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Translated from the original in spanish

Original article

## Theoretical importance of the coordinative capacity of differentiation of technical gestures in U-12 soccer

Importancia teórica de la capacidad coordinativa de diferenciación de los gestos técnicos en fútbol sub-12

Importância teórica da capacidade de coordenação da diferenciação de gestos técnicos no futebol sub-12

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### ABSTRACT

Motor coordination is defined as the neuromuscular capacity to work together different components of sports training, senses and body segments with precision. Therefore, improving the theoretical scope and limitations of national coaches in usefulness and importance terms of coordination training in general, and the capacity to differentiate technical gestures in particular, makes it possible to prospectively enhance the teaching-educational process. The objective of this work is theoretically validate some indicators that govern the importance and priority of coordination training and differentiation of technical gestures in U-12 soccer players. This is a descriptive-explanatory correlational research, studied four theoretical indicators evaluated by 22 national and international specialists classified into two independent groups (Group 1: National Specialists; Group 2; International Specialists), comparing results and deducing future national strategies to improve the coordinating component and the differentiation of technical gestures in U-12 players. In general, there are no significant differences in the scores of two



indicators studied (ImC:  $p=0.974$  and PeC:  $p=0.923$ ), with significant differences in the rest (ImD:  $p=0.000$  and PeD:  $p=0.003$ ); in the latter two, a higher average range is obtained, in favor of group 2 (group 1: ImD=6.92; group 2: ImD=17.00; group 1: PeD=7.83; group 2: PeD=15.90). The validation by specialist evidences the theoretical importance of the training of the coordination capacity in initiation soccer players. In addition, a significant level of importance and priority is evidenced in the international specialists in the training of differentiation in U-12 soccer, with respect to the national specialists.

**Keywords:** U-12 Soccer; Coordination Capacity; Technical Gestures Differentiation; Specialists Theoretical Validation.

## RESUMO

A coordenação motora é definida como a capacidade neuromuscular de trabalhar em conjunto diferentes componentes da preparação desportiva, dos sentidos e dos segmentos corporais com precisão. Assim, a melhoria do âmbito e das limitações teóricas dos treinadores nacionais, em termos de utilidade e importância da formação de coordenação em geral e da capacidade de diferenciar gestos técnicos em particular, torna possível melhorar prospectivamente o processo ensino-educativo. O objetivo desta investigação é validar teoricamente alguns indicadores que regem a importância e a prioridade da formação coordenadora e a diferenciação dos gestos técnicos nos jogadores de futebol sub-12. Esta investigação descritiva-explicativa é de ordem correlativa e baseia-se em quatro indicadores teóricos, avaliados por 22 especialistas nacionais e internacionais, classificados em dois grupos independentes (grupo 1: especialistas nacionais; grupo 2: especialistas internacionais). Em geral, não há diferenças significativas nas classificações de dois indicadores estudados (ImC:  $p=0,974$  e PeC:  $p=0,923$ ), com diferenças significativas no resto (ImD:  $p=0,000$  e PeD:  $p=0,003$ ); nos dois últimos, obtém-se um intervalo médio mais elevado, a favor do grupo 2 (grupo 1: ImD=6,92; grupo 2: ImD=17,00; grupo 1: PeD=7,83; grupo 2: PeD=15,90). A validação por especialistas evidencia a importância teórica da formação da capacidade de coordenação em jogadores de futebol principiantes. Além disso, é evidenciado um nível significativo de importância e prioridade nos especialistas internacionais no treino de diferenciação no futebol sub-12, no que diz respeito aos especialistas nacionais.

**Palavras-chave:** Futebol Sub-12; Capacidade de coordenação; Diferenciação de gestos técnicos; Validação teórica por especialistas.

## RESUMEN

La coordinación motriz se define como la capacidad neuromuscular de trabajar conjuntamente diferentes componentes de la preparación deportiva, de los sentidos y segmentos corporales con precisión. Por ello, mejorar los alcances y limitaciones teóricas de los entrenadores nacionales, en términos de utilidad e importancia del entrenamiento coordinativo en general y la capacidad de diferenciación de los gestos técnicos en particular, posibilita potenciar prospectivamente el proceso docente-educativo. El objetivo de esta investigación consiste en validar teóricamente algunos indicadores que rigen la importancia y la prioridad del entrenamiento coordinativo y de diferenciación de los gestos técnicos en futbolistas sub-12. Esta investigación descriptivo-explicativa es de orden correlacional y se basa en cuatro indicadores teóricos, evaluados por 22



especialistas nacionales e internacionales, clasificados en dos grupos independientes (grupo 1: especialistas nacionales; grupo 2: especialistas internacionales). De forma general, no se evidencian diferencias significativas en las calificaciones de dos indicadores estudiados (ImC:  $p=0.974$  y PeC:  $p=0.923$ ), existiendo diferencias significativas en el resto (ImD:  $p=0.000$  y PeD:  $p=0.003$ ); en estos dos últimos, se obtiene un mayor rango promedio, a favor del grupo 2 (grupo 1: ImD=6.92; grupo 2: ImD=17.00; grupo 1: PeD=7.83; grupo 2: PeD=15.90). La validación por especialista evidencia la importancia teórica que reviste el entrenamiento de la capacidad de coordinación en futbolistas de iniciación. Además, se evidencia un nivel significativo de importancia y prioridad en los especialistas internacionales en el entrenamiento de la diferenciación del fútbol sub-12, con respecto a los especialistas nacionales.

**Palabras clave:** Fútbol sub-12; Capacidad coordinativa; Diferenciación de gestos técnicos; Validación teórica por especialistas.

## INTRODUCTION

The training of physical capacities in sports, is usually modeled in the sports training planning process as part of the physical preparation component, (Bompa, Blumenstein, Hoffmann, Howell, & Orbach, 2019; Morales & González, 2015) of vital importance to raise the functional possibilities of the human organism, being classified into five different types: (strength, flexibility, speed or quickness, endurance and coordination), and subclassified according to the importance for each sport in question, among them the determinant type and the conditioning type.

In soccer, the enhancement of physical capacities is a recurring theme in the national and international literature, which evidences different works that outline training strategies in various age ranges of the soccer player, being the case of strength preparation, flexibility preparation, speed training, endurance and motor coordination (Rojas, Natali, López Montalvo, Vallejo Rojas, & Chávez Cevallos, 2019; Yépez & Ramírez, 2019; Cejudo, *et al.*, 2019).

In the specific case of motor coordination, the literature defines it as a complementary physical capacity, which allows the athlete to execute and combine different motor movements, aimed at obtaining an optimal technical gesture, (Morales & González, 2014) complementing the determining physical capacities to convert motor movements into technical-sports gestures. While motor differentiation, a relevant aspect in coordination training, is defined as a specific component of training to achieve a fine coordination of motor phases and partial movements, characterized by a high accuracy and motor efficiency of the entire technical movement as a whole (Weineck, 2005).

The training of motor coordination in soccer players is usually fundamental, among other aspects, to improve the interpersonal dynamics of marking, where Menuchi & Moro (2020) show the link between coordination and the coupling between the marker and the passers, as well as the synergy of marking, evidenced in a flexible and adaptive change of passes, the intensity of marking, age and experience in the sport modality.

Therefore, the control and assessment of the influences exerted on sport performance by motor coordination is a fundamental aspect in the process of sports training management in soccer players (Padrón-Cabo, Rey, Kalén, & Costa, 2020; Cakir, Turkkan, & Ozer, 2020; Li, Alexander, Glazebrook, & Leiter, 2016; González, Córdova,



Madrigal, & Pérez, 2019), highlighting the coordinative quantification between various body segments during the execution of specific techniques such as kicking and ball driving, the effects of employing training methods that favor movement coordination over traditional methods, and the direct and indirect influences of coordinative training on performance factors such as sprinting, agility, and dribbling.

Several authors specify the advantages of coordination training in soccer players from early ages, (DiCesare, *et al.*, 2019; Cakir, Turkkan, & Ozer, 2020) specifying the need to enhance coordination from the initiation stage, either through technical-tactical training or through stimuli from Physical Education, as would be the case of pre-sports games and educational intervention by applying the cooperative method (Fajardo & Correa, 2020; Blanco, 2014).

However, given the importance of coordination training in soccer players from the stage of sports initiation, according to the bibliographic consultations made, the question arises as to the priority of coordination training in specific teaching-educational environments such as Ecuador's. This aspect can be compared with world powers in soccer to assess the level of theoretical knowledge of national and international specialists, about the field of action studied, a preliminary step to establish strategies to improve the technical staff of Ecuador in the training of coordination and differentiation of technical gestures in soccer players of initiation. In this sense, the purpose of the research was to theoretically validate some indicators that govern the importance and level of priority of coordination training and the differentiation of technical gestures in U-12 soccer players.

## **MATERIAL AND METHODS**

The present research is of a descriptive-explanatory type, of correlational order; a freely designed questionnaire is applied that includes four indicators that allow the theoretical validation through consultation of specialists on the importance of the physical capacity of coordination in general and the differentiation of technical gestures in specific form, in the process of direction of the sports training of soccer players of the U-12 category.

Twenty-two training soccer specialists were selected, divided into two independent groups: Group 2 (I: 10 international specialists from Spain and Italy) and Group 1 (N: 12 national specialists from the provinces of Esmeralda, Quito and Guayaquil) under a non-probabilistic intentional sampling, bearing in mind the inclusion assumptions of having practical experience in training soccer for at least ten years, having a third level degree and demonstrable evidence of outstanding results in national championships.

The indicators evaluated by the independent groups are classified as follows:

1. ImC: importance of coordination in the training of the initiation soccer player (emphasis on the U-12 category).
2. PeC: priority of coordination training in U-12 soccer with respect to the rest of the physical abilities (strength, endurance, flexibility, speed).
3. ImD: importance of training on the differentiation of technical gestures in U-12 soccer.
4. PeD: priority of training on the differentiation of technical gestures, with respect to the rest of the components of motor coordination (motor adaptation and



adaptation to variations, regulation capacity, reaction capacity, orientation capacity, balance capacity, rhythm capacity, combination capacity and coupling of movements) as established by **Weineck (2005)**.

Each indicator will be evaluated by each specialist in five levels, based on a Likert scale, where the field instrument will measure the theoretical opinion on the studied topic. The evaluation levels will be:

1. Level 1: not important.
2. Level 2: not very important.
3. Level 3: moderately important.
4. Level 4: important.
5. Level 5: very important.

In the comparison of the data collected, the Mann-Whitne U and ( $p \leq 0.05$ ) for two independent samples will be applied, as there is no normal distribution of the data.

## RESULTS AND DISCUSSION

Table 1 shows the averages reached in the ratings issued by each independent group for each indicator evaluated. In the first two indicators, there were no notable differences in the means or averages reached, both in the theoretical importance given by the specialists to coordination in the training of the initiation soccer player (Group 1: ImC=3.75 points; Group 2: ImC=3.8 points), as well as the priority of coordination training in U-12 soccer, with respect to the rest of the physical capacities (Group 1: PeC=3.67 points; Group 2: PeC=3.7 points), obtaining in these indicators an average qualitative qualification between moderately Important to important (Table 1).

**Table1.** - Specialist evaluations by independent group

No	Indicators			
	ImC	PeC	ImD	PeD
<b>N1</b>	4	3	2	2
<b>N2</b>	3	4	2	2
<b>N3</b>	4	4	3	3
<b>N4</b>	2	3	1	2
<b>N5</b>	4	3	2	3
<b>N6</b>	4	4	2	2
<b>N7</b>	5	4	2	3
<b>N8</b>	3	3	3	3
<b>N9</b>	4	5	4	2
<b>N10</b>	3	3	2	1
<b>N11</b>	5	4	3	2
<b>N12</b>	4	4	2	2
□	<b>3,75</b>	<b>3,67</b>	<b>2,33</b>	<b>2,25</b>



<b>I1</b>	5	4	4	3
<b>I2</b>	4	4	4	3
<b>I3</b>	3	4	3	3
<b>I4</b>	4	4	5	3
<b>I5</b>	3	3	5	3
<b>I6</b>	3	3	4	3
<b>I7</b>	4	3	5	4
<b>I8</b>	4	4	4	3
<b>I9</b>	4	5	4	4
<b>I10</b>	4	3	5	3
□	<b>3,8</b>	<b>3,7</b>	<b>4,3</b>	<b>3,2</b>

For the case of the rest of the indicators evaluated, the comparison of the mean values does evidence certain differences, verified through the Mann-Whitney U Test (Table 2) and (Table 3), where the indicator that classifies the importance of the training of the differentiation of technical gestures presented different means among the independent groups studied (Group 1: ImD=2.33 points; Group 2: ImD=4.3 points), as well as the priority of training the differentiation of technical gestures, with respect to the rest of the components of motor coordination, described in [Weineck \(2005\)](#).

**Table 2.** - Correlations of indicators among independent groups. Mann-Whitney U test

		Ranges		
	Group	N	Average range	Ranges sum
<b>ImC</b>	N-Group1, National Specialists	12	11,46	137,50
	I-Group2, International Specialists	10	11,55	115,50
	Total	22		
<b>PeC</b>	N-Group1, National Specialists	12	11,38	136,50
	I-Group2, International Specialists	10	11,65	116,50
	Total	22		
<b>ImD</b>	N-Group1, National Specialists	12	6,92	83,00
	I-Group2, International Specialists	10	17,00	170,00
	Total	22		
<b>PeD</b>	N-Group1, National Specialists	12	7,83	94,00
	I-Group2, International Specialists	10	15,90	159,00
	Total	22		



**Table 3.** - Test statistics<sup>a</sup>

	ImC	PeC	ImD	PeD
<b>U de Mann-Whitney</b>	59,500	58,500	5,000	16,000
<b>W de Wilcoxon</b>	137,500	136,500	83,000	94,000
<b>Z</b>	-,036	-,110	-3,746	-3,231
<b>Asymptotic significance (bilateral)</b>	,971	,912	,000	,001
<b>Exact significance [2*(one-sided sig.)].</b>	,974 <sup>b</sup>	,923 <sup>b</sup>	,000 <sup>b</sup>	,003 <sup>b</sup>
<b>a. Grouping variable: Group</b>				
<b>b. Number corrected for ties.</b>				

As evidenced in the correlations (Table 2), as part of the evaluations issued by the specialists in both independent groups, the ImC ( $p=0.974$ ) and PeC ( $p=0.923$ ) indicator did not present significant differences in the individual ratings issued, having in both cases similar average ranges. In this sense, it shows a similar level of importance and priority, offered in theory by the national and international specialists surveyed, given to the coordination component in general, present in the training of initiation soccer players.

Both national and international specialists value the need that presents the training of coordination capacity as an essential component of the process of sports training management, in initiation soccer players, usually modeled through the design of technical-tactical contents of sports training as a didactic component of teaching-learning, (Infante, Aliaga, & Cuadro, 2019). Relevant aspect in the training of cooperation-opposition sports, forming part of the training models in basic training, as specific Barrero & Lazarraga, (2020).

There is no doubt that the levels of acceptance of motor coordination training are high, both for national and international coaches, reaching qualitative scores between moderately important and important. However, the rest of the indicators studied did present notable differences, both the ImD ( $p=0.000$ ) and the PeD indicator ( $p=0.003$ ), with higher average ranges (Group 1: ImD=6.92; Group 2: ImD=17.00; Group 1: PeD=7.83; Group 2: PeD=15.90) in the international specialists, when rating these variables with a higher score.

In this sense, the importance of training the differentiation of technical gestures in U-12 soccer (ImD) is not relevant for national specialists, qualitatively qualifying this component of the preparation as "Not very important" (2.33), unlike national specialists who qualitatively qualify it as "Important" (4.3), an aspect that can be reflected in the design and applicability of preparation contents where the ImD indicator is prioritized.

The importance of differentiation training has been reflected in the own consultation of primary research sources, where works such as that of Muñoz, Castillo, & Yanci, (2018) analyze the differentiated effort in different formats of reduced games in a Spanish team, while in the literature of national authors no works directly related to the field of study indicated were detected.





The above indicates the little relevance of differentiation training in technical gestures provided by national coaches, despite the need for it in the training of initiation soccer players, (Weineck, 2005) aspect to be taken into account for future strategic teaching-learning actions, oriented to the training of national technical personnel.

On the other hand, it is logical to think that the priority of training the differentiation of technical gestures, with respect to the rest of the components of motor coordination (motor adaptation and adaptation to variations, regulation capacity, reaction capacity, orientation capacity, balance capacity, rhythm capacity, combination capacity and coupling of movements) will not be an essential component to model and implement it through specialized contents of the preparation by the national specialists who, likewise to the ImD indicator, qualitatively qualified it as "Not very relevant" (PeD: 2. 25), in contrast to the positive qualification made by the international specialists of "Moderately important" (PeD: 3.2).

Given the above, as a future step of the present research, it is recommended to design a group of exercises to enhance motor coordination in general and, specifically, the ability to differentiate technical gestures in U-12 training categories. Additionally, it will be necessary to disseminate nationally the importance of training the physical capacity studied, emphasizing in the Ecuadorian environment of teacher-educational training for soccer players of initiation categories.

## CONCLUSIONS

It is concluded that the validation by specialist evidences the theoretical importance of the training of the physical capacity of coordination in soccer players, in initiation stages, both for national and international specialists. In addition, a significant level of importance and priority is evidenced in international specialists, in the training of differentiation of technical gestures in U-12 soccer, with respect to national specialists, as well as a greater preference for the training of differentiation, with respect to other components of coordination training.

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**Conflict of interests:**

The authors declare not to have any interest conflicts.

**Authors' contribution:**

**Marco Antonio Romero Mackenzie:** Conception of the idea, literature search and review, instrument making, instrument application, compilation of information resulting from the instruments applied, statistic análisis, preparation of tables, graphs and images, database preparation, general advice on the topic addressed, drafting of the original (first version), review and final version of the article, article correction, authorship coordinator, translation of terms or information obtained, review of the application of the applied bibliographic standard.



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