Saúde e Pesquisa
DOI: 10.17765/2176-9206.2022v15n1.e8903

FIFA11 + Part 2 - Effect on dynamic balance in young volleyball athletes

FIFA11+ Parte 2 - Efeito no equilíbrio dinâmico em jovens atletas de voleibol

Igor dos Reis Bones[1], Fábia Milman Krumholz[2], Ana Paula Barcellos Karolczak[3]

[1] Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre (RS), Brazil; [2] Master in Ciências do Movimento Humano from the Universidade Federal do Rio Grande do Sul. Professor at the School of Health at the Universidade do Vale do Rio dos Sinos (UNISINOS), Porto Alegre (RS), Brazil; [3] PhD in Public Health from the Universidade do Vale do Rio dos Sinos. Professor at the School of Health at the Universidade do Vale do Rio dos Sinos (UNISINOS), Porto Alegre (RS), Brazil.

[*] **Corresponding author**: Igor dos Reis Bones. E-mail: igor.bones@hotmail.com

ABSTRACT
The effects of FIFA11 + Part 2 program with dynamic balance (DB) on young volleyball athletes are investigated. Experimental cross-over, with a sample of 8 athletes (16.4 ± 0.7 years, 1.87 ± 0.07m), randomly divided into two groups, with 10 sessions. The two groups were submitted to intervention and control at different times, respecting the 13-day washout period. Y-Balance Test (YBT) was employed prior and posterior to each time. Results of FIFA11 + Part 2 effect on YBT, through the difference in anterior distance media and composite score, failed to show statistical effects on DB between interventions (p = 0.128; p = 0.740; p = 0.492, respectively), momentum (p = 0.612; p = 0.697; p = 0.237, respectively) and intervention x momentum (p = 0.778; p = 0.433; p = 0.590, respectively). No improvement in DB was detected in young volleyball athletes after applying FIFA11 + Part 2 Program.

Keywords: Balance postural. Physical therapy Specialty. Volleyball.

RESUMO
Investigar os efeitos do programa FIFA11+ Parte 2 no equilíbrio dinâmico (ED) em jovens atletas de voleibol. C*ross-over* experimental, com amostra constituída por oito atletas (16,4±0,7 anos, 1,87±0,07m) divididos de maneira aleatória em dois grupos, submetidos a dez intervenções. Ambos os grupos foram considerados intervenção e controle em momentos distintos, respeitando o período de *washout* de 13 dias. Antes e após cada um destes momentos os jovens atletas realizaram o *Y-Balance Test* (YBT). Os resultados do efeito do FIFA11+ Parte 2 no YBT, a partir da variação de médias da distância anterior e escore composto, não mostraram diferenças estatísticas no ED entre intervenção (p=0,128; p=0,740; p=0,492, respectivamente), momento (p=0,612; p=0,697; p=0,237, respectivamente) e intervenção *x* momento (p=0,778; p=0,433; p=0,590, respectivamente). Não foi identificado aprimoramento no ED em jovens atletas de voleibol após a realização do programa FIFA11+ Parte 2.

Palavras-chave: Equilíbrio postural. Fisioterapia. Voleibol.

Received in June 24, 2020
Accepted on February 15, 2021

INTRODUCTION

Volleyball is one of most practiced sports worldwide[1, 2]. Within the competition context, players have an average of three to four lesions for every thousand play hours. The number is halved in training[3]. Although volleyball has always been considered a safe sport when other modalities are compared, due to lack of physical contact, its technical base demands a complex combination in the athlete´s speed, resistance, force and coordination, with maximum effort on the neuro-muscular-skeleton frame[3,4].

Changes in static and dynamic equilibrium may predispose athletes to lesions since inadequate motor and posture control overload joints and muscle chains[5-8]. Further, an immature body structure in children and adolescents, with a set of possible neuro-muscular dysfunctions, coupled to repetitions of motor gestures, features a potential health issue for young people in general[1,3]. Preventive methods that capacitates Dynamic Balance (DB) may reveal a decrease in the index of injuries and should be incorporated in the team routine.

Prevention integral strategies are usually employed in sports, especially during athletes´ warm-up period[9,10]. The exercise protocol FIFA11+ has been developed since 2006 by the Medical Assessment and Research Centre, linked to the Fédération Internationale de Football Association (FIFA)[9]. Warm-up program, based on scientific evidence, was initially idealized for football professional players, although quickly disseminated to other types of sports[11–13].

FIFA11+ comprises a set of 15 exercises, divided into three parts, undertaken during the warm-up period, during approximately 20 minutes. Running activities with changes in direction, accelerations and de-accelerations, forward and lateral displacements with jumps are analyzed in Parts 1 and 3, whilst Part 2 deals with strength, plyometrics and balance, divided into three levels of complexity and physical demands[9,14–16]. The program diminishes repercussions of instrinsic factors in athletes, improve such capacities as stability of the trunk, static and dynamic balance, muscule strength, and decreases the number of lesions[11,17].

Current analysis investigates the effect of the program of FIFA11+ Part 2 exercises in DB of the lower limbs (LLs).

METHODOLOGY

Current study may be characterized as an experimental cross-over experimental, with a convenience sample of a single voluntary team[18], initially comprising 11 athletes, aged between 15 and 17 years, members of a juvenile volleyball team of a private school in the Vale dos Sinos region, Rio Grande do Sul state, Brazil, with a year practice in the sport modality. Exclusion criteria comprised lesions which incapacitated the player during evaluation, or rather, any complaint that made the player unable to participate within the normal time during training, two consecutive absences during interventions,

and players quitted from the club during research.

The athletes´ tutors signed a Term of Free Consent prior to the start of interventions. The study was approved by the Committee for Ethics in Research of the Universidade do Vale do Rio dos Sinos (UNISINOS) on July 2018, n. 2.733.976.

Data were retrieved in the afternoon prior to training by the respective team, with a total of eight week, between August and September 2018. Athletes were selected at random by simple draw and divided into Group 1 (G1) and Group 2 (G2). Incapacitating lesions, such as laterality, were self-reported by a questionnaire with social and demographic data. The two groups were then submitted to YBT. G1 and G2 were alternatively an experimental group (EG) and a control group (CG). It was a GE when it received protocol FIFA11+ Part 2 associated with regular sports training and it was a CG when merely submitted to the team´s regular sport training.

Interventions were undertaken in groups, starting on the day following evaluations. In the first place, G1 was EG, with a total of 10 interventions during six weeks per group. YBT was applied again on the day following the end of interventions with G1, in the two groups, and again after the 13-day washout period.[19] The start of exercise protocol with G2 occurred on the day following evaluation, within the same shift and frequency for G1; at the end, YBY was undertaken with all the participants in the research (Figure 1).

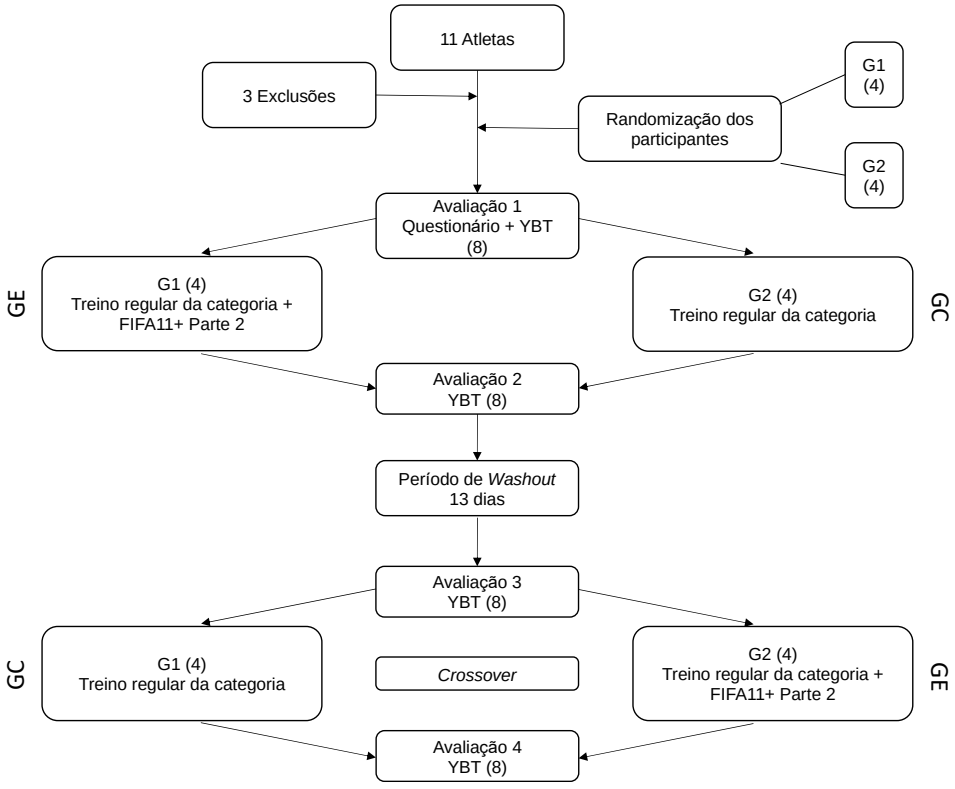

Figure 1. Layout and design of the study.
Source: the authors.

Evaluations were done at the sports gymnasium of the institution, at room temperature. Estimated MSIS discrepancy measures were referenced to the anterior-upper iliac spine up to the medial malleolus. Evaluation with YBT employed three measuring tapes fixed to the ground, intersecting at one common place and forming two angles of 135º with regard to the prior direction[7,20]. The athletes were asked to place the dominant foot, barefoot, with the hallux at the tapes cross points and to displace the contra-lateral lower member in the anterior, postero-lateral and postero-medial directions, respectively. Distance reached was measured and the last three measurements for each lower limb were taken into consideration for analysis[20,21]. Results was not taken into account when the athlete failed to maintain the position required or when the athlete touched the foot during displacement and discharged weight on the ground, or s/he failed to return to the initial position[5,21].

The three previous valid measurements and the greatest measurement obtained in each direction were respectively taken into account to calculate the variation of average distance in the previous direction and the LLs compound score[5,22,23]. Compound score is the sum of the greatest LLs measurement obtained for each direction in YBT of the respective disrepance measurement of LLs length normalized thrice[20]. Asymetries greater than 4 cm in mean result in the anterior direction and compound scores lower than 89% and 94% indicate deficit in posture control[8,23].

Exercise protocol was composed of Part 2 of FIFA11+ entirely, with six proposed activities (Chart 1). Initially, all athletes underwent Level 1, and changes in intensity were determined by the capacity of the athletes for tasks. Modification in the exercises were undertaken according to FIFA11+, classified at Levels 1 to 3, according to the progression of complexity and physical demands[11,14,16].

Quantitative variations are described by means and standard deviations, whilst variables by absolute and relative frequencies. Co-Variance (ANCOVA) compared pre- and post-intervention means according to type at 5% significance level ($p<0.05$); analyses were performed by SPSS 21.0

Chart 1. FIFA11+ Part 2: Intervention protocol

Exercise	Description of complexity	Picture
Supine		
Level 1	Static	
Level 2 *	Elevation of one lower limb	
Level 3	Alternate elevation of the lower limbs	
Lateral supine		
Level 1	Static	
Level 2	Elevation and depression of hip	
Level 3 *	With elevation of lower limb	
Thigh		
Level 1 *	3 to 5 repetitions	
Level 2	7 to 10 repetitions	
Level 3	12 to 15 repetitions	
Support on one foot		
Level 1	Holding a ball	
Level 2	Throwing a ball	
Level 3 *	Imbalance caused by mate	
Squatting		
Level 1	Free, with the elevation of the tip of the foot	
Level 2 *	Deep	
Level 3	Unilateral	
Jump		
Level 1	Vertical	
Level 2 *	Unilateral, lateral displacement	
Level 3	Multi-directional	

Source: Adaptation of FIFA 11+ Handbook: Complete Warm-up program for the prevention of lesions in football (2011).
(*) Level of exercise shown in the picture.

RESULTS

Final sample comprised eight male athletes, aged 15-17 years old, minimum height 1.78m and maximum height 1.97m, category volley infant-juvenile, students, most of whom at high school. The five positions are given in current analysis (Table 1). All athletes said they were right-handed, with a frequency of four trainings per week with the team and with volleyball practice time at high yield between 12 and 84 months. Three athletes were excluded from the study: two were excluded due to self-reported lesions at the initial evaluation and one was excluded due to being contracted by the club for work in the national volley team during the period.

Table 1. General characteristic of the sample (n=8). RS, 2018

Variable	Total (n=8)
Age (years)	
Mean ± standard deviation	16.4 ± 0.7
Height (m)	
Mean ± standard deviation	1.87 ± 0.07
Schooling level - n (%)	
Year 8 Basic Schooling	1 (12.5)
1st year High School	4 (50.0)
2nd year High School	2 (25.0)
3rd year High School	1 (12.5)
Position in volleyball - n (%)	
Setter	2 (25.0)
Middle hitter	3 (37.5)
Opposite hitter	1 (12.5)
Outside hitter	1 (12.5)
Defensive/Líbero	1 (12.5)

Source: the authors.

Evaluation of the difference of discrepancy estimate between LLs detected that the athletes had a clinical difference of up to 1 cm during the four evaluation times under analysis, which is within the 2 cm limit of alteration permitted[25]. There was no difference between interventions and conventional sports training ($p = 0.061$) and between pre- and post- times for the ten interventions with exercise protocol FIFA11+ ($p = 0.528$). There was consequently no difference when intervention and time effect was assessed ($p = 0.664$) (Table 2).

Table 3 gives athletes´ performances in YBT. Difference between left and right LLs means in the anterior distance was 2.9±2.2cm and 2.3±1.5cm in pre- and post-intervention, respectively. When the team underwent mere training, variation between means was initially 4.0±3.7cm; afterwards, it was 3.9±3.3cm, with no significance ($p = 0.788$). Differences greater than 4 cm between YBT anterior averages reveal a positive result and suggest a neuro-muscle deficit that may cause DB alterations in the athlete[8].

Table 2. Comparison of difference (Δ) in the length discrepancy of lower limbs, before and after 10 sessions with intervention (IG) and control (CG) group FIFA11+, (n=8). RS, 2018

Variable	IG	CG	Effects (rate-p)		
	Mean ± SD	Mean ± SD	Intervention	Time	Intervention x Time
Δ discrepancy (cm)			0.061	0.528	0.644
			IC 95%	**IC 95%**	
Before	0.3 ± 0.4	0.8 ± 0.5	[0.06 : 0.44]	[0.25 : 0.75]	
After	0.3 ± 0.5	0.6 ± 0.7	[0.22 : 1.09]	[0.05 : 0.76]	

Source: authors.

There were no significant changes between direct Compound Score between interventions (p=0.740) and times (p=0.697). Similar behavior was detected in Compound Score of the left lower members between intervention and times (p=0.590) (Table 3).

Table 3. Comparison of mean rates of anterior displacement of the right lower member (RLM) and left lower member (LLM) and Compound Score (CS) of the Y-Balance Test (YBT), before and after 10 sessions with intervention group (IG) and control group (CG). (n=8)

Variable YBT	IG	CG	Effects (rate-p)		
	Mean±SD	Mean± SD	Intervention	Time	Intervention x Time
Média Anterior (cm)			0.128	0.612	0.778
			IC 95%	**IC 95%**	
Before	2.9 ± 2.2	4.0 ± 3.7	[1.3 : 3.8]	[1.2 : 5.7]	
After	2.3 ± 1.5	3.9 ± 3.3	[1.6 : 6.3]	[1.6 : 4.5]	
CS - RLM (%)			0.740	0.697	0.433
			IC 95%	**IC 95%**	
Before	102.87 ± 6.01	102.5 ± 7.55	[97.4 : 107.1]	[97.2 : 108.2]	
After	101.62 ± 5.85	103.00 ± 9.87	[95.7 : 109.8]	[96 : 108.6]	
CS – LLM (%)			0.492	0.237	0.590
			IC 95%	**IC 95%**	
Before	101.12 ± 6.08	101.87 ± 8.39	[96.1 : 106.7]	[95.7 : 107.3]	
After	101.62 ± 7.19	103.50 ± 9.54	[95.3 : 110.1]	[96.1 : 109]	

Source: authors.

DISCUSSION

Current study determines whether Part 2 of the FIFA11+ protocol exercises could improve volley young athletes´ DB. YBT was employed to evaluate indirectly adolescents´ DB after 10 interventions. No significant alterations were identified. Two studies on FIFA11+ in its entireness showed different results from those in current study[26,27]. A study with 226 young female football athletes, aged 13-18 years

identified improvement in DB after undergoing warm-up protocol for 10 weeks[26]. In another study, there was a DB evolution in 20 male football athletes, aged 12.91 years, on an average, after six weeks with FIFA11+.[27] Several aspects may have affected divergent results, namely, the number of participants, intervention period, sports modality. In current analysis, interventions were undertaken in athletes of a single team of one modality.

Intervention time, with 10 meetings during three weeks, may have triggered results obtained. There is no agreement with regard to frequency of interventions with warm-up protocols such as FIFA11+, suggesting an inability in improving the athletes´ physical performance and their aptitude in neuro-muscle-skeleton variables, such as DB, with two weekly meetings during 10 weeks of intervention[28,29]. Meta-analysis has revealed that the protocol of FIFA11+ exercises improved DB, without mentioning the application times of results[17]. Therapeutic success proposed by warm-up protocols are related to intensity, adherence and frequency of activities by team and athletes[26]. It is well-known that neuromuscular improvement, as every other motor learning, occurs through repetition and intensity of the stimulus[30].

The organization and integration of the sensorial, exteroceptive and proprioceptive systems occurs gradually, according to age and experience[12]. Therefore, sports practice influences the maturity and improvement of the sensorial-motor system, with consequences for of posture control[12]. In spite of motor acts, such as running, jumping and displacement, are similar in collective sports, intensities, neuromuscular demands and physical aptitudes are unique for each modality and develop an adaptation complex which may have repercussions in neuromuscular behavior and may influence YBT results[5,13,31]. Further, the difference between sports modalities and the athlete´s technical level may directly affect DB[32].

Volleyball is characterized as a sports with little or no physical contact but with repetitions of vigorous motor acts and great impacts[1]. The recurrence of necessary motor functions for volleyball practice coupled to indispensable speed and effort for competitivity bring about an increase in stress of the organic tissues[1,33]. The effects of sports specialization in YBT performance in different modalities was investigated and variations were reported when compared to individual and collective practice[5,21]. Consequently, stimuli by FIFA11+ Part 2 may not have been the most adequate for the best DB improvement in young volleyball athletes.

In its entirety, FIFA11+ reduces the repercussions of intrinsic factors in athletes, improving skills, such as trunk stability, static and dynamic balance and muscle strength[11,34]. Part 1 and 2 may have an effective proprioceptive control of the trunk, MSIS and abdominal muscle complex, with a successful dynamic stability during sports activity[26]. Variables, such as body center stabilization, muscle

strength and MSIS range of motion, affect YBT results[31]. However, FIFA11+ Part 2 does not address activities for mobility gain. Since current analysis employed only the second part of the program, it may be suggested that DB does not undergo significant changes with the application of a fraction of the protocol in the population concerned.

Several sports modalities employ YBT to evaluate the predisposition of lesions in LLs in athletes[6,7,23,35]. Quick, effective and low-cost evaluation of athletes on flat ground was one of the reasons for the choice[5,31]. Anyhow, test sensitivity has been questioned by researchers[31]. The lack of a standard instrument to evaluate DB demands several estimation methods to classify this aspect in the literature[32]. Several data collection instruments may be options for DB evaluation. They are capable of calculating the time of stabilization of the limb´s reaction after impacting the ground through force platforms or the association of visual and proprioceptive components with the vestibular system by computerized analysis[7.12.36].

FINAL CONSIDERATIONS

DB improvement in young volleyball athletes could not be detected after 10 interventions by FIFA11+ Part 2. FIFA11+ has a proven efficaciousness in athletes of different modalities. Due to the characteristics of volleyball, Part 2 was applied. It may be recommended that in further studies the specifically volleyball protocol be adapted since there is a deep distinction between the modality in current study and that described in the literature.

APPLICATIONS

Establishment of concepts for the use of warm-up protocols to prevent lesions in young volleyball athletes through functional, low-cost and easy aspects.

REFERENCES

1. Vanderlei FM, Bastos FN, Tsutsumi GYC, Vanderlei LCM, Netto J, Pastre CM. Characteristics and contributing factors related to sports injuries in young volleyball players. BMC Res Notes. 2013;6(1):1-7.

2. Moreira TS, Mezzadri FM, Souza DL de, SIlva MM e. O perfil da produção científica em língua portuguesa sobre o voleibol. Motrivivência. 2017;29(51):119-35.

3. Bere T, Kruczynski J, Veintimilla N, Hamu Y, Bahr R. Injury risk is low among world-class volleyball players: 4-year data from the FIVB Injury Surveillance System. Br J Sport Med. 2015;49(17):1132-1137.

4. Kilic O, Maas M, Verhagen E, Zwerver J, Gouttebarge V. Incidence, aetiology and prevention of musculoskeletal injuries in volleyball: A systematic review of the literature. Eur J Sport Sci. 2017;17(6):765-793.

5. Lai WC, Wang D, Chen JB, Vail J, Rugg CM, Hame SL. Lower Quarter Y-Balance Test Scores and Lower Extremity Injury in NCAA Division I Athletes. Orthop J Sport Med. 2017;5(8).

6. Wright AA, Dischiavi SL, Smoliga JM, Taylor JB, Hegedus EJ. Association of Lower Quarter Y-Balance Test with lower extremity injury in NCAA Division 1 athletes: an independent validation study. Physiotherapy. 2017;103(2):231-236.

7. Gribble PA, Hertel J, Plisky P. Using the Star Excursion Balance Test to assess dynamic postural-control deficits and outcomes in lower extremity injury: a literature and systematic review. J Athl Train. 2012;47(3):339-357.

8. Gonell AC, Romero JAP, Soler LM. Relationship Between the Y Balance Test Scores and Soft Tissue Injury Incidence in a Soccer Team. Int J Sport Phys Ther. 2015;10(7):955-966.

9. Soligard T, Nilstad A, Steffen K, et al. Compliance with a comprehensive warm-up programme to prevent injuries in youth football. Br J Sport Med. 2010;44(11):787-793.

10. Fernandes A de A, Silva CD da, Costa IT da, Marins JCB. The "FIFA 11+" warm-up programme for preventing injuries in soccer players: a systematic review. Fisioter mov. 2015;28(2):397-405.

11. Longo UG, Loppini M, Berton A, Marinozzi A, Maffulli N, Denaro V. The FIFA 11+ program is effective in preventing injuries in elite male basketball players: A cluster randomized controlled trial. Am J Sport Med. 2012;40(5):996-1005.

12. Oliano VJ, Teixeira LP, Lara S, Balk RDS, Fagundes SG. Effect of FIFA 11+ in addition to conventional handball training on balance and isokinetic strength. Rev Bras Cineantropom Desempenho Hum. 2017. [19(4):406-415.

13. Slauterbeck JR, Reilly A, Vacek PM, et al. Characterization of Prepractice Injury Prevention Exercises of High School Athletic Teams. Sport Heal. 2017;9(6):511-517.

14. Silvers-Granelli H, Mandelbaum B, Adeniji O, et al. Efficacy of the FIFA 11+ Injury Prevention Program in the Collegiate Male Soccer Player. Am J Sport Med. 2015;43(11):2628-2637.

15. Jäger T, Kiefer J, Werner I, Federolf PA. Could Slackline Training Complement the FIFA 11+ Programme Regarding Training of Neuromuscular Control? Eur J Sport Sci. 2017;17(8):1021-1028.

16. Fédération Internationale de Football Association (FIFA). FIFA 11+ Manual: Um programa de aquecimento completo para prevenir lesões no futebol. Zurich: FIFA; 2011.

17. Gomes Neto M, Conceição CS, De Lima Brasileiro AJA, De Sousa CS, Carvalho VO, De Jesus FLA. Effects of the FIFA 11 training program on injury prevention and performance in football players: A systematic review and meta-analysis. Clin Rehabil. 2017;31(5):651-659.

18. Hoch MC, Welsch LA, Hartley EM, Powden CJ, Hoch JM. Y-Balance Test Performance Following a Competitive Field Hockey Season: A Pretest-Posttest Study. J Sport Rehabil. 2017;26(5). doi: 10.1123/jsr.2017-0004.

19. Paschalis V, Nikolaidis MG, Theodorou AA, Giakas G, Jamurtas AZ, Koutedakis Y. Eccentric exercise affects the upper limbs more than the lower limbs in position sense and reaction angle. J Sport Sci. 2010;28(1):33-43.

20. Hébert-Losier K. Clinical Implications of Hand Position and Lower Limb Length Measurement Method on Y-Balance Test Scores and Interpretation. J Athl Train. 2017;52(10):910-917.

21. Miller MM, Trapp JL, Post EG, et al. The Effects of Specialization and Sex on Anterior Y-Balance Performance in High School Athletes. Sport Heal. 2017;9(4):375-382.

22. Hooper TL, James CR, Brismée JM, et al. Dynamic balance as measured by the Y-Balance Test is reduced in individuals with low back pain: A cross-sectional comparative study. Phys Ther Sport. 2016;22:29-34.

23. Linek P, Sikora D, Wolny T, Saulicz E. Reliability and number of trials of Y Balance Test in adolescent athletes. Musculoskelet Sci Pr. 2017;31:72-75.

24. Wilson BR, Robertson KE, Burnham JM, Yonz MC, Ireland ML, Noehren B. The Relationship Between Hip Strength and the Y Balance Test. J Sport Rehabil. 2018;27(5):445-450.

25. Pereira CS, Sacco I de CN. Desigualdade estrutural discreta de membros inferiores é suficiente para causar alteração cinética na marcha de corredores? Acta ortop bras. 2008;16(1):28-31.

26. Steffen K, Emery CA, Romiti M, et al. High adherence to a neuromuscular injury prevention programme (FIFA 11+) improves functional balance and reduces injury risk in Canadian youth female football players: a cluster randomised trial. Br J Sport Med. 2013;47(12):794-802.

27. Dunsky A, Barzilay I, Fox O. Effect of a specialized injury prevention program on static balance, dynamic balance and kicking accuracy of young soccer players. World J Orthop. 2017;8(4):317-321.

28. Lopes M, Simões D, Rodrigues JM, Costa R, Oliveira J, Ribeiro F. The FIFA 11 + does not alter physical performance of amateur futsal players . J Sport Med Phys Fit. 2018.

29. Lindblom H, Waldén M, Hägglund M. No effect on performance tests from a neuromuscular warm-up programme in youth female football: A randomised controlled trial. Knee Surg Sport Traumatol Arthrosc. 2012;20(10):2116-2123.

30. Palazzin, A. Aprendizado motor em crianças e adultos normais: semelhanças e diferenças. São Paulo: Universidade de São Paulo, Instituto de Psicologia; 2007. 95 p. (Master´s dissertation in Psycology).

31. López-Valenciano A, Ayala F, De Ste Croix M, Barbado D, Vera-Garcia FJ. Different neuromuscular parameters influence dynamic balance in male and female football players. Knee Surg Sport Traumatol Arthrosc. 2018.

32. Butler RJ, Southers C, Gorman PP, Kiesel KB, Plisky PJ. Differences in soccer players' dynamic balance across levels of competition. J Athl Train. 2012;47(6):616-620.

33. Marshall SW, Hamstra-wright KL, Dick R, Grove KA, Agel J. Descriptive epidemiology of collegiate women's softball injuries: National Collegiate Athletic Association Injury Surveillance System, 1988-1989 through 2003-2004. J Athl Train. 2007;42(2):286-294.

34. Meurer MC, Silva MF, Baroni BM. Strategies for injury prevention in

Brazilian football: Perceptions of physiotherapists and practices of premier league teams. Phys Ther Sport. 2017;28:1-8.

35. Read PJ, Oliver JL, De Ste Croix MBA, Myer GD, Lloyd RS. A Review Of Field-Based Assessments Of Neuromuscular Control And Their Utility In Male Youth Soccer Players. J Strensearch. 2017.

36. Chen Y-S, Lai W-L, Hou C-W, Chen C-H, Chiu Y-W, Bezzera P. Effect of post warm-up resting interval on static and dynamic balance, and maximal muscle strength followed by the FIFA 11+ and dynamic warm-up exercises. J Sport Med Phys Fit. 2018.