# 101 - RESISTED TRAINING RESPONSE IN THE WATER (WATER FORCE) IN PROFESSIONAL FUTSAL PLAYERS

HENRIQUE FRANÇA, FABRÍCIO MADUREIRA.
Faculdade de Educação Física de Santos- FEFIS- UNIMES Santos-SP
swinfast@hotmail.com

During the last decade, the Futsal passed by a series of evolutions in it tactical aspects, technician and physical aggregated I the changes in the rules of the game.The new aspect of the game mainly modified the determinative physical characteristics for a good performance of the athlete, becouse the rules proposals by the FIFUSA (International Federacy of Fusal) had been modified in 1990 with the junction to the "Soccer of Five" recognized modality by the Federation internaciolale Football Association (FIFA) as cite by Lucena (1998), becoming the game more dynamic. During the departures proposals for the FIFUSA the game was considered slower, the official ball was heavier, of lesser circumference and difficult conduction, becoming less fast the tactical standard. With the junction with the FIFA in the Nineties, these characteristics had been modified to become the game more attractive and dynamic, one of the main modifications happened with the game basic instrument the Ball, that it started to be bigger, with a circumference of sixty and four centimeters, and lighter with in the maximum four hundred and thirty grams. According to Sun (1998) the alterations occurred in the ball allow that the same one become quicker, what it demands of the athlete a bigger domain and control. The more dynamic standard of the games demanded that the professionals emphasized the physical condition of the players, for Weineck (2000) the athlete who desires to have a good income during the game must prioritize the physical factors of the performance. The bigger speed during the disputes caused a modification in the physical training structure of the players, instead of a bigger cardiovascular condition, what it was emphasized in the Seventies as the best form of gaining resistance for the game, today the component muscular strength assumes a prominence place and must to be prioritized during the specific training as argues Shinkarenco (1997). According to Guedes (1997), the strength is the capacity to exert muscular tension against one determinate resistance, being able to improve the speed with its increase, improving two primordial specific characteristics for the Futsal athletes, they are: power of reaction and changes of direction in speed. The training resisted program in the water (Water Force) appeared for three years, elaborated by teachers Fabricio Madureira and Cassia Campi, whose main objectives were the improvement of the muscular condition and the standard of esthetic for the Water Exercise practitioners. In the water exists the hydrostatic pressure that added with the density and the turbulence of this environment can improve the resistance against the members in movement. Using these concepts, was elaborated a training program whose the main characteristic is the execution of movements with great amplitude and speed, increasing the active and passive drag forces. One of the main objectives of this program is to offer an efficient alternative to train the muscular strength. In some studies done with the Water Force program, It was found sufficiently significant resulted about the increase of the strength. According to Guedes et all (2003) significant increases of strength were found in active youngsters. Another study realized by Rocha et al (2004) testing abdominal resistence strenght showed no statistic difference between the group that trained with the Water program, and the group that trained the abdominal muscles in a terrestrial environment, after 12 weeks. Vilarinho et al (2004) obtained significant results in muscular hipertrofy after three months of training Water Force with ahealthy young group. Rodrigues et al (2004) found significant results with elderly groups that used the program, where the group that trained the Water Force program improved their performance on daily life activity tests, in comparison to those who practiced specific gymnastic for third age. These works have corroborated with the internationalliterature found, Ostonic (2003) and Robinson (2004). The analysis of these results makes us believe that the program can be efficient for the muscular force training, thus we redirected the program in order to complement the specific work carried through by players of Futsal. Due to the necessity of the athletes to be physically stronger, during the matches. Thus, we tried to elaborate located exercises applied to the specificity of the motor gestures executed during the games, intending to potencialize the determinant capacities of a match: Maximum Force, Strength Resistance and Explosive Force.

**Methods:**

**Subject:** 16 athletes of the masculine sex with age between 18 and 25 years with averages of height 1,77 m±0,06 and weight 71,240 ±6,56 kg participated of this study. All the individuals were professional Futsal players of the Santos Team with more than 10 years of practice in the modality. A point that must be emphasized is that the players group were already training for six months when the Water Force training started, aiming for the second semester of the season.

**Performed tests:** Before data collection the athletes went through one week of apprenticeship of the tests where procedures information had been given, as well as the accomplishment of each test in experimental form, with the teachers guidance about where the errors in the execution procedures could appear, valorizing the importance of the results for the evaluation and reducing the error margin of the tests on data collection.The evaluation week was held right after the experimental week with the following tests:

a) Total body weight (TBW) and height (H);
b) Relative fat (RF) and thin mass body weight (TMBW);
c) Anaerobic (ANPT) and aerobic (AEPT) power test;
d) Flexibility (FL);
e) Agility (AG);
f) Inferior limbs dynamic maximum weight (IL DMW);
g) Abdominal (AP) and upper limbs power (ULP)
h) Horizontal motion (HM)

All tests performed at the evaluation week are mentioned by Giannichi (1998).

**Program Description:**The athletes had a 3 times a week training session lasting 50 minutes each. The sets of exercises were aimed at the following group muscles: pectoral and dorsal muscles,anterior and posterior thigh, biceps and triceps brachii, sural triceps,hip abductors and adductors. Each group of muscles had three sets of 10 to 15 of maximum repetitions of the respective exercises, with a 45 seconds recovery during the sets, between muscle group changes there was an 1 minute stationary running active interval. For a better quantification of the training weight, greater amplitude and execution speed had to be mantained during all the sets, respecting the Brenann exertion scale (1990). During training sessions of the muscle groups chosen for the sets, the inferior limb exrecises were aproximated in its specific execution of motor gestures developed during the matches, with the purpose of transfering the possible gain of power for specific court gestures (kicks, runs, etc). After three months of training the athletes were submitted to all the physical evaluation tests again, with the purpose of analysing the training feedback, observing points which might possibly help in maintaining the match condition.

**Statistical Treatment:** After the exploratory analysis of the data and confirmation of normal results of the evaluated characteristics, the averages (standard deviation) and the [confidence interval] were calculated, with a confidence coefficient of 90%; for the description of the sample under study. The analysis of variation for repeated measures was applied to determine the statistical significance of the effectiveness of the training being used. A post-hoc "lsd" (least significant difference) was used when necessary, along with the Bonferroni correction for multiple comparisons, with the purpose of determining in which points of the training the changes occurred. The statistical significance level was set at â = 0,05; for all the statistical proofs..

**Results:**

**Table1. Description and comparison of the Body Mass Index (BMI) (BMI), Height (H) Fat Percentage (FP) and Thin Mass (TM) between the pre-training, intermediate training and post-training periods.**

| | Pre | Inter | Post |
|---|---|---|---|
| *BMI (kg)* | **69,73 (7,57) [65,59; 73,87]** | **71,07 (6,68) [67,42; 74,72]** | **71,24 (6,56) [67,66; 74,83]** |
| *H (cm)* | **176,18 (3,97) [174,01; 178,35]** | **176,36 (4,23) [174,05; 178,67]** | **176,55 (4,08) [174,31; 178,78]** |
| *FP (%)* | **14,67 (1,96) [13,60; 15,74][a]** | **14,34 (1,73) [13,40; 15,29][b]** | **11,80 (1,26) [11,11; 12,49]** |
| *TM (kg)* | **59,40 (5,42) [56,43; 62,35][c]** | **60,82 (5,02) [58,07; 63,57][d]** | **62,80 (5,45) [59,83; 65,79]** |

The data is displayed in an average (standard deviation) format [confidence interval 90%].[a] significant difference related to post training for p = 0,001. [b] significant difference related to post training for p = 0,0001. [c] significant difference related to post training for p = 0,035. [d] significant difference related to post training for p = 0,005.

**Anthropometry:** As shown in Table 1, statistically significant changes were found in the thin mass and fat mass percentage in the post training when compared to intermediate and pre-training periods. For the body fat percentage, there was an average reduction of 2,87 [1,60; 4,15] % between pre and post training; between intermediate and post-training period, however, there was an average reduction of 2,55 [1,61; 3,48] %. As for the thin mass, there was a an average increase of 3,41 [0,68; 6,14] k between pre and post training. For the comparison between intermediate and post-training period, the average gain was 1,99 [0,82; 3,15] kg. Although not statically significant, the thin mass change between pre and intermediate training was of 1,42 [-0,80; 3,65] kg; what shows an important tendency towards its increase. At last, no statically significant changes were verified both for body mass and height.

**Table 2. Description and comparison of the set of abdominals (ABD) and arm push ups (APU), the maximum dynamic leg press weight (MLPW) and flexibility (FLEX) between the pre-training, intermediate training and post-training periods.**

| | Pre | Inter | Post |
|---|---|---|---|
| *ABD (rep)* | **40,45 (5,72) [37,33; 43,58]** | **45,82 (8,95) [40,93; 50,71]** | **52,55 (11,49) [46,27; 58,83][a]** |
| *APU (rep)* | **20,09 (9,44) [14,93; 25,25]** | **32,45 (9,63) [27,19; 37,72][b]** | **34,18 (7,05) [30,33; 38,04][c]** |
| *MLPW (kg)* | **230,00 (21,33) [218,34; 241,66]** | **270,00 (23,13) [257,36; 282,64][c]** | **307,27 (26,49) [292,80; 321,75][c, d]** |
| *FLEX (cm)* | **28,36 (5,14) [25,55; 31,17]** | **32,82 (6,40) [29,32; 36,32][e]** | **34,36 (6,53) [30,79; 37,93][f]** |

The data is displayed in an average (standard deviation) format [confidence interval 90%] [a] significant difference related to pre- training for p = 0,015. [b] significant difference related to pre- training for p = 0,002. [c] significant difference related to pre- training for p =0,0001. [d] significant difference related to intermediate for p= 0,0001. [e] significant difference related to pre- training for p = 0,023. [f] significant difference related to pre- training for p = 0,008.

The data is displayed in an average (standard deviation) format [confidence interval 90%] [a] significant difference related to pre- training for p = 0,015. [b] significant difference related to pre- training for p = 0,002. [c] significant difference related to pre- training for p =0,0001. [d] significant difference related to intermediate for p= 0,0001. [e] significant difference related to pre- training for p = 0,023. [f] significant difference related to pre- training for p = 0,008.

**Strength and maximum dynamic resistance and flexibility.** The abdominal dynamic muscle resistance showed an average increase of 12 [4; 20] repetitions between pre and post-training, a statically significant increase; the average increase between pre- training and intermediate period was of 5 [1; 10] repetitions, with a statistical significance of p = 0,053. The upper limb muscle resistance, however, showed an average increase of 12 [6; 18] repetitions and 14 [9; 19] repetitions for the comparison between pre- training and intermediate period, and between pre and post-training respectively. The maximum dynamic leg press weight also showed statistically significant increase during all the training periods. Between pre- training and intermediate period, there was an average weight increase of 40,0 [30,3; 49,7] kg in the intermediate period and 77,3 [61,0; 93,5] kg in the post-training; the total average maximum weight increase was of 77,3 [61,0; 93,5] kg. The flexibility showed an average increase of 4,45 [1,14; 7,77] cm, between pre- training and intermediate period. Between pre and post-training, the increase was of 6,00 [2,23; 9,76] cm.

**Table 3. Description and comparison of horizontal motion (HM), agility (AG), anaerobic power (AP) and aerobic power (APWR) between pre-training, intermediate training and post-training periods.**

| | Pre | Inter | Post |
|---|---|---|---|
| *HM (cm)* | **240,00 (19,07) [229,58; 250,42]** | **246,91 (17,58) [237,30; 256,51]** | **256,18 (17,76) [246,48; 265,89]** |
| *AG (s)* | **12,19 (0,70) [11,81; 12,57]** | **11,22 (0,42) [10,99; 11,45][a]** | **10,79 (0,28) [10,64; 10,95][b, c]** |
| *AP (s)* | **7,01 (0,75) [6,60; 7,42]** | **6,47 (0,21) [6,35; 6,58]** | **6,38 (0,22) [6,26; 6,50][d]** |
| *APWR (m)* | **2817,27 (238,14) [2687,13; 2947,41]** | **2905,45 (134,80) [2831,79; 2979,12]** | **2988,64 (176,89) [2891,97; 3085,30][e]** |

The data is displayed in an average (standard deviation) format [confidence interval 90%] [a] significant difference related to pre- training for p = 0,020. [b] significant difference related to intermediate for p = 0,007. significant difference related to pre- training for p= 0,0001. [d] significant difference related to pre- training for p = 0,042. [e] significant difference related to pre- training for p = 0,003.

**Agility, Anaerobic and aerobic power:** There was a statistically significant improvement ofagility between all the training periods. Between pre- training and intermediate period, the average magnitude reduction of time was of 0,97 [0,27; 1,67] seconds; between intermediate and post-training period there was a reduction of 0,43 [0,17; 0,70] seconds; finally, the accumulated magnitude reduction was of 1,40 [0,89; 1,91] seconds, shown between pre and post-training. The analysis of anaerobic power showed a statistically significant improvement of 0,64 [0,11; 1,16] seconds between pre and post-training; although not statistically significant (p = 0,064) the average reduction shown between pre-training and intermediate period was of 0,55 [0,05; 1,04] seconds. Just like anaerobic power, the aerobic power underwent a significant improvement between pre and post-training, with a average magnitude increase of 171,36 [77,67; 265,06] meters. The training was able to induce an average increase of 9,27 [-0,01; 18,55] cm between intermediate and post-training period (p = 0,100); between pre and post-training, there was a increase 16,18 [1,35; 31,01] cm (p = 0,068); although none of these increases were considered statistically significant, the average tendencies suggest the effectiveness of the training under this characteristic..

**Discussion:** Even though some researchers fail to identify a significant increase of power in water training programs, we could observe in this study positive adaptive answers, although the sample was comprised of young high level competition athletes, that is, highly trained individuals less susceptible to physical condition improvement, the more trained he is, proportionally the less trainable he becomes. Thus, a crucial point for the answers to the power training in the water environment is that the volunteers must comprehend a great difference between the weights offered in a terrestrial environment and the ones unleashed in the water

environment. While on terrestrial environment, the individual becomes a passive subject and tries to overcome the weight previously defined, in water environment the volunteers are active subjects in the implementation of the external weight, that is, the magnitude of water resistance is intimately connected to the action developed by the subject.

**Conclusion:** The resisted training in water environment may potentialize the increase in specific physical capacities of the start. One can associate this increase to the higher resistance offered by the viscosity of the liquid environment (water is 700 times more resistant than air), and when in movement this can be quadruplicated, offering thus a more intense work for the muscles, making players stronger and more prepared for the situations demanded in a match. Besides the primary characteristics of the Water Force program, the water submersion may causeÂ the sensation of pain in articulation to be reduced compared to terrestrial running as cited by GolegÃ£ (2004) and Robinson et al (2004) found out that the pain level was reduced in athletes under plyometrics training, what therefore reduces the injuries on the players, potentializing the match condition.

**Bibliographical references:**

1. Lucena,r,F; Futsal e a Iniciação, Editora Sprint;1998;
2. Filho,J, L,S; Manual de Futsal; Editora Sprint, 1998;
3. Weineck,J; Treinamento Ideal,9º edição, editora Manole 2000;
4. Shikarenko,I; Golomazov,S; Futebol: Preparação Física, Editora Phorte1997;
5. Guedes, Jr; Personal Training na Musculação, Editora Phorte1997;
6. Guedes, Jr ; Treinamento de Força no Meio Líquido; FIEP Buletin, 2003;73:86.
7. Rocha, A; comparação do treinamento abdominal dentro e fora da água, FIEP Buletin; 2004;74: 55.
8. Vilarinho,R; modificações morfológicas decorrentes do treinamento de força no meio líquido, Revista Ciêntífica da Jornada Paranaense de Educação Física, 2004; 1(1):27.
9. Giannichi,R,S; Avaliação & Prescrição de Atividade Física, editora Shape, 2º edição 1998;
10. Brennan,D.K .Wlilder, L.P. Aqua Runing,1990.
11. Ostojic, S.M, Seasonal alterations in body composition and sprint performance of elite soccer players, Jornal of Exercice Physiology, on line, 2003;6(3):11-14.
12. Cirino, E. Efeitos do treinamento de Futsal sobre a composição corporal e desempenho de jovens atletas; Revista Brasileira de Ciência e Movimento;2002 ;10(1): 41-46.
13. Robinson, L.E. The effects of land vs. aquatic plyometric on power , torque, velocity and muscle soreness in women. Jornal Stregth Condition Res.2004 ; 16 ;18(1):84-91

HENRIQUE FRANCA RODRIGUES
RUA: CARAGUATATUBA Nº 86 SANTOS SP
CEP:11085-250
TEL: (13) 3296-2194 CEL: (13) 91418094
EMAIL: swinfast@hotmail.com

**RESISTED TRAINING RESPONSE IN THE WATER (WATER FORCE) IN PROFESSIONAL FUTSAL PLAYERS**

With the change of the rules of the Futsal game in last the 10 years the Maximum Force, Force Resistance and Explosive Force had become determinated capacities in an athlete income.This way , a training resisted program Â in the water was elaborated (Water Force) and it was applied in the volunteers to inquire it effect. The sample was composed by Professional Futsal players of the Santista selection who was: age 23 years, height 1,77m and 71,490 weight kg. It was used as comparative parameters: battery of testsfor maximum force, resistance Resistance and Explosive Force, cited for Giannichi(1998).The training had occurred 3 times a week for 50 minutes for each session, the athletes did 3 series of 10 to15 repetitions for each muscular group respecting the interval of 45 seconds between each series. After 12 weeks of training all the group was reevaluated in order toobserve the training results The results had demonstrated positive alterations in all the strength variations, demonstrating efficiency of the considered program.

**RESPONSE DU ENTRENAMENT RESISTE IN MID LIQUIDE (FORCE DU L EAU) EN JOVERS DU FOOTBALL PROFISSIONEL**

Avec les changment des regles du jeu du football dans les derniere dix annes la force maxime, la reesistensi de la Force et la force explosive se change la capacite determinant in revenue a run athlete. D accord con cette principe, un programmed u instruction resiste in mid-liquide (force du l eau ) fut elabore. Aussi fut appliqué en voluntaries pour rechercher sons effets. La echantllon fut compose par jouers DU Football Profissionel de la Selection Santista que possede en moyenne:23 ans, hauteur 1,77m.et poids de 71,490 Kgs. Fut utilise come parametro comparative la batterie du test pour Force Maxime , Resistence du force rapida, mentione pour Giannichi (1998). Les entrainements se furent rappele trios fois en la semaine et le duree de 50 minutes pour chaque session, lês athletes sont realise trois series de 10 a 15 repetitions pour chaques groupe musculaire et chaque groupe a respecte l intervale de 45 secondes entre chaques series. Après 12 semaines du entreinements, les resultants furent demontre changment positive et en tou le variation de force, que fut demontre efficacite du programme propose.

**RESPUESTAS DEL ENTRENAMIENTO RESISTIDO EN LO MEJO LIQUIDO (FUERZA EN EL AGUA) EN JUGADORES DE FÚTBOL DE SALÓN PROFESIONAL.**

Con la modificación de las reglas del fútbol del salón en los últimos 10 años, la fuerza máxima, fuerza resistida e fuerza de la explosión entornaran-se capacidad determinantes en la redención del atleta. Partiendo diste principio, fue elaborado un programa del entrenamiento resistido en lo mejo liquido (fuerza en el agua) que fue aplicado en los voluntarios verificando sus efectos. La Muestra: con jugadores de fútbol del salón, profesionales de la selección santista, que poseían media de edad de 23 años, estatura de 1,77m e peso de 71,490kg. Fueran utilizados como los parámetros comparativos una batería de avaluaciones para fuerza máxima, fuerza resistida e fuerza rápida. Los trenos acontecieran 3x en la semana e con duración de 50 minutos por la sesión. Los atletas hacían 3 series de 10 a 15 repeticiones en cada agrupamiento muscular, respetando lo intervalo de 45 segundos entre cada serie. Después de las 12 semanas de entrenamiento, los individuos fueran testados. Los resultados muestrearan alteraciones significativas en todas variaciones de la fuerza, demostrando así la eficiencia del programa propuesto.

**RESPOSTA DO TREINAMENTO RESISTIDO NO MEIO LÍQUIDO (WATER FORCE) EM JOGADORES DE FUTSAL PROFISSIONAL**

Resumo: Com a mudança das regras do jogo de Futsal nos últimos 10 anos a Força Máxima, Resistência de Força e a Força Explosiva se tornaram capacidades determinantes no rendimento do um atleta. Partindo desse princípio, foi elaborado um programa de treinamento resistido no meio líquido (Water Force) que foi aplicado nos voluntários a fim de averiguar seus efeitos.A amostra foi composta por jogadores de Futsal Profissional da Seleção Santista que possuíam médias de: idade 23 anos , altura 1,77m e peso 71,490 Kg. Foram utilizados como parâmetros comparativos bateria de testes para força máxima, resistência de forca e forca rápida, citados por Giannichi(1998).os treinos ocorreram 3 vezes na semana e com a duração de 50 minutos para cada sessão, os atletas, realizavam 3 séries de 10 a 15 repetições para cada grupo muscular, respeitando o intervalo de 45 segundos entre cada série. Após 12 semanas de treinamento todo o grupo foi reavaliado a fim de observar os resultados do treinamento. Os resultados demonstraram alterações positivas em todas as variações de forca, demonstrando eficiência do programa proposto.