surfers, there is limited published research examining the training profile of elite Bodyboarders and is influence in competition outcomes. Based on that, the aim of this study is to characterize world class professional bodyboarders on their preferences and training habits, both technical and physical. Further, to find and analyse reappearing patterns on their training method.

Methods

According to a 12 months retrospective questionnaire, divided in three parts. One to characterize the population and to have an insight on their preferences regarding wave conditions. Second and third concerning their technical and complementary training methods respectively. To accomplish the specifications of the study a group of Surfing Sports Experts were involved in the development and review of the questionnaire. This board of Surfing Sports Experts included a former professional bodyboarder athlete and coach from Portuguese National Surfing Federation, surfing specialists and coaches from Surfing Viana Hight Performance Center. The questionnaire was reviewed until they agree that all questions were objectively corrected according to the main purposes. Data was collected during the Viana World Bodyboard Pro in Viana do Castelo. The questionnaire was composed by 50 questions to allow a response time of about 8 minutes. To reply to the questionnaire bodyboarders could choose between various categories of answers.

Forty-nine elite bodyboarders (eighteen of them juniors), with an average of 22.8 years old, (67.0 kg and 173.6 cm) answered the questionnaire (Table 1). On average they have been surfing for 12.9 years.

Table 1. Sample description (mean and 95%CI).

Variable	Total (n= 49)	Open (n = 31)	Junior (n = 18)
Age (years old)	22.8 [20.8 – 25.3]	16.3 [15.6 – 17.1]	16.3 [15.6 – 17.1]
Height (cm)	173.6 [172.2 – 175.1]	173.6 [170.9 – 176.3]	173.6 [170.9 – 176.3]
Weight (kg)	67.0 [65.0 – 69.0]	64.3 [60.9 – 67.8]	64.3 [60.9 – 67.8]
BB practice years	12.9 [10.3 – 15.4]	7.1 [5.0 – 9.3]	7.1 [5.0 – 9.3]
BB competition years	8.9 [6.7 – 11.1]	4.1 [3.2 – 4.9]	4.1 [3.2 – 4.9]
BB World Tour years	5.3 [3.2 – 7.4]	1.7 [1.0 – 2.4]	1.7 [1.0 – 2.4]

cm – centimetres; kg – kilograms; BB – Bodyboard.

Statistical analyses

The effect size to non-parametric tests is obtained (Pallant, 2011): $r = \frac{|z|}{\sqrt{N}}$ where N is the total sample and the value of z that is reported after apply the Mann-Whitney test. The classification of effect size (ES) is obtained by using of the follow criteria (Pallant, 2011): very small (r <0.1); small effect (0.1 ≤ r <0.3); medium effect (0.3 ≤ r < 0.5); and large effect (r ≥ 0.5). Spearmen correlation was applied and the following correlation scale was adopted (15): trivial (_< 0.1); small (0.1 ≤ _< 0.3); moderate (0.3≤ _ < 0.5); large (0.5 ≤ _< 0.7); very large (0.7 ≤ _ < 0.9); and nearly perfect (≥ 0.9). The tests were executed using the SPSS software (version 25.0, USA) for a statistical significance at 0.05.

Results

Most of Open athletes are from United States of América (19.4%), Spain and Portugal (16.1%), Chile and Brazil (9.7%), while Junior athletes are largely from Portugal (33%), Spain (33.3%) and Chile (22.2%). The majority assume that is indifference the direction and height of the waves (Open:

64.5% and 74.2%; Júnior:50.0% and 44.4%) but Open athletes give more importance to manoeuvre execution (83.9%) than Junior (66.7%). However, is observed the same distribution about the importance of using the critical section of the wave (87.1% and 61.1%) and functional distance (45.2% and 29.0%), Open and Junior respectively. All assume to perform video analyses. Nevertheless, both Open and Junior athletes see more videos from other athletes, 74.2% and 66.7%, in detriment of there one videos. The focus of videos analyses is relatively different in percentage distribution but similar in the importance of the observations focus (Table 2).

When questioned about the elaboration of a season plan most of the athletes assume to have, while performing more frequently between zero and three surf trips per year (table 2). In relations to another type of complementary training, not all perform physical or mental training being the report frequency different, specially concerning mental training (Table 2).

Table 2. Frequencies to questionnaire answers.

Variable		**Total**	**Open**	**Junior**
Wave direction	No matter	63.3%	74.2%	44.4%
	Left	20.4%	12.9%	33.3%
	Right	16.3%	12.9%	22.2%
Wave height	No matter	42.9%	51.6%	27.8%
	Big	20.4%	25.8%	16.1%
	Medium	16.3%	16.1%	61.1%
Wave type	No matter	46.9%	54.8%	33.3%
	Tube	26.5%	22.6%	33.3%
	Vertical	18.4%	16.1%	22.2%
Wave break	No matter	59.2%	64.5%	50.0%
	Reef	28.6%	29%	27.8%
Manoeuvres in the critical section of the wave	Important	22.4%	12.9%	38.9%
	Very Important	77.6%	87.1%	61.1%
BB sessions	1 a 3 times per week	14.3%	13.3%	16.7%
	4 a 6 times per week	57.1%	63.3%	50.0%
	More than 7 times per week	26.5%	13.3%	16.7%
Time BB sessions	Un till 2 hours	53.1%	45.2%	66.7%
	2 to 4 hours	26.5%	24.1%	33.3%
	More than 4 hours	16.3%	27.6%	0.0%
Coach	No	59.2%	83.9%	16.7%
	Yes	40.8%	16.1%	83.3%
Video Analyses Focus	Tricks, technique and waves	32.7%	32.3%	33.3%
	Tricks and technique	18.4%	19.4%	16.7%
	Technique	20.4%	16.1%	27%
Surfing Trips	0 a 3	40.8%	32.3%	55.6%
	4 a 6	24.5%	29.9%	16.7%
	More than 7	24.4%	25.0%	16.7%
Season Plan	No	38.8%	45.2%	27.8%
	Yes	57.1%	51.6%	66.7%
Physical Training	No	10.2%	9.7%	11.1%
	Yes	89.8%	90.3%	88.9%
Mental Training	No	53.1%	27.8%	72.2%
	Yes	46.9%	58.1%	41.9%

BB – Bodyboard;

Analysing all athletes, the ending ranking in the world tour is influenced by the practice of Physical Training (p=0.016, r=0.349, positive and moderate effect) and having a coach (p=0.025, r=0.326, positive and moderate effect).

Although, having a coach is influenced by competitions years (p=0.016, r=0.351, positive and moderate effect), Bodyboard practice years (p=0.005, r=0.403, positive and moderate effect), age (p=0.001, r=0.477, positive and moderate

effect), being Open or Junior athlete (p=0.000, r= -0.659, negative and large effect), session time (p=0.001, r=0.467, positive and moderate effect) and season plan (p=0.004, r=0.414, positive and moderate effect).

Mental training practice influence wave height preferences (p=0.026, r= 0.367, positive and moderate effect) and competition years influence mental training practice (p=0.012, r= -0.362, negative and moderate effect).

Analysing separately, and independent of the physical training performed, Junior competitors that don't perform physical training presents inferior performance (p=0.026, r=0.554, positive and large effect) in contrast with Open athletes were this difference is not demonstrated (p=0.210, r=0.232, positive and moderate effect). For mental training, only Junior athletes maintain the statistically significant dereference for wave height preferences (p=0.026, r=0.524, positive and large effect) and competition years (p=0.002, r= -0.694, positive and large effect).

Continuing the separate analyses but comparing the two groups of athletes, competition years (p=0.000; ES= 0,642 large effect); wave height preferences (p=0.041; ES= 0.292 small effect), importance of performing a manoeuvre in the critical section (p=0.037; ES=0,297 small effect), the having a coach (p=0.000; ES=0,652 large effect) and mental training (p=0.043; ES=0,290 small effect), presents significant statistical differences.

Discussion

Physical training is a key factor for bodyboarders accomplish better performance since ending ranking in the world tour is influenced by the practice of Physical Training (p=0.016, r=0.349). However, if analysed separately Open and Junior athletes, the results are different, since the positive and statistic significant differences is obtained only in the Junior competitors (p=0.026, r=0.554) and not in Open (p=0.210, r=0.232). This findings are in line with other studies since (Farley et al., 2017; O. R. L. Farley et al., 2012; J. Sheppard, Walshe, & Coyne, 2012) reported strong association between physical variables and performance, with fitness level being a key factor both training and competition. However, the results of Open athletes may be mediated because more than 90% of inquired assume to perform Physical Training.

The number of competition years influence mental training practice (p=0.012, r= -0.362) and training session per week (p=0.003, r=0.438). Concerning the significant and positive correlation with the number of training sessions per week is a relatively logic matter, since the number of practice hours are a key factor to performance (Haff & Triplett, 2016) and the permanence in competition is influenced by performance. Nevertheless, the negative and moderate correlation between mental training practice and competitions years is possible mediated by the sample distribution. When analysed separately, only Junior athletes maintain the statistically significant dereference for wave height preferences (p=0.026, r=0.524, positive and large effect) and competition years (p=0.002, r= -0.694, positive and large effect). Although, mental training all so presents a statistical significant different between groups (p=0.043), with 72.2% of the Junior athletes don't perform mental training in contrast with 22.8% for Open athletes. These results are likely influenced with the kind of waves of the APB Mens World Tour, that are performed in some of the world's heaviest spots, becoming some of the most demanding waves in the world (Guisado, 2003; Mead & Black, 2001), here the athlete have to be in perfect control of all is capacities, including emotional control (Cooke, Kavussanu, McIntyre, & Ring, 2013). In addition, importance of performing a manoeuvre in the critical section (p=0.037) and wave height preferences (p=0.041) are all so different between Open and Junior Athletes. Junior category don't valorise the critical section of the wave (table 2), with 61.1% assuming to be more comfortable in medium height waves, that have less scoring potential, than bigger and heavier sections (Surfing Australia, 2017).

Subsequently, the fact that have a coach may be a key factor since is influenced by competitions years (p=0.016, r=0.351), Bodyboard practice years (p=0.005, r=0.349), age (p=0.001, r=0.477), session time (p=0.001, r=0.467) and season plan (p=0.004, r=0.414).

This assumption has more strength for Junior athlete's, since that having a coach presents a statistical significant different with large effect size between categories (p=0.000; ES=0,652) and because of the negative and large effect on having a coach and being Junior or Open (p=0.000, r= -0.659). In fact, most of Junior athletes have a season plan (66.7%) and have a coach (table 2). Possibly explained by the fact that Junior athletes are in the ending of is development plan (Balyi, 2002) and probably Open athletes give less importance to coach guidance. Although, this indicators maybe also related that when compared to other sport's training methodology, for bodyboarding is still a new concept (Moreira et al., 2013), since having a season plan in one of the foundations of Surfing Performance (Bernards, Blaisdell, Light, & Stone, 2017).

Besides some methodological limitations of sample size and being a 12-month's retrospective, self-reported questionnaire, the majority of top 20 Open APB tour competitors were included, giving important indicators to bodyboarders and surfing coach's concerning training habits and performance.

Conclusions

Is clear that Bodyboarding is more than a recreational sport needing a new insight regarding sports specific season plan,

to response both to technical and physical training demand, that allow athletes compete at higher level. Specially for Junior athlete's, physical training is key factor for accomplish better performance.

References

1. Balyi, I. (2002). Long-term Athlete Development the system and solutions. *FHS-LEEDS,* 6-10.
2. Bernards, J., Blaisdell, R., Light, T. J., & Stone, M. H. (2017). Prescribing an annual plan for the competitive surf athlete: Optimal methods and barriers to implementation. *Strength and Conditioning Journal, 39*(6), 36-45. https://doi.org/10.1519/SSC.0000000000000335
3. Cooke, A., Kavussanu, M., McIntyre, D., & Ring, C. (2013). The Effects of Individual and Team Competitions on Performance, Emotions, and Effort. *Journal of Sport and Exercise Psychology*. https://doi.org/10.1123/jsep.35.2.132
4. Farley, Abbiss, C. R. ., & Sheppard, J. M. (2017). Performance analysis of surfing: A review. *Journal of Strength and Conditioning Research*. https://doi.org/10.1519/JSC.0000000000001442
5. Farley, O., Harris, K. N., & Kilding, E. A. (2012). Anaerobic and Aerobic Fitness Profiling of Competive Surfers. *The Journal of Strength and Conditioning Research*, *26*(8), 2243–2248. https://doi.org/10.1519/JSC.0b013e31823a3c81
6. Farley, O. R. L., Harris, N. K., & Kilding, A. E. (2012). Physiological demands of competitive surfing. *Journal of Strength and Conditioning Research / National Strength & Conditioning Association*, *26*(7), 1887–1896. https://doi.org/10.1519/JSC.0b013e3182392c4b
7. Farley, Secomb, J. L., Parsonage, J., Lundgren, L. E., Abbiss, C. R., & Sheppard, J. M. (2016). Five Weeks Of Sprint And High Intensity Interval Training Improves Paddling Performance In Adolecent Surfers. *Journal of Strength and Conditioning Research*. https://doi.org/10.1519/JSC.0000000000001364
8. Guisado, R. (2003). *Art of Surfing: A Training Manual for the Developing and Competitive Surfer*. Connecticut: The Globe Pequot Press.
9. Haff, G. G., & Triplett, N. T. (2016). *Essentials of Strength Training and Conditioning* (4th Editio). National Strength and Conditioning Association.
10. Heck, M. B., & Borgonovo-Santos, M. (2016). Time-motion analysis of competitive bodyboard. In *Encontro de Investigação Jovem*.
11. Mead, S., & Black, K. (2001). Predicting the Breaking Intensity of Surfing Waves. *Journal of Coastal Research, 103*, 51–65. https://doi.org/10.2307/25736205
12. Meir, R. A., Lowdon, B. J., & Davie, A. J. (1991). Heart Rates and Estimated Energy Expenditure During Recreational Surfing. *The Australian Journal of Science and Medicine in Sport*, *23*(3), 70–74.
13. Mendez-Villanueva, A., & Bishop, D. (2005). Physiological aspects of surfboard riding performance. *Sports Medicine*, *35*(1), 55–70. https://doi.org/10.2165/00007256-200535010-00005
14. Mendez-villanueva, A., Bishop, D., & Hamer, P. (2006). Activity Profile of World-Clas Professional Surfers During Competition : a Case Study. *Journal of Strength and Conditioning Research*, *20*(3), 477–483.
15. Mendez-Villanueva, A., Bishop, D., & Hamer, P. (2006). Activity Profile of World-Class Professional Surfers During Competition: A Case Study. *The Journal of Strength and Conditioning Research*, *20*(3), 477. https://doi.org/10.1519/16574.1
16. Moreira, M., Clemens, H., & Peixoto, C. (2013). Profile of training habits of world class professional surfers. In *18th annual Congress of the EUROPEAN COLLEGE OF SPORT SCIENCE*. Barcelona.
17. Pallant, J. (2011). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using the SPSS Program*. Book, Australia: Allen & Unwin.
18. Peirão, R., & dos Santos, S. G. (2012). Critérios de julgamento em campeonatos internacionais de surfe profissional. *Revista Brasileira de Cineantropometria e Desempenho Humano*, *14*(4), 439–449.
19. Rodríguez-Matoso, D., Mantecón, A., Barbosa-Almeida, E., Valverde, T., García-Manso, J. M., & Rodríguez-Ruiz, D. (2015). Mechanical response of knee muscles in high level bodyboarders during performance. *Revista Brasileira de Medicina Do Esporte*, *21*(2), 144–147. https://doi.org/10.1590/1517-86922015210201507
20. Secomb, J. L., Sheppard, J. M., & Dascombe, B. J. (2015). Time-motion analysis of a 2-hour surfing training session. *International Journal of Sports Physiology and Performance*, *10*(1), 17–22. https://doi.org/10.1123/ijspp.2014-0002
21. Sheppard, J. M., McNamara, P., Osborne, M., Andrews, M., Oliveira Borges, T., Walshe, P., & Chapman, D. W. (2012). Association Between Anthropometry and Upper-Body Strength Qualities With Sprint Paddling Performance in Competitive Wave Surfers. *Journal of Strength and Conditioning Research*, *26*(12), 3345–3348. https://doi.org/10.1519/JSC.0b013e31824b4d78
22. Sheppard, J. M., Nimphius, S., Haff, G. G., Tran, T. T., Spiteri, T., Brooks, H., … Newton, R. U. (2011). Development of a Comprehensive Performance Testing Protocol for Competitive Surfers. *International Journal of Sport Nutrition and Exercise Metabolism*, 1–44. https://doi.org/10.1123/ijspp.2015-0012
23. Sheppard, J., Walshe, P., & Coyne, J. (2012). A brief examination of strength and paddle- conditioning considerations for competitive surfers, 91–93. Retrieved from http://ro.ecu.edu.au/ecuworks2012/234
24. Silva, B., & Clemente, F. M. (2017). Physical performance characteristics between male and female youth surfing athletes. *The Journal of Sports Medicine and Physical Fitness*. https://doi.org/10.23736/S0022-4707.17.08036-7
25. Silva, B., Clemente, F. M., & Lourenco Martins, F. M. (2017). Associations between Functional Movement Screen scores and performance variables in surf athletes. *The Journal of Sports Medicine and Physical Fitness*. https://doi.org/10.23736/S0022-4707.17.07154-7
26. Surfing Australia. (2017). *Surfing Australia Rule Book 2018*. Coolangatta. Retrieved from www.surfingaustralia.com
27. Tran, T. T., Lundgren, L., Secomb, J., Farley, O. R. L., Haff, G. G., Seitz, L. B., … Sheppard, J. M. (2015). Comparison of physical capacities between nonselected and selected elite male competitive surfers for the national junior team. *International Journal of Sports Physiology and Performance*, *10*(2), 178–182. https://doi.org/10.1123/ijspp.2014-0222