Journal of Sport and Health Research 2018, 10(3):383-388

Yanci, J.; Iturricastillo, A.; Granados, C. (2018). Efectos del entrenamiento y la competición en la capacidad de sprint y cambio de dirección en baloncesto en silla de ruedas. *Journal of Sport and Health Research.* 10(3):383-388.

Original

EFECTOS DEL ENTRENAMIENTO Y LA COMPETICION EN LA CAPACIDAD DE SPRINT Y CAMBIO DE DIRECCION EN BALONCESTO EN SILLA DE RUEDAS

TRAINING AND MATCH SESSIONS EFFECTS IN STRAIGHT SPRINT AND CHANGE OF DIRECTION ABILITY IN WHEELCHAIR BASKETBALL

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Edited by: D.A.A. Scientific Section Martos (Spain)

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Received: 2/7/17
Accepted: 26/11/17

Journal of Sport and Health Research 2018, 10(3):383-388

RESUMEN

Objetivos: El objetivo de este estudio fue analizar los efectos de entrenamiento y competición en la capacidad de sprint con y sin balón, y el cambio de dirección en jugadores masculinos de baloncesto en silla de ruedas (BSR). Material y métodos: 15 jugadores masculinos de BSR (30.45 ± 11.56 años) de la Primera División española de BRS participaron en este estudio. Siete jugadores fueron excluidos del estudio por no participar en todas las sesiones de entrenamiento y competición. Resultados: Las sesiones de entrenamiento y competición produjeron una mejora en el tiempo de sprint de 5 m ($p < 0.01$, dif. medias = -4.32%, d = -0.46, moderado), pero no en el tiempo de sprint de 20 m ($p > 0.05$, dif. medias. = -0.75%, d = -0.06, trivial), ni en el T-Test ($p > 0.05$, dif. medias = 0.23%, d = -0.02, trivial). Sin embargo, el rendimiento de sprint en 5 y 20 m con balón disminuyó significativamente después de 5 semanas ($p < 0.05$, 5.26%, d = 0.36 y $p < 0.01$, 14.60%, d = 1.00, respectivamente). Discusión: El mayor resultado de este estudio mostró que 5 semanas de entrenamiento y competición durante la temporada son suficientes para mejorar el tiempo de sprint en 5 m en jugadores de BSR, pero no para mejorar el tiempo en 20 m o la capacidad de cambiar de dirección (T-test). Además, las sesiones de juegos reducidos, de entrenamiento convencional y de competición no tuvieron efectividad en el rendimiento de sprint con balón (5 y 20 m). Conclusiones: los entrenadores y preparadores físicos de deportes adaptados deberían considerar implementar tareas de entrenamiento específicas para la mejora del sprint, el cambio de dirección y las habilidades específicas de baloncesto además del entrenamiento integrado.

Palabras clave: tarea de entrenamiento, afectación, agilidad.

ABSTRACT

Objectives: The main purpose of this study was to analyze the effects of training and match sessions in straight sprint with and without ball, and change of direction ability on male national wheelchair basketball (WB) players. Methods: 15 male WB players (30.45 ± 11.56 years) who were members of the First Division Spanish WB team participated in this study. Seven players were excluded from the study for not participating in all training sessions and matches. Results: The training and match sessions induced a significantly higher performance in 5 m straight sprint time ($p < 0.01$, mean dif. = -4.32%, d = -0.46, moderate), but not in the 20 m straight sprint ($p > 0.05$, mean dif. = -0.75%, d = -0.06, trivial), neither in the T-Test ($p > 0.05$, mean dif. = 0.23%, d = -0.02, trivial). However, the performance in the 5 and 20 m straight sprints with ball decreased significantly after the 5 weeks ($p < 0.05$, 5.26%, d = 0.36 and $p < 0.01$, 14.60%, d = 1.00, respectively). Discussion: The main results of this study showed that in-season 5-week training and match sessions were efficient for improving 5 m straight sprint in WB players, but not 20 m straight sprint and change of direction ability (T-test). In addition, small sided games, conventional training and match sessions have not been effective in improving straight sprint performance with ball (i.e. 5 and 20 m). Conclusions: Adapted sports coaches and physical trainers should consider implementing specific training tasks for improving sprint, change of direction ability and basketball-specific skills in addition to an integrated training.

Keywords: training task, impairment, agility.

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INTRODUCCIÓN

Wheelchair basketball (WB) is an intermittent activity that involves repeated short, intense exercise bouts that include rapid sprint, acceleration, deceleration and dynamic position changes (Molik et al., 2010). That is why measurements of straight sprinting (with and without ball) and change of direction ability (CODA) are usually included in test batteries in order to evaluate the performance of WB players (De Groot et al., 2012; Vanlandewijck et al., 1999; Yanci et al., 2015).

With regard to basketball several studies reported that small sided games (SSG) elicited significant physical performance improvements (Delextrat & Martinez, 2014; Delextrat & Kraiem, 2013). The physiological response to SSG has also been studied in WB players (Yanci et al., 2014) since it is a training task widely used by coaches and physical trainers in order to train physical capacities in an integrated way. Apart from that, the main benefits of SSG are that they can develop or maintain technical skills, which are particularly important in basketball players (Delextrat & Martinez, 2014; Bogdanis et al., 2007). However, the WB training could not be understood without the conventional training (CT), such as technical/tactical training and throwing training among other type of training sessions. To our knowledge, no scientific study has analyzed the effects of SSG, CT and match sessions on physical performance in WB players and thus, further studies are needed to characterize training and competition adaptations of WB players during the competitive season.

Therefore the aim of this study was to analyze the effects of a 5-week training and match sessions on straight sprint with and without ball, and change of direction ability in male national wheelchair basketball players.

MATERIAL Y MÉTODOS

Participants

Fifteen male WB players (30.45 ± 11.56 years) who were members of a team which played in the First Division of the Spanish WB League participated in this study. All the participants had a minimum of 5 years experience in this sport and possessed the corresponding International Wheelchair Basketball Federation (IWBF) functional classification (class 1, n = 6; class 2, n = 1; class 3.5, n = 2; class 4, n = 2; class 4.5, n = 4). All participants trained twice a week and played an official match every week. Seven players withdrew from the study because they had not participated in at least 90% of the training sessions and matches or had failed to perform all test sessions. As a result the intervention program was completed by 8 WB players (29.83 ± 11.76 years, class 1, n = 3; class 3.5, n = 2; class 4, n = 2; class 4.5, n = 1). The participants were informed about the objectives of the research, participated voluntarily in the study from which they could withdraw at any time, and signed the required informed consent. The procedures followed the guidelines of the Declaration of Helsinki (2013) and were approved by the Ethics Committee at the University of the Basque Country (UPV/EHU).

Procedures

The study took place during the competitive season, with baseline testing (PreTest) performed in November, followed by a 5-week training and 5 official match's period, and post- tests (PostTest) in December, when the team was in the middle of the League competition. None of the participants carried out specific strength, sprint or CODA training, and all trained twice a week and played an official match every week. Exercise intensity of training and match sessions was assessed recording heart rate (HR) at 5 s intervals with short range telemetry (Polar® Team Sport System, Polar Electro Oy, Finland) (Yanci et al., 2014). At the end of training or match sessions, the WB players, individually, rated their exertion using Foster's 0-10 scale (Foster et al., 2001). They responded separately about their respiratory perceived effort (RPEres) and their arm muscle perceived effort (RPEmus) (Paulson et al., 2013). The RPEres and RPEmus values were multiplied by the total duration of the match (min) following the criteria of Foster et al. (2001) to estimate the RPE-derived training load (sRPEres TL and sRPEmus TL) (Table 1). Once a week on Tuesdays, the training sessions were based in different type of SSG (1 vs. 1, 2 vs. 2, 3 vs. 3, 4 vs. 4 and simulated 5 vs. 5 games and throwing activities) with the aim to improve physical capacities in an integrated way. CT sessions (Thursdays) were oriented to pre-match tactical training in order to attempt to win. According to the official match sessions, the coaches' strategies lead some players to have more playing time or not.

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Table 1. Training and match load quantified by objective (HR) and subjective methods (RPE) over 5 consecutive weeks.

Week	Training day (type)	HRmean	HRmax	sRPEres TL	sRPEmus TL
Week 1	Tuesday (SSG)	119.1 ± 12.7	167.5 ± 21.1	623.0 ± 173.6	641.9 ± 171.3
	Thursday (CT)	123.7 ± 13.8	173.0 ± 10.7	114.0 ± 98.1	141.1 ± 86.9
	Match	135.1 ± 10.2	178.4 ± 12.3	649.3 ± 72.8	675.0 ± 45.0
Week 2	Tuesday (SSG)	128.6 ± 10.4	178.6 ± 6.7	712.7 ± 320.2	722.8 ± 324.8
	Thursday (CT)	118.5 ± 17.6	162.3 ± 14.3	488.6 ± 206.9	507.9 ± 205.7
	Match	136.1 ± 12.4	177.3 ± 15.2	525.0 ± 156.1	519.6 ± 142.7
Week 3	Tuesday (SSG)	126.3 ± 11.5	173.0 ± 11.8	459.2 ± 163.6	427.5 ± 130.9
	Thursday (VA)	-	-	-	-
	Match	131.6 ± 22.6	182.4 ± 14.9	400.0 ± 315.4	400.0 ± 292.0
Week 4	Tuesday (SSG)	132.9 ± 8.5	175.3 ± 11.9	483.7 ± 197.9	433.1 ± 209.6
	Thursday (CT)	132.5 ± 8.4	178.6 ± 11.1	527.1 ± 183.2	591.4 ± 161.1
	Match	131.5 ± 18.9	183.0 ± 9.7	545.1 ± 215.07	545.1 ± 220.3
Week 5	Tuesday (SSG)	131.5 ± 12.0	175.6 ± 8.8	631.9 ± 171.9	602.4 ± 227.2
	Thursday (VA)	-	-	-	-
	Match	140.9 ± 12.1	185.4 ± 10.5	521.3 ± 181.1	597.6 ± 183.2
Total 5 weeks	Tuesday (SSG)	127.7 ± 5.4	174.0 ± 4.1	582.1 ± 107.2	565.6 ± 130.9
	Thursday (CT)	124.9 ± 7.0	171.3 ± 8.3	376.6 ± 228.2	413.5 ± 239.5
	Match	135.0 ± 3.9	181.3 ± 3.4	528.1 ± 88.7	547.5 ± 101.6
Mean of the total training and match sessions		129.9 ± 6.5	176.2 ± 6.3	492.6 ± 232.9	498.5 ± 235.2
∑ of the total training and match sessions		-	-	8167.7	8332.1

SSG = small sided game, CT = conventional training, HRmean = mean heart rate, HRmax = maximum heart rate obtained in the training session, RPEres TL = respiratory rating of perceived exertion training load, RPEmus TL = muscular rating of perceived exertion training load, VA = video analysis.

Test battery

Before each test session (PreTest and PostTest) all the players performed a standard warm-up which consisted in 5 min smoothly propelling the wheelchair, two accelerations of 10 m in a straight line and two accelerations of 20 m with a change of direction. All tests were performed at the same venue and under identical conditions, supervised by the same test leaders. All players were assessed for the 5 and 20 m straight sprint test with and without ball and CODA.

Straight sprint with and without a ball: The participants undertook a wheelchair sprint test consisting of three maximal sprints of 20 m (Vanlandewijck et al., 1999), with a 120 s rest period between each sprint. The participants were placed at 0.5 m from the starting point, and began when they felt ready. Time was recorded using photocell gates (Microgate, Polifemo Radio Light®, Bolzano, Italy). The timer was activated automatically as the volunteers passed the first gate at the 0.0 m mark and split times were then recorded at 5 m (De Groot et al., 2012; Yanci et al., 2015) and 20 m (Vanlandewijck et al., 1999; Yanci et al., 2015). For the with ball sprint test, the participants started with a ball from a stationary position and pushed 20 m as fast as possible, adhering to the IWBF rules for dribbling (De Groot et al., 2012).

Change of direction ability (CODA): The participants completed the agility T-test (Figure 1) using the protocol modified for WB players by Yanci et al. (2015). All participants performed the test 3 times with at least 3 minutes rest between trials. A photocell (Migrogate Polifemo Radio Light®, Bolzano, Italy) was used to record the time.

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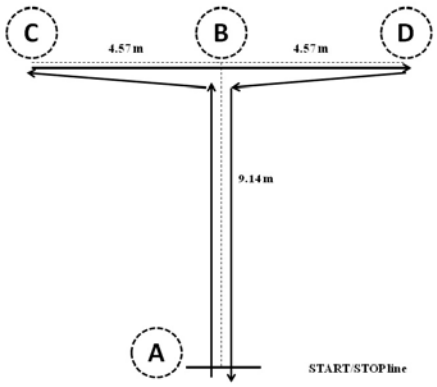

Figura 1. Start/Stop Line

Data analysis

The best performance of each test was used for the calculations. Results are presented as means ± standard deviations. Data normality was assessed using the Kolmogorov-Smirnov test. The differences from baseline (PreTest) to post test (PostTest) in straight sprinting and CODA were calculated with Student's t-test for dependent samples. Practical significance was assessed by calculating Cohen's d effect size (Cohen, 1988). Differences between means were expressed as pre-to-post percentage. Statistical significance was set at $p < 0.05$. Data analysis was performed using the Statistical Package for Social Sciences (version 20.0 for Windows, SPSS® Inc, Chicago, IL, USA).

Table 2. PreTest and PostTest results in straight sprint with and without ball and change of direction ability.

	PreTest	PostTest	Mean dif. (%)	Cohens' d
Straight sprint without ball (s)				
SP5 m	1.74 ± .16	1.66 ± .16**	-4.32	-.46
SP20 m	5.36 ± .64	5.32 ± .62	-.75	-.06
Straight sprint with ball (s)				
SPB5 m	1.90 ± .28	2.00 ± .25*	5.26	.36
SPB20 m	5.90 ± .86	6.77 ± 1.08**	14.60	1.00
Change of direction ability (s)				
T-test	14.62 ± 1.83	14.66 ± 1.90	.23	.02

SP5 = 5 m straight sprint, SP20 = 20 m straight sprint, SPB5 = 5 m straight sprint with ball, SPB20 = 20 m straight sprint with ball. PreTest to PostTest significant differences (* $p < .05$, ** $p < .01$).

RESULTADOS

The PreTest and PostTest results of participants are described in Table 2. The SSG, CT and matches induced a significantly higher performance in the 5 m straight sprint time ($p < 0.01$, $d = -0.46$, moderate), but not in the 20 m straight sprint ($p > 0.05$, $d = -0.06$, trivial) and in the T-Test ($p > 0.05$, $d = -0.02$, trivial). However, performance in the 5 and 20 m straight sprint with ball decreased significantly after 5 weeks ($p < 0.05$, 5.26%, $d = 0.36$ and $p < 0.01$, 14.60%, $d = 1.00$, respectively).

DISCUSIÓN

The main results of this study showed that in-season 5-week training and match sessions were efficient for improving 5 m straight sprint in WB players, but not 20 m straight sprint and change of direction ability (T-test). In addition, SSG, CT and match sessions have not been effective in improving straight sprint performance with ball (i.e. 5 and 20 m). These results are inconsistent with those reported in previous studies in conventional basketball players (Delextrat & Martinez, 2014; Bogdanis et al., 2007). Delextrat and Martinez (2014), after applying a 6-week SSG training program obtained improvements in both physical performance and basketball specific skills. Bogdanis et al. (2007) showed that 4-week training programmes consisting of SSG resulted in an aerobic physical improvement (4.9%) in junior basketball players. In addition, Delextrat and Martinez (2014) showed benefits from an SSG training program for defensive agility. However, in our study the WB players did not improve CODA after a 5-week training and competition period, where SSG represented a great percentage of the training program. These contradictory results may be due to the different characteristics of the game (conventional: lower limbs vs. wheelchair: involvement of the arms). Despite this, dose response research is needed to better understand the effects of an integrated training based on SSG training in WB players and to better prescribe training programs in

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order to improve physical capacities, so more studies on this issue are warranted. The results obtained in this study suggest that coaches and adapted physical trainers should consider implementing specific training tasks for improving the 20 m sprint, CODA and basketball-specific skills with ball in addition to an integrated training based on SSG training tasks.

The results of the present study suggest that the 5-week training and competition period produces improvements in the 5 m straight sprint without ball, but decreases sprint performance with ball. A great percentage of integrated training based on SSG did not cause modifications in change of direction ability.

CONCLUSIONES

Adapted sports coaches and physical trainers should consider implementing specific training tasks for improving the sprint, CODA and basketball-specific skills in addition to an integrated training.

AGRADECIMIENTOS

The authors would like to thank the Zuzenak K.E. players and coaches for the opportunity to carry out this investigation.

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