**SEGUNDO DOCUMENTO**

El propósito de esta investigación fue estudiar cómo afecta el ejercicio intermitente de alta intensidad al control dinámico postural en jugadores de futbol de 3ª División Española. A través de un test de esfuerzo intermitente (Yo-Yo Intermittent test 1) se somete a los jugadores a una situación de fatiga con el objeto de observar la incidencia en el control dinámico postural, cuya alteración está relacionada con el aumento del riesgo de las lesiones deportivas. La fatiga es un elemento que trae consigo una serie de cambios fisiológicos y hace ineficaz nuestra respuesta motriz ante la diversidad de estímulos que ofrece un deporte como el fútbol, pudiendo desencadenar en una lesión, la epidemiología lesional del futbol nos muestra la importancia del control de la fatiga y sus consecuencias en las acciones de los jugadores.

**Objetivo.**

Comprobar la incidencia de la fatiga en el control dinámico postural.

**Diseño.**

Pre experimental, de pre y post tratamiento de un grupo.

**Población.**

Doce jugadores varones (Edad = 4±5,3 años, altura = 1,81± 0,04 m, peso = 76,8±6,35, % graso = 11,9±0,99 %)
**Método.**
Se realizó un pre test Y Balance Test (YBT), inmediatamente inducimos fatiga a través de Yo-Yo Intermittent test 1, cuando el jugador finaliza el test se obtiene muestra de lactemia en sangre y se realiza un el post test YBT para ver las diferencias tras la fatiga inducida. La frecuencia cardiaca (FC) se monitorizo durante todo el proceso para obtener la frecuencia cardiaca máxima (FCmax) y se controló la percepción subjetiva de esfuerzo de los jugadores mediante escala de Borg.
**Resultados**
Tras realizar una T de Student comparamos las medias pre y post con el objetivo de comprobar si existían diferencias significativas. Todos los alcances descendieron en el post test, pero de forma significativa fueron el alcance frontal derecho (p<0, 0100), postero-lateral derecho (p<0,0000) y postero-medial izquierdo (p<0, 0130). La correlación r de Pearson encontró relaciones positivas aunque no significativas entre variables.
 **Conclusión.**
Con los datos obtenidos, podemos decir que la fatiga inducida a través de un test de alta intensidad intermitente afecta de forma negativa al control dinámico postural, llevándolo incluso, a situaciones de riesgo de lesión, esas situaciones aparecen en el plano frontal donde la pierna más afectada fue la derecha (hábil o no estabilizadora) que empeoró de manera significativa entrando en situación de riesgo tras la fatiga (p<0, 01). Podemos decir que la pierna hábil en este caso es la pierna menos estable.
**Palabras clave**

Control dinámico postural, YBT, fatiga, Yo Yo Intermittent Test 1, Fútbol.

The purpose of this research was to study how intermittent high intensity exercise affects dynamic postural control in soccer players of the 3rd Spanish Division. Through an intermittent effort test (Yo-Yo Intermittent test 1) the players are subjected to a fatigue situation in order to observe the incidence of dynamic postural control, whose alteration is related to the increased risk of sports injuries. Fatigue is an element that brings with it a series of physiological changes and makes our motor response ineffective due to the diversity of stimuli offered by a sport such as football, and can trigger in an injury, the epidemiology of football shows us the importance of the control of Fatigue and its consequences on the actions of players.

**Objective.**

To verify the incidence of fatigue in dynamic postural control.

**Design.**

Pre experimental, pre and post treatment of a group.

**Population.**

Twelve male players (Age = 4 ± 5.3 years, height = 1.81 ± 0.04 m, weight = 76.8 ± 6.35, fat% = 11.9 ± 0.99%)

**Method.**

We performed a pre-test Y Balance Test (YBT), we immediately induce fatigue through Yo-Yo Intermittent test 1, when the player completes the test we obtain lactam sample in blood and perform a post test YBT to see the differences After induced fatigue. Heart rate (HR) was monitored throughout the process to obtain maximum heart rate (HRmax) and the subjective perception of exertion of the players was controlled using Borg scale.

**Results**

After performing a Student's T, we compared the pre and post means in order to verify if there were significant differences. All the scopes declined in the post-test, but significantly the right frontal range (p <0, 0100), right postero-lateral (p <0.0000) and left postero-medial range (p <0.0130). Pearson's correlation r found positive but not significant relationships between variables.

 **Conclusion.**

With the data obtained, we can say that fatigue induced through a test of high intermittent intensity adversely affects the dynamic postural control, even leading to situations of risk of injury, such situations appear in the frontal plane where the leg more Affected was the right (skillful or non-stabilizing), which significantly worsened and became risky after fatigue (p <0.01). We can say that the skillful leg in this case is the less stable leg.

**Keywords**

Dynamic Postural Control, YBT, Fatigue, Yo Yo Intermittent Test 1, Soccer.

Table 1. Studies with a similar structure.

|  |  |  |
| --- | --- | --- |
| **AUTHOR** | **DESCRIPTION** | **INSTRUMENTS** |
| **DYNAMIC POSTURAL CONTROL** | **FATIGUE** |
| Enda Whyte et al (2015) | Dynamic control pre-test + Fatigue protocol + Dynamic control post-test | SEBT | High-intensity intermittent circuit |
|
| Sarshin et al (2011) | YBT | 6 functional strength exercises |
|
| Sarshin et al (2012) | YBT |  Conconi test |
|
| Steib S el al (2013) | SEBT | Incremental treadmill test |
|
| Gribble PA (2004) | SEBT | Isokinetic fatigue protocol |
|
| Gribble PA (2009) | SEBT | Isokinetic fatigue protocol |
|
| Sarshin et al (2007) | SEBT | Strength circuit (20 min 7 stations) |
|

Table 2. Process schedule.

|  |
| --- |
| **SCHEDULE** |
| **DATE** | **PROCEDURE** |
| 2/12/15 | Informed consent and explanation of the programme |
|
| 10/12/15 | Record age, weight, height, % body fat, dominant leg, and hip-ankle length |
|
| 21 to 27/12/15 | Pre-test ( Yo-Yo Intermittent Recovery Test 1) |
|
| 4/1/16 | Pos-test (Pre-YBT + Yo-Yo Intermittent Recovery Test + Post-YBT) |
|

**Table 3. Left leg reach distances.**

|  |  |  |  |
| --- | --- | --- | --- |
| **REACH** | **PRE** | **POST** | **DIFF** |
| **Anterior** | 65.25 | 63.08 | 2.17 |
| **Posterolateral** | 102.9 | 99.5 | 3.4 |
| **Posteromedial** | 107.5 | 104.2 | 3.3 |

**Table 4. Right leg reach distances.**

|  |  |  |  |
| --- | --- | --- | --- |
| **REACH** | **PRE** | **POST** | **DIFF** |
| **Anterior** | 65.00 | 61.00 | 4.00 |
| **Posterolateral** | 104.00 | 97.00 | 7.00 |
| **Posteromedial** | 107.00 | 104.00 | 3.00 |

**Table 5. Pre-test asymmetry for different reaches.**

|  |
| --- |
| **PRE-TEST** |
| **REACH** | **ASYMMETRY (cm)** | **OBSERVATIONS** |
| **Anterior** | 4.00 | Risk factor only with anterior reach (≥4 cm) |
| **Posterolateral** | 3.75 |
| **Posteromedial** | 4.42 |

**Table 6. Post-test asymmetry for different reaches.**

|  |
| --- |
| **POST-TEST** |
| **REACH** | **ASYMMETRY (cm)** | **OBSERVATIONS** |
| **Anterior** | 5.25 | Asymmetry increased in all reaches |
| **Posterolateral** | 3.83 |
| **Posteromedial** | 4.75 |

**Table 7. Pre-test and post-test frontal plane asymmetry.**

|  |
| --- |
| **FRONTAL ASYMMETRY** |
| **PRE-TEST** | **POST-TEST** |
| **Right** | **Left** | **Diff** | **Right** | **Left** | **Diff** |
| 65.42 | 65.25 | 4,00 | 61.33 | 63.08 | 5.25 |

**Table 8. Pre-test and post-test posteromedial plane asymmetry.**

|  |
| --- |
| **POSTEROMEDIAL ASYMMETRY** |
| **PRE-TEST** | **POST-TEST** |
| **Right** | **Left** | **Diff** | **Right** | **Left** | **Diff** |
| 106.58 | 107.5 | 3.75 | 103.83 | 104.17 | 3.83 |

**Table 9. Pre-test and post-test posterolateral plane asymmetry.**

|  |
| --- |
| **POSTEROLATERAL ASYMMETRY** |
| **PRE-TEST** | **POST-TEST** |
| **Right** | **Left** | **Diff** | **Right** | **Left** | **Diff** |
| 103.83 | 102.92 | 4.48 | 96.58 | 99.5 | 4.75 |

**Table 10. Post-test lactate**

|  |  |
| --- | --- |
| **mmol/L lactate values recorded for the players from highest to lowest** | **LACTATE (mmol/L)** |
| 14.3 |
| 14.3 |
| 14.6 |
| 14.3 |
| 14.8 |
| 14.4 |
| 14.2 |
| 14.6 |
| 14.5 |
| 14.3 |
| 14.8 |
| 14.2 |
| 13.5 |
| **AVERAGE** | 13.91 |

**Table 11. Post-Test Yo-Yo Intermittent Recovery Test 1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LOWEST SCORES** | **Subject** | **Level** | **Speed (m/s)** | **Time 40 m (sec)** | **Total distance (m)** | **VO2max (ml/min/kg)** |
| **1** | 20.00 | 4.86 | 8.23 | 2680.00 | 59.98 |
| 2 | 20.00 | 4.86 | 8.23 | 2680.00 | 59.98 |
| **9** | 20.5 | 4.86 | 8.23 | 2560.00 | 57.9 |
| 8 | 21.6 | 5.00 | 8.00 | 2920.00 | 60.93 |
| **11** | 22.1 | 5.14 | 7.78 | 3040.00 | 61.94 |
| **10** | 22.1 | 5.14 | 7.78 | 3040.00 | 62.94 |
| **HIGHEST SCORES** | **5** | 23.2 | 5.28 | 7.58 | 3400.00 | 66.32 |
| **7** | 23.2 | 5.28 | 7.58 | 3400.00 | 66.32 |
| **12** | 23.4 | 5.28 | 7.58 | 3440.00 | 66.67 |
| **4** | 23.5 | 5.28 | 7.58 | 3520.00 | 65.97 |
| **3** | 23.8 | 5.28 | 7.58 | 3640.00 | 66.98 |
| **6** | 23.8 | 5.28 | 7.58 | 3640.00 | 66.98 |
| **AVERAGE** | 22.27 | 5.13 | 7.81 | 3163.33 | 63.58 |

**Table 12. Pre-test and post-test heart rate.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Subject** | **Resting HR (bpm)** | **HRmax (bpm)** | **HR Reserve (bpm)** |
| **INITIAL** | **POST** | **DIFF** | **INITIAL** | **POST** | **DIFF** | **INITIAL** | **POST** | **DIFF** |
| **1** | 62 | 61 | 1 | 200 | 198 | 2 | 138 | 137 | 2 |
| **2** | 61 | 61 | 0 | 200 | 200 | 0 | 139 | 139 | 0 |
| **3** | 62 | 63 | 1 | 186 | 193 | 7 | 124 | 130 | 7 |
| **4** | 62 | 60 | 2 | 178 | 188 | 10 | 116 | 128 | 10 |
| **5** | 62 | 61 | 1 | 180 | 180 | 0 | 118 | 119 | 0 |
| **6** | 64 | 6 | 2 | 188 | 189 | 1 | 124 | 127 | 1 |
| **7** | 64 | 64 | 0 | 176 | 178 | 2 | 112 | 114 | 2 |
| **8** | 62 | 62 | 0 | 182 | 182 | 0 | 120 | 120 | 0 |
| **9** | 68 | 64 | 4 | 201 | 200 | 1 | 133 | 136 | 1 |
| **10** | 57 | 57 | 0 | 183 | 175 | 8 | 126 | 118 | 8 |
| **11** | 56 | 56 | 0 | 193 | 188 | 5 | 137 | 132 | 5 |
| **12** | 56 | 56 | 0 | 176 | 177 | 1 | 120 | 121 | 1 |
| **AVERAGE** | **61.3** | **60.6** | **0.9** | **186.9** | **187.3** | **3.1** | **125.6** | **126.8** | **3.1** |

**Figure 1. Graphic representation of Yo-Yo Test 1.**

|  |
| --- |
| **YO-YO INTERMITTENT TEST** |
| Macintosh HD:Users:manugarciasillero:Library:Caches:TemporaryItems:msoclip:0:clip_image001.png

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