

Original Article

Study on the physical capacity in the individual roles of basic competitive volleyball

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Abstract:

Testing is used to measure performance and, therefore, check for improvements resulting from training activities. More and more frequently, coaches require checks even during the current sporting season to measure the status of the athletes' performance and to eventually change their training plans in order to make them more productive. Therefore, more and more often testing has a monitoring function and, for this reason, an adaptation to ordinary training activities is required to allow it.

The purpose of this study is to monitor the state of some physical abilities in the team sport of volleyball at a basic competitive level. The method is experimental longitudinal and it consists in detecting the initial and the final data in a period of time of 6 months for the following skills: high jump, long jump, reaction speed, upper limb strength, lower limbs speed, shoulder girdle mobility and back chain flexibility in a sample of 12 athletes aged from 18 to 30 years.

The tests are the following: skipe jump; block jump; reaction speed; upper limb strenght; long jump; 9-3-6-3-9 speed; side test; six balls test; shoulder girdle mobility; flexibility rear chain. From the results, it comes out that the physical abilities (resulting from the training activities) were optimally monitored. The goal is therefore achieved, because the coach has verified the athletes' performance status and he has specifically noted an improvement. At the end, the study was useful for the purpose but it is necessary to improve the evaluation tools and to adapt them to the training plans.

Key Words: Enably physical abilities, basic competitive volleyball, tests, monitoring and evaluation system.

Introduction

The volleyball fundamental is technical aspects in common of whole volleyball categories, including championships C series (D'Isanto et al, 2019). In this category there is no monitoring system. Could be useful to concern a monitoring activity concerning training activities and the collection data(qualitative and quantitative). Every monitoring training activity can be expected at any categories and males and females. Video analysis have the main role in this way to support monitoring system (Raiola et al, 2013; Izzo et al, 2018). This is the basis for every sport and it has implications for every competitive every level and, so, suggests also practical indications (D'Isanto et al, 2019, 2017). This study enlarge a monitoring system for planning training in reality. Monitoring could be to apply criteria and to aim the training activity such as the match (Alminni et al, 2019ab)in the similar manner with a model adapted to scope (Altavilla & Raiola, 2018).For this reason purposes are as following.

- highlight the trend, starting from elementary variables of the observed phenomenon;
- record the deviations between what is taking place and what was expected;
- inform the players of the monitoring system (recipients, beneficiaries, users, controllers) about the critical issues that arise from time to time to search for the most appropriate solutions.

By monitoring we therefore mean: preparation of an information gathering system:

- coded;
- registered;
- constantly updatable.

It is made by the assessment of the whole process (Raiola & D'Isanto, 2016) on the athlete, including the workout methodology used (D'Elia et al, 2019, Raiola, 2014). Is possible to control the efficacy of training loads and can modify the errors. The proposed methodology helps the training workouts for all level and throughout scientific tool, such as for the investigations, could have the same result of the studies (Forte et al, 2019ab). In other words, if the testing measures performance aspects, such as can do to verify the resulting improvements of training session (Forte et al, 2019). Often, trainer requests to to have the state of the athletes' performance conditions by the athletic trainer (Federici et al, 2019, Invernizzi et al, 2019) to purpose to changing the planning workout in order to make more effective. Increasingly testing method in the planning give the reason for an better conditions to decide the annual planning. So, it have to provide the kinds of functional tests for training.

The aim is to select a type of testing, that have a qualitative and quantitative data. In other words, to design a qualitative/quantitative system to collect data. Necessarily, the tools have to be compatible with the ordinary training activities. In addition, there will be possible the quantitative evaluation of each athlete, and so the trainer can decide which players are most effective at that time for the next match. Along this process, also the athletes will know their own performance condition and have the stimulus to pursue the maximum efforts in order to be included in the initial roster.

Material & methods

Material needed to implement this monitoring system are: "A meterstick, a black billboard, a sacket of chalk powder, a ruler, a medicine ball, a stopwatch and six balls of any type or size.

The main contents which are to be presented:

Participants: 12 athletes aged from 18 to 30 years old and at least two volleyball sport technicians.

Procedure: each test of the Monitoring System was immediately preceded by a general warm-up, administered equally to each athlete. Subsequently a specific heating was administered, also in equal measure to every athlete.

The general warm-up was so composed, in the order:

- a part of joint mobility of the main joints through their anatomical movements;
- subsequently, the core was activated with 3 series of crunches x10 repetitions, alternated with 3 series of 10 repetitions of backbones: all on the ground and free body;
- followed a run with a progressive speed of 7 minutes. At the end of this race, the athletes prepared themselves on the baseline and performed the following gaits: skipped step with circling forward of the arms; skipped step with circling back arms; carioca; changes of direction; backward run; alternate swings of arms and legs; low skip; high skip; side push step.

Subsequently a specific warm-up was done for each type of test: the same for each athlete.

Specific warm-up:

For tests concerning the vertical jump (jump, block jump) the warm-up includes 8 squats and 8 progressive jumps on the spot; after 30 seconds rest, the athlete had up to 3 repetition possibilities in the spike jump test and in the block jump test.

For the reaction speed test, the warm-up requires an "attention activation". Before using the ruler and numerically calculating the ability to react, I made the boys concentrate by making them grab a tennis ball (that I dropped without warning) for three times and they had to grab it exclusively with the hand with which they would actually perform the test. Later, boys performed the test with the possibility of repeating it once.

For the upper limb strength test, the warm-up involves the use of the elastic in all the following exercises, except for the bending of the arms: 10 extra-rotations of the humerus for both limbs, 10 intrarotations of the humerus for both limbs, 10 military press, 10 rows, 10 bicep curls, 10 extensions of the forearm and finally 8 push-ups on the arms. All for a single series and, after 15 seconds pause, the test started.

For the long jump test, the warm-up includes 8 squats, 8 progressive jumps on the spot with a final rest of 30/45 seconds. The athlete had up to 3 chances to repeat the test.

For the 9-3-6-3-9 speed test, the warm-up consists in 3 shots up to half of the field and back with a mild run and 3 backward sprints up to the bottom of the field (starting from the net) and back with a mild run to the back. After a break of 30/45 seconds, the test started.

For the side-test: the warm-up involves lateral movements along the vertical line of a portion of the field, round-trip at increasing speed; after a rest of 30/45 seconds, the test started.

For the six balls: the warm-up foresees that every single athlete touches every corner of the half court in the shortest possible time. After a break of 45 seconds the test started.

For the shoulder girdle mobility: the warm-up involves circling with a prone grip of a rubber band carried out 3 times, 3 circumferences of the arms without elastic and then the circumferences with the meter to give a number to the joint mobility of the shoulder.

For the flexibility rear chain: heating involves an active lengthening of the posterior kinetic chain (the muscles of the sole of the foot, the soleus, the ischiocruralis, the large gluteus and the piriformis, the square of the loins, the dentate, the large dorsal, the paravertebral, trapezoid, scapula elevator, rhomboid) in a global sense with the 3 Mezieres positions, each held for 30 seconds. Then the athlete positions himself with respect to the meter and tries to flex forward as much as possible trying to touch the floor.

The tests adopted were the following:

Spike Jump:

The athlete with the run-up of the fundamental technical of the "spike" tries to touch as high as possible, with the dominant hand, on a previously measured surface.

Tool used: billboard, plaster powder, meter.

Note on the measurement: This billboard, calibrated on the meter, has been fixed to the wall at a height of 240cm. Athletes were asked to dip their dominant hand's fingers in the chalk powder. Gypsum powder is useful to leave a clear and evident mark on the corresponding centimeters on the black-panel billboard. The run-

up was carried out parallel to the wall, with the side used for the spike facing the wall. Thus, the detected value, for example "+ 50cm" was added to 240cm to get the result of the spike jump: 290cm.

Block Jump:

Standing still under the metered black board, with counter-movement, the height reached by the two fingers is measured. Only a small difference between the height reached between the two hands can be tolerated. Tool used: billboard, plaster powder, meter.

Note on the measurement: This billboard, calibrated on the meter, has been fixed to the wall at a height of 240cm. The athletes were asked to dip the fingers of both hands in the chalk powder and jump with their feet apart as shoulder width, with counter-movement, and to touch the board.

With these data, it is subsequently calculated:

- 1) the elevation with the wall technique (difference between the value of the block jump test and the two-handed reach);
- 2) the elevation with the technical spike run-up (difference between the spike jump test and one-handed reach).

Reaction speed: A line of at least 40 cm is maintained by the coach in a vertical position taking it at the top (the part where there is the value "40cm"). Then the athlete adjusts the thumb, index and middle fingers at a distance of at least 2 cm at the bottom of the line (so where there is a zero or even below). The coach releases the line without warning and the athlete tries to grab it as soon as possible by squeezing the 3 fingers. The value that the ruler indicates at the socket is shown. Lower value, greater ability to react. Tool used: 40cm ruler.

Upper limb strength: The athlete, sitting cross-legged and adhering to a wall, throws the medicine ball using his arms only and starting with the ball at the chest with adducted shoulder blades. The objective of the athlete is to throw as far as possible a medical ball (weighing about 3 kg).

Tools used: 3 kg medical ball, meter.

Long jump: The athlete, with both heels on the baseline (or in any case a starting line), jumps on a metrata tape (or a line of the marked field) as long as possible, without running up and starting from a standstill.

Tool used: meter.

9-3-6-3-9 speed: In a volleyball field, the athlete, lying on the ground in a prone position with his arms folded on his back and with his toes on the bottom line, snaps towards the center-field line at the coach's whistle (then covering 9 meters in forward), touch it with one hand and then run backwards on the 3-meter line (then covering 3 meters backwards) and, after putting at least one foot behind the three-meter line, must touch it with at least one hand. Immediately afterwards, he starts forward again to touch the 3-meter line of the other field (then covering 6 meters forward) and with the same methods described above, touches, this time running backwards, the center-field line (then going through 3 meters backwards) and finally runs forward until you cross the baseline (then traveling 9 meters forward) without having to touch any lines.

The technician positioned on this line measures global time. Less time it takes, speed is greater.

Instrument used: Stopwatch at the tenth of a second, whistle, volleyball court.

Side-test: The athlete, standing at the edge of the three-meter line, on the coach's whistle starts to touch the sub-net line and then the three-meter line alternately. The technician counts the actual touches of the line and not just the simple method. More repetitions there are, greater is the speed of lateral movements.

Instrument used: Stopwatch at the tenth of a second, whistle, volleyball court.

Six balls: In the shortest possible time, the athlete must collect, one at a time, the 6 balls located in the corners of the volleyball court and deposit them in a basket. The balls must be placed with the following way:

- 4 balls on the volleyball court corners, that is on 9 meters;
- 2 in a part of the field;
- 2 on the other side of the field;
- the 2 remaining balls must be placed where there are the net poles;

The basket for the balls will be only one and it will be placed at the bottom of the field, just behind the baseline, at the seat 6.

The start is standing next to the basket. The collection order is free. I preferred to remove the net from the field to perform this test. Instrument used: Chronometer, whistle, volleyball court, 6 balls, basket for balls.

Shoulder girdle mobility: The athlete holds a meter (extendable for at least 2m) and he tries, without letting go, to bring the tape measure completely behind his back. The hands that wrap the meter must have a prone grip on it to allow a correct physiological evaluation, consequent to the freedom degrees of the joints of the anatomical region of the shoulder. The shortest distance obtained is calculated. Smaller distance obtained, greater flexibility of the shoulders. Tool used: meter.

Rear chain flexibility:

The athlete flexes forward, with feet together and knees straight, with the meter placed below the median axis of the body (between the two feet). The distance between the fingers of the overlapping hands and the ground is measured. Lower value, greater flexibility of the posterior chain. The maximum measurable is 0 cm which corresponds to the athlete who, by flexing forward, manages to touch the floor beneath the tip of the foot with the fingers of the overlapping hands, with the knees extended.

Tool used: meter.

Results:

Table 1 november:

Name	Spike jump	Block jump	Spike elevation	Block elevation	Reaction speed
Athlete 1	libero	libero	libero	libero	19cm
Athlete 2	281cm	270cm	60cm	50cm	18cm
Athlete 3	306cm	290cm	65cm	52cm	15cm
Athlete 4	316cm	291cm	73cm	51cm	11cm
Athlete 5	libero	libero	libero	libero	7cm
Athlete 6	298cm	278cm	56cm	29cm	20cm
Athlete 7	293cm	271cm	57cm	38cm	15cm
Athlete 8	291cm	275cm	51cm	38cm	28cm
Athlete 9	274cm	268cm	45cm	43cm	13cm
Athlete 10	280cm	270cm	46cm	39cm	20cm
Athlete 11	308cm	288cm	63cm	47cm	14cm
Athlete 12	286cm	270cm	48cm	37cm	12cm

Table 2 november:

Name	Upper limb	Long jump	9-3-6-3-9	side-test	Six balls	Shoulder mobility	Rear chain flexibility
Athlete 1	5,15m	215cm	9.12s	16rip	36.59s	114cm	17cm
Athlete 2	4.5m	206cm	8,91s	16rip.	37,25s	152cm	20cm
Athlete 3	6,3m	226cm	9,15s	24rip.	39.13s	104cm	15cm
Athlete 4	6,25m	234cm.	9s	16rip.	37,63s	105cm	0cm
Athlete 5	6m	200cm	8,81s	18rip.	40,81s	126cm	9cm
Athlete 6	6.5m	202cm	9.55	14rip.	39.5s	160cm	0cm
Athlete 7	7m	225cm	9.26s	16rip.	36.22s	115cm	19cm
Athlete 8	6,75m	197cm	9,50s	14rip.	37.78	114cm	0cm
Athlete 9	6.2m	200cm	8,78s	15rip.	44.22s	150cm	0cm
Athlete 10	6.95m	183cm	9,22s	15rip.	45s	136cm	15cm
Athlete 11	6,16m	218cm	8,46s	18rip.	38.12s	67cm	0cm
Athlete 12	4.85m	190cm	9.82s	13rip.	42s	118cm	1cm.

Table 3 January:

Name	Spike Jump	Block Jump	Spike elevation	Block elevation	Reaction speed
Athlete 1	libero	libero	libero	libero	11cm
Athlete 2	281cm	270cm	60cm	50cm	18cm
Athlete 3	308cm	292cm	67cm	54cm	14cm
Athlete 4	316cm	291cm	73cm	51cm	11cm
Athlete 5	libero	libero	libero	libero	20cm
Athlete 6	298cm	282cm	56cm	43cm	21cm
Athlete 7	292cm	270cm	56cm	37cm	15cm
Athlete 8	290cm	274cm	50cm	37cm	28cm
Athlete 9	279cm	266cm	50cm	41cm	6cm
Athlete 10	280cm	270cm	46cm	39cm	13cm
Athlete 11	310cm	290cm	65cm	49cm	15cm
Athlete 12	286cm	270cm	48cm	37cm	12cm

Table 4 January:

Name	Upper limb	Long jump	9-3-6-3-9	side-test	Six balls	Shoulder mobility	Rear chain flexibility
Athlete 1	5m	215cm	9.12s	18rip	36.50s	96cm	12cm
Athlete 2	4.5m	206cm	8,91s	16rip.	37,26s	152cm	20cm
Athlete 3	6.4m	230cm	9,14s	24rip.	39.15s	100cm	16cm
Athlete 4	6.30m	238cm.	9s	16rip.	37,60s	105cm	0cm
Athlete 5	6.80m	230cm	8,81s	18rip.	40,80s	128cm	10cm
Athlete 6	6.80m	250cm	9.55	18rip.	39.4s	138cm	0cm
Athlete 7	7m	225cm	9.26s	16rip.	36.21s	115cm	19cm
Athlete 8	6,75m	197cm	9,50s	14rip.	37.78	114cm	0cm
Athlete 9	6.2m	215cm	8,90s	17rip.	44.50s	147cm	0cm
Athlete 10	6.90m	215cm	9,20s	18rip.	45s	140cm	0cm
Athlete 11	6.70m	232cm	8,46s	20rip.	38s	60cm	0cm
Athlete 12	4.85m	190cm	9.82s	13rip.	42s	118cm	1cm.

Table 5 March:

Name	Spike jump	Block jump	Spike elevation	Block elevation	Reaction speed
Athlete 1	libero	libero	libero	libero	11cm
Athlete 2	290cm	270cm	69cm	50cm	10cm
Athlete 3	310cm	294cm	69cm	56cm	12cm
Athlete 4	316cm	291cm	73cm	51cm	11cm
Athlete 5	libero	libero	libero	libero	15cm
Athlete 6	298cm	282cm	56cm	43cm	20cm
Athlete 7	298cm	280cm	62 cm	47cm	12cm
Athlete 8	287cm	273cm	47 cm	36cm	13cm
Athlete 9	275cm	263cm	46 cm	38cm	10cm
Athlete 10	280cm	270cm	46cm	39cm	15cm
Athlete 11	310cm	290cm	65cm	49cm	14cm
Athlete 12	286cm	270cm	48cm	37cm	12cm

Table 6 march:

Name	Upper limb	Long jump	9-3-6-3-9	side-test	Six balls	Shoulder mobility	Rear chain flexibility
Athlete 1	6.13m	250cm	9,41 s	17rip.	35.34s	85cm	0cm
Athlete 2	6.63m	250cm	8, 43s	20rip.	34.68s	110cm	20cm
Athlete 3	7.4m	266cm	9 ,10s	24rip.	37s	104cm	15cm
Athlete 4	6.13m	270cm	9.40s	19rip.	38.41s	105cm	0cm
Athlete 5	6.73m	250cm	9 s	19rip.	39s	126cm	9cm
Athlete 6	7.8m	242cm	8,44 s	15rip.	36.63s	160cm	0cm
Athlete 7	7.63m	265cm	8, 44 s	21rip.	35.71s	115cm	19cm
Athlete 8	8.23m	230cm	9.20 s	17rip.	38.10s	114cm	0cm
Athlete 9	6.9m	240cm	8.90s	18rip.	42.2s	150cm	0cm
Athlete 10	7m	230cm	9.30s	15rip.	44.2s	136cm	15cm
Athlete 11	7m	248cm	8.37 s	18rip.	34.14s	67cm	0cm
Athlete 12	4.85m	190cm	9.82s	13rip.	42s	118cm	1cm.

Data collection and analysis / Statistical analysis:

Table 7. T-Test between the two series of Spike jump

	Coupled differences					t	Gl	Sign. (Two-tailed)
	Average	Std Deviation	Average standard error	Confidence interval of 95% difference				
				lower	Higher			
VAR01 VAR02	-1,75000	3,22279	,93034	-3,79766	,29766	-1,881	11	,087

Significance level > 0.05 – There is no significant difference in “Spike jump” (0.087)

Table 8. T-Test between the two series of Block jump

	Coupled differences					t	Gl	Sign. (Two-tailed)
	Average	Std Deviation	Average standard error	Confidence interval of 95% difference				
				lower	Higher			
VAR01 VAR02	-1,16667	3,45972	,99874	-3,36487	1,03154	-1,168	11	,267

Significance level > 0.05 – There is no significant difference in “Block jump” (0.267)

Table 9. T-Test between the two series of Spike elevation

	Coupled differences					t	Gl	Sign. (Two-tailed)
	Average	Std Deviation	Average standard error	Confidence interval of 95% difference				
				lower	Higher			
VAR01 VAR02	-1,75000	3,22279	,93034	-3,79766	,29766	-1,881	11	,087

Significance level > 0.05 – There is no significant difference in “Spike elevation” (0.087)

Table 10. T-Test between the two series of Block elevation

	Coupled differences					t	Gl	Sign. (Two-tailed)
	Average	Std Deviation	Average standard error	Confidence interval of 95% difference				
				lower	Higher			
VAR01 VAR02	-2,16667	5,02418	1,45036	-5,35888	1,02555	-1,494	11	,163

Significance level > 0.05 – There is no significant difference in “Block elevation” (0.163)

Table 11. T-Test between the two series of Upper limb

	Coupled differences					t	Gl	Sign. (Two-tailed)
	Average	Std Deviation	Average standard error	Confidence interval of 95% difference				
				lower	Higher			
VAR01 VAR02	-81,83333	65,32413	18,85745	-123,33831	-40,32836	-4,340	11	,001

Significance level > 0.05 – There is a significant difference in “Upper limb” (0.001)

Table 12. T-Test between the two series of Long jump

	Coupled differences					t	Gl	Sign. (Two-tailed)
	Average	Std Deviation	Average standard error	Confidence interval of 95% difference				
				lower	Higher			
VAR01 VAR02	-36,25000	12,74309	3,67861	-44,34657	-28,15343	-9,854	11	,000

Significance level > 0.05 – There is a significant difference in “Long jump” (0.000)

Discussion

With these simple tables we managed to build a system for monitoring the progress of training activities in an entire season. The surveys took place every two months. Each of detections cycle we went to check which fundamentals were increased and which not. The players appeared very excited about the new monitoring system. These tests have supported the technical and tactical evaluation and intrinsic motivation of the boys to be examined.

Conclusions

From the results it turns out that the training activities were constantly monitored and, therefore, the purpose can be considered achieved because the coach has occurred over time the level of athletes’ performance also noting a final performance improvement, confirmed by data collected during the competitions too. In conclusion, the study was useful for the purpose even if it is necessary to refine the assessment tools and adapting them to training plans.

Conflicts of interest - If the authors have any conflicts of interest to declare.

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