ABSTRACT

The present study aimed to (i) identify a potential relationship between players’ creativity in individual and collective settings and (ii) identify the effects of a training program in young footballers’ creative and tactical performance. The sample was composed by a total of 25 football players (age 13.9 ± 0.6 and 5.4 ± 2.1 years of practice) competing in the U15 category, randomly distributed across a control (n=12, age 13.8 ± 0.6 and 5.4 ± 2.2 years of practice) and an experimental group (n=13, age 14.0 ± 0.7 and 5.3 ± 2.2 years of practice). The experimental group was submitted to a 12 week training program based on the principles of Nonlinear Pedagogy and Differential Learning. Creative performance was assessed in individual (1 vs 1) and collective (5 vs 5 plus goalkeepers) tasks. The collective task was organized in blocks, changing the team’s formation in each game. Both tasks were filmed and, in order to evaluate the tactical performance, every field player was equipped with a portable GPS (SPI PRO XII, GPSports, Australia). Observational (creativity score in the collective task, average of creativity scores, flexibility and fluency) and positional variables (team centroid distance and approximate entropy) were analyzed. Effect size statistic was used to compare the more and less creative players at pre and post-test. Significant differences were identified for the average of creativity scores, which registered a moderate effect in the pre-test and a very large effect in the post-test. These results suggest that that the most creative players in the 1vs1 situation keep their scores high when they enrol in the 5 vs 5 plus goalkeepers game, meaning that there might be a relationship between the players’ creative performance in individual and collective settings. The improvements on the effect from pre to post-test might indicate a positive impact of the training program on players’ creative performance.

Keywords: Creativity, Football, Nonlinear Pedagogy, Differential Learning.
RESUMO

Considerando as teorias habitualmente explicativas das assimetrias posturais (teoria ascendente e descendente), pretendeu-se verificar a magnitude e sentido das associações entre a tipologia das assimetrias posturais verificadas em crianças e jovens futebolistas. Quarenta e sete futebolistas do sexo masculino entre os 9 e os 16 anos (13.02 ± 2.51) foram avaliados com recurso ao software de avaliação postural SAPo. O teste de correlação de Spearmen foi utilizado para verificar possíveis associações entre as diferentes tipologias de assimetrias identificadas. Foram observadas correlações positivas e negativas entre as assimetrias na zona inferior e superior do corpo. As assimetrias entre os lóbulos, espinhas ilíacas, escolioses na coluna vertebral, maléolos mediais, linha articular do joelho, ângulo inferior das escápulas e linha média da perna apresentaram correlações positivas entre si. Parece pertinente descrever as associações possíveis entre as prevalências de assimetrias nas diferentes modalidades, bem como controlar a magnitude dos desvios posturais. A existência de uma assimetria pode levar ao aparecimento ou desaparecimento de outra.

Palavras-chave: Postura; Assimetrias; Prevalência; Jovens; Futebol.

RESUMEN

El presente estudio tuvo como objetivo (i) identificar una posible relación entre la creatividad de los jugadores en situaciones individuales y colectivas, e (ii) identificar los efectos de un programa de entrenamiento en el rendimiento creativo y táctico de los jóvenes futbolistas. La muestra estaba compuesta por un total de 25 jugadores de fútbol (edad 13.9 ± 0.6 y 5.4 ± 2.1 años de práctica) que compiten en la categoría U15, distribuidos al azar a través de un grupo de control (n=12, edad 13.8 ± 0.6 y 5.4 ± 2.2 años de práctica) y un grupo experimental (n=13, edad 14.0 ± 0.7 y 5.3 ± 2.2 años de práctica). El grupo experimental fue sometido a un programa de entrenamiento de 12 semanas basado en los principios de la pedagogía No-lineal y aprendizaje diferencial. El rendimiento creativo se evaluó en tareas individuales (1 vs 1) y colectivas (5 vs 5 más porteros). La tarea colectiva se organizó en bloques, cambiando la constitución del equipo en cada partido. Ambas tareas fueron filmadas, con el fin de evaluar el desempeño táctico, cada jugador de campo estaba equipado con un GPS portátil (SPI PRO XII, GPSports, Australia). Se analizaron variables observacionales (puntuación de creatividad en la tarea colectiva, las puntuaciones medias de creatividad, flexibilidad y fluidez) y posicionales (distancia al centro del equipo y entropía aproximada). Se utilizó el Effect Size para comparar a los jugadores más y menos creativos en el pre y pos-test. Se identificaron diferencias significativas en la media de las puntuaciones de creatividad, que registró un efecto moderado en el pre-test y un efecto muy grande en el pos-test. Estos resultados sugieren que los jugadores más creativos en la situación 1 vs 1 mantienen sus puntuaciones altas cuando participan en el juego 5 vs 5 más portero, lo que significa que podría haber una relación entre el desempeño creativo de los jugadores en situaciones individuales y colectivas. Las mejorías en el efecto del pre al pos-test podrían indicar un impacto positivo del programa de entrenamiento en el rendimiento creativo de los jugadores.

Palabras-clave: Creatividad, Fútbol, Pedagogía No-lineal, Aprendizaje Diferencial.

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INTRODUCTION

During a game, players are confronted with a huge amount of information they must process in short periods of time. Therefore, having a wider breadth of attention seems to be an important condition in order to achieve elite performance, as it allows to more easily perceive and learn potentially better alternative solutions (Memmert & Perl, 2006; Memmert, 2009). However, a broad attentional focus per se is not enough to achieve a higher creative performance. Besides the amount of information collected, the players’ technical repertoire will also preclude the conceptualized solutions. According to Abernethy et al (2005), experts distinguish from average players by the capacity to recognize and remember complex patterns and by the capacity to anticipate and produce consistent and adaptable motor patterns, which ultimately lead to an effective movement control. Based on these criteria, it seems clear that a broad and refined technical repertoire is important to achieve high-level performances and is related with a better information processing (Memmert, 2007; Memmert & Furley, 2007).

The development of these competences must be done through varied situations with high contextual interference, in order to stimulate the adaptation capacity to the unpredictable, enriching the learning process (Memmert et al., 2009). Having these assumptions in mind, Nonlinear Pedagogy and Differential Learning were in the genesis of the training program, since both consist of nonlinear methods (Schollhorn et al, 2012). Nonlinear Pedagogy highlights the interactive role of the context’s key-components (subject, task and environment) in shaping the emergent motor behaviors (Chow et al., 2009). In turn, Differential Learning is characterized by taking advantage of the fluctuations inherent to the complex system, amplifying them through non-repetition and continuously varying the motor task (Schollhorn et al., 2012). In team sports, there is no “perfect” execution. Facing environmental unpredictability, players are required to present flexible “versions” of the same technical action in order to succeed. Thereby, instabilities represent a key aspect in learning (Araújo et al, 2006; Schollhorn et al, 2012).

The current competitive demands require not only intelligent answers, but also the production of new and useful ones. Understanding the relationship between creativity in individual and collective settings seems to be a high relevance matter, which can bring important implications to the way training is conceptualized and the team management is thought. Therefore, the present study aims to (i) identify a potential relationship between player’s creativity in individual and collective settings; and (ii) analyze the effects of a training program in young footballers’ creative and tactical performance.

METHODS

SAMPLE

The sample was composed of 25 footballers (age 13.9 ± 0.6), with about 5 years of football practical experience (5.4 ± 2.1), competing in the U15 district championship. The subjects were
randomly distributed by a control (n=12, age 13.8 ± 0.6 and 5.4 ± 2.2 years of practice) and an experimental group (n= 13, age 14.0 ± 0.7 and 5.3 ± 2.2 years of practice). The experimental group experienced a training program between the pre and post-test. All the players were informed about the research procedures and requirements before the study began.

**DESIGN**

Three components were evaluated during pre and post-test: creative performance in individual settings (CRIAi), creative performance in collective tasks (CRIAc) and tactical performance. For the CRIAi evaluation the head coaches defined the dyads of players to confront in a 1 vs 1 situation according to their level of technical, tactical and physical performance. The resulting scores were used to determine the more and less creative subjects. The CRIAc task was organized in blocks, each encompassing three Gk+5 vs 5+Gk games. In each game, the team’s formation was changed. Both tasks were filmed for later observational analysis. The following variables were measured: CRIAc score, average CRIAc score, flexibility and fluency. Finally, tactical performance was assessed simultaneously to CRIAc, and considered the following variables: team centroid distance (own and opponent’s) and approximate entropy (ApEn). Every player (except the goalkeepers) were equipped with a portable GPS (SPI-PRO X, GPSports, Canberra, ACT, Australia), which allowed to collect global positioning data with a frequency of fifteen measures per second.

Between the pre and post-test evaluation moments, the experimental group experienced a training program, which was applied twice a week in 20-minute sessions (warm-up). Four weeks were dedicated to each one of the following technical categories: dribbling, shooting, passing/reception.

**STATISTICS**

The “team factor” (belonging to the more or less creative group) influence over CRIAc score, average CRIAc score, flexibility, fluency and positional data, was assessed via standardized mean differences, computed with pooled variance and respective 90% confidence intervals (Hopkins et al, 2009). Thresholds for effect size statistics were 0.2, trivial; 0.6, small; 1.2, moderate; 2.0, large; and 4.0 very large (Hopkins et al, 2009).

**RESULTS**

Significant differences between more and less creative players were identified for average CRIAc scores, which registered a moderate effect (1,07; 90% IC:[0,27; 1,87]) in the pre-test and a very large effect (3,96; 90% CI:[2,65; 5,28]) in the post-test (Table 1). The remaining variables registered a trivial effect.
**DISCUSSION**

The aim of the present study was to (i) identify a potential relationship between player’s creativity in individual and collective settings; and (ii) analyze the effects of a training program in young footballers’ creative and tactical performance. In order to accomplish these objectives, a training program was designed and applied to enhance the players’ technical repertoire and broaden the attentional focus. Intervening at an individual level, we intended to check if the player’s CRIAi scores evolved similarly to CRIAc’s.

It is important to state that the program effect might had been attenuated by some external factors, as the participants’ age (13.92 ± 0.64). There are some evidences that place creativity’s trainability window in childhood (Memmert, 2009; Memmert 2010). In the future, is suggested to replicate this design with younger categories. At the same time, it should be considered the increase of the training program duration, since creativity development is slower than other cognitive skills (Memmert, 2007).

Usually creativity is seen as a mental process that belongs only to a single individual. However the analysis of creative people and objects has demonstrated that most scientific and artistic innovations emerge from joint thinking, passionate conversations and shared struggles among different people, emphasizing the social dimension of creativity (Fisher et al, 2005). As a football team gathers subjects with common interests that guide their actions towards the same goal (Parjanen, 2012), it demands their players to cooperate in order to achieve success. In this context, many creative ideas result from the contribution of several team members’ actions, being socially constructed products.

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### Table 1 – Differences between more and less creative teams in pre and post-test.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-test</th>
<th>Cohen’s d [90% CI]</th>
<th>Post-test</th>
<th>Cohen’s d [90% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>More C.</td>
<td>Less C.</td>
<td>More C.</td>
<td>Less C.</td>
</tr>
<tr>
<td>CRIAc Score</td>
<td>6.9 ± 2.3</td>
<td>6.0 ± 2.2</td>
<td>8.9 ± 3.1</td>
<td>7.4 ± 2.6</td>
</tr>
<tr>
<td>Average CRIAc</td>
<td>6.8 ± 0.7</td>
<td>5.8 ± 1.2</td>
<td>8.3 ± 0.4</td>
<td>6.7 ± 0.3</td>
</tr>
<tr>
<td>Flexibility</td>
<td>2.5 ± 0.7</td>
<td>2.1 ± 0.6</td>
<td>2.8 ± 0.7</td>
<td>2.5 ± 0.6</td>
</tr>
<tr>
<td>Fluency</td>
<td>4.4 ± 1.7</td>
<td>3.9 ± 1.6</td>
<td>6.2 ± 2.5</td>
<td>4.9 ± 2.1</td>
</tr>
<tr>
<td>Center Distance (Mean)</td>
<td>6.5 ± 1.1</td>
<td>6.8 ± 0.9</td>
<td>5.7 ± 1.3</td>
<td>6.4 ± 1.1</td>
</tr>
<tr>
<td>Opponent’s Center Distance (Mean)</td>
<td>7.0 ± 1.3</td>
<td>7.6 ± 1.3</td>
<td>6.6 ± 1.6</td>
<td>7.4 ± 1.6</td>
</tr>
<tr>
<td>Approx. Entropy</td>
<td>0.9 ± 0.1</td>
<td>0.9 ± 0.1</td>
<td>0.8 ± 0.1</td>
<td>0.8 ± 0.1</td>
</tr>
<tr>
<td>Approx. Entropy Opp.</td>
<td>1.0 ± 0.1</td>
<td>1.0 ± 0.1</td>
<td>0.9 ± 0.1</td>
<td>1.0 ± 0.1</td>
</tr>
</tbody>
</table>

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**Description**

Comparison between more and less creative teams performance during the Gk + 5 vs 5 + Gk, in pre and post-test. Only creativity-related and tactical variables were considered.
Despite the collective nature of the game, when a person contributes to the generation of a creative product, she does it as an individual. Fisher et al. (2005) refers that “[i]ndividuality makes a difference, and organizations get their strength to a large extent from the creativity and engagement of their individual members”. The group members influence team’s collective creative processes, determining its creativity and innovation (Shin et al, 2012). In addition, appropriate socio-technical settings can enhance creative performance of a group of creative people by increasing individual creativity and multiplying it (Fisher et al, 2005). Our results are consistent with the previous statements. When we reunite individuals with higher CRIAi values in the same group, they distinguish themselves from the less creative group by the average CRIAc score, suggesting the existence of a relationship between creativity scores in individual and collective tasks.

**CONCLUSIONS**

Although further investigation is needed, nonlinear methodologies seem to be adequate for creativity training. In addition, young athletes should be encouraged to diversify their sporting experiences. Besides helping broaden their technical repertoire, it confronts them with various attentional processes (Huttermann & Memmert, 2014). In fact, engaging in multiple sports during early stages might improve the focus of attention sensibility to relevant stimuli (Santos et al, in press). Since a diverse technical repertoire and a broad attentional focus seem to be key-components of creative performance, their development in training should be prioritized.

**REFERÊNCIAS**


