Do coaches from different handball contexts assume the same success criteria to identify high potential handball athletes?

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In sport, the interpretation of performance has motivated researchers and practitioners to study its modelling, in other words, the clarification of concepts and the identification of factors and indicators that are associated to sports success. Thus, the main goal of this work is to know the opinion of handball coaches about the major requirements of elite handball players. It is also our purpose to understand if coaches from different handball contexts assume the same success criteria when they want to identify athletes with high potential for the practice of handball, or if on the contrary the theoretical model adopted by each group of coaches is different. A questionnaire (Questionnaire to Handball Technicians) was given to a sample of 71 coaches (31 from formation teams, 32 from senior groups, 8 from national sports teams in Portugal). It was asked to the respondents to rate the importance of each factor and indicator of performance when considering a success senior handball player.

In what refers to the conception that coaches have about an high performance handball athlete, it is observed that the three group studied only differ significantly in 19 of the 282 variable considered in the study (6.74%), i.e., coaches have the same theoretical referential about a handball athlete in general, as well as they have about each game position. With this result we can then think in investing and build a theoretical model.

Keywords: coaches; handball; Portugal; performance; success
Introduction

Diversity is the basis of the capacity of being creative and different. Being talented implies having certain attitudes, individual differences and abilities. While some authors believe that certain human beings own since birth better “attributes”, others are certain that the difference between subjects comes from the ability to use those “attributes” and from the benefits achieved through their use throughout life (Csikszentmihalyi et al., 1993). Howe et al. (1998) thinks that knowledge acquisition through experience, preferences, practice opportunities, training and also the accomplishment of difficult tasks are a better explanation of some teenage and children’s feats than the innate talent (Hyllegard, 2000). However, it is known that talent is one of the fundamental conditions to achieve the excellence in sports competition and its identification represents the first step to select the exact subjects, in other words, to select the subject capable to reach a higher level of sportive perfection based on a complete process of specialization (Manso et al., 2003). This process of selection is covered by great complexity, so, only the clear definition of methodological principles and selection criteria, scientifically supported, will permit to increase substantially the efficiency of the process and ensure a correct guidance of the youngsters.

The analysis of sports performance is one of the main purposes of sports modulation. The performance, as perceived and evaluated result, according to Fitts and Posner (1968) and Famose (1999), can be presented in an ordinal scale of quantity or quality. Regardless of the scale used, sports performance can be analyzed according to different scientific perspectives (Grosser et al., 1989), using for that purpose specific knowledge of different research areas (e.g., pedagogy, morphology,
physiology, psychology) and can also assume different connotations both in the general scientific literature, and in the context of physical education and sports (Blanco, 2004).

One of the most productive areas of research has been the evaluation of effort, during handball game. The handball game with its intermittent nature and complexity of movements and techniques, inversely to other sport disciplines (especially the ones denominated as cyclic) is very difficult to study. The literature, on this area, includes studies of Portuguese and foreigner experts, who have studied the characterization of the load during handball game (Teoduresco, 1984; Bayer, 1986; Santos, 1989; Brandão, 1992) and the characterization of the athletes’ effort (Soares, 1987, 1988; Monge da Silva, 1988; Bompa, 1990), with the aim of identifying the physical capacities required in the game (Konzak and Schacke, 1968; Mikkelsen and Norgaard, 1976; Cercel, 1980; Flohr, 1985; Janeira, 1988, 1994; Álvaro, 1989; Santos, 1989, 1995; Garcia, 1990; Seiru-lo, 1990, 1993; Czerwinski, 1993; Román, 1994; Magalhães, 1995; Soares, 1995; Borges, 1996; Silva, 1999; Laguna and Torrescusa, 2000; Blanco 2004). The importance of the optimization and characterization of an athlete’s physical condition, especially during the game situation, in order to create physiological profiles (Janeira, 1988) for each handball game positions, is certainly essential.

Furthermore, the importance of some psychological and social variables is obvious and have been used to support the differences observed between athletes (Lévêque, 1984; Lorenzo, 1994) and should be part of the coaches concerns during systematic training (Cercel, 1980; Bayer, 1986; Mahoney et al., 1987; Chamorro and Palenzuela, 1991; Latiskevits, 1991; Laguna and Torrescusa, 2000). This psychological process of optimization allows the subject to accept sacrifices in order
to reach excellence and persist on this objective. Wishing to be the best and a winner, seems to be the result of the interaction between intrinsic factors (i.e., athletes’ disposition) and extrinsic factors (i.e., context in which sport is developed and performed). Actually, in spite of numerous studies mentioning the psychological capacities of the high performance athlete, all of them emphasize a specific situation, or a determine sports discipline, but never the different game positions being therefore difficult to state or select which are the most important psychological variables to achieve specific success (Laguna and Torrescusa, 2000).

However, the great variety of terms, methods and scientific disciplines involved in the study of sports performance do not help the systematization and methodological organization of studies with these characteristics. It is known that the absence of knowledge about the morphologic prototype for one specific modality can seriously limit sports performance (Tanner, 1973), in a context of high level of performance, as there are anthropometrical characteristics directly related with the requirements of the game (Cercel, 1980; Bayer, 1986; Durand, 1988; Garcia, 1990; Román, 1990, 2001; Czerwinski, 1993; Trosse, 1993; Álvaro, 1996; Moreno, 1996; Blanco, 2004; Massuça, 2007). Also in the domain of physiology, the terminology adopted, when studying sports modelling, varies a lot depending on the studied variables, that is, many authors shape performance from the study of physical condition (Karpovich, 1980; Grosser and Neumaier, 1986), others through motor qualities (Cercel, 1980, 1990; Román, 1994), others using the physical capacity (Garcia, 1984 and 1990), others from the study of physical factors (Trosse, 1993), or from the study of general physical capacity (Czerwinski, 1993), or from the study of motor factors (Álvaro, 1996), or from the factors of physical condition (Moreno, 1996) or even through the analysis of physical qualities (Laguna and Torrescusa,
It is thus evident that the conceptual delimitation of the term performance cannot be unanimous, in this context and domain of knowledge, finding different translations as a consequence of the options followed by researchers and as a result of the type of variables they use for its delimitation (Ozolin, 1972; Fleishman and Quaintance, 1984; Durand, 1988; Arroyaga and Martínez, 1998). Furthermore, in the scope of the study of the sports modelling the term technique is also confused with other expressions that appear frequently instead of sports technique (e.g., type of execution, technical gesture, ideal/perfect movement). Parallel to the technique concept, two other concepts appear; (i) the technical gesture, which includes the actions and movements that define the individual action, (Blanco, 2004) and (ii) the collective technique that results of the interaction between the athletes, the situation and their colleagues’ trajectory and position.

Tactics has also been considered a basic and determinant factor of performance (Teodoresco, 1977, 1984; Weineck, 1983; Fleishman and Quaintance, 1984) in the different stages of sports learning but also during the stages of success consolidation, as it allows distinguishing the good athlete from the one that is able to perform the adequate action at the right moment. Researchers are unanimous in regards to the importance of tactics in the development of handball (Bayer, 1986; Cercel, 1990; Sánchez, 1993; Laguna and Torrescusa, 2000), however, similarly to what we have already pointed out, the conceptual delimitation of the term tactics has also led to a few different concepts, such as tactical intelligence, (Fleishman and Quaintance, 1984; Bayer, 1986; Cercel, 1990; Laguna and Torrescusa, 2000), individual tactics (Cercel, 1990; Czerwinski, 1993; Sánchez, 1993; García, 1998), collective team tactics (García, 1998) and tactic of attack and defense (Czerwinski, 1993; Sánchez, 1993).
After presenting some conceptual divergences we will now present the conceptual models of performance and the conceptual trends that have been associated to the study of high performance in handball (Cercel, 1980; Czerwinski, 1993; Trosse, 1993; Moreno, 1996; Laguna and Torrescusa, 2000). According to Czerwinski (1993), only a small group of handball players reaches a high level of performance, as the sportive success depends of the innate talent, the (optimal) conditions and of the training methodology followed (i.e., adequate work). To Cercel (1980) although the sports result may be extremely associated with the human qualities, it can be influenced by the process of sportive selection. Trosse (1993) based in the causal model of performance, stated that handball performance results of the complex capacity of combining a set of capabilities (e.g., psychic, physiological, technical), and create different and complex actions to solve the problems throughout the game, being essential for this purpose to present a balanced domain of the factors that influence the sports performance (e.g., morphological, physical condition, technical, tactical and psychosocial). In short, and as Laguna and Torrescusa (2000) say, it seems that the high performance in handball is supported essentially by two conditions: the work done (quantity and quality) and the quality of the raw materials. The last condition highlights the importance of the genetic conditions of the players, showing that “sportsman without adequate genetic potential can hardly reach high performance” (Blanco, 2004, p.66). Francisco Moreno Blanco had already presented in 1996 a simplified model based on four factors: anthropometric measures, physical condition, technical and tactical requirements and psychological factors. This means that Blanco (2004) was perhaps the first author to explicitly contribute for the modelling of sports success in handball. In Portugal the sportive performance has also been studied with special attention to sportive games performance. This theme has
been reviewed by Garganta (2001), however, few have been the ones (coaches, researchers and other associated agents) who have tried to identify the factors that most contribute to the success of handball (Silva, 1999; Rito, 2000; Massuça, 2007).

Throughout the sportive life a set of performance factors will act and shape the athlete’s motivations until the moment that the optimization process will coincide with the desire of showing his maximum potential. This means that there is a moment of “grace” defined by Ruiz (1997) as “the optimal state of performance”, which all athletes wish to achieve. This moment is ephemeral and unstable by nature and requires steadiness and commitment to be extended in time. The debate over what is “optimal state of performance” in the context of sport modeling should be made despite all the terminological difficulties already mentioned, the answers given by many authors about innate talent and training conditions and specially this debate should be done based on a theoretical model that supports and influences the talent selection done by each coach during different learning stages.

The main goal of this work is to evaluate what are the requirements of a high performance handball player using for this purpose the opinion of handball coaches and national team managers. It is also our purpose to understand if coaches from different handball contexts (senior teams’ coaches, formation teams’ coaches and Portugal national team managers) assume the same success criteria when they want to identify high potential handball athletes, or if on the contrary the theoretical model adopted for each group is different.

Methods

The sample is constituted by 71 coaches, 31 from the formation stages (F), 32 from the senior stages (S) and 8 from the Portugal national teams (NT).
A questionnaire was applied (“Questionnaire to Handball Technicians”; Massuça, 2007), whose elaboration was based on other ones used in Portugal for similar studies (Estriga, 2000; Rito, 2000). Measures and guidelines referred by Barros and Lehfelt (1986), Lakatos and Marconi (1990) and Bell (1997) were adopted. The questionnaire, applied on the 26th August 2006, at the Action Training and Technical Guidances – Season 2006/2007”, organized by the Portuguese Handball Federation, which contemplates the following dimensions: (i) Identification; (ii) Sportive practice; (iii) Identification criteria for high performance handball players; (iv) Suggestions. In the third dimension (subject of analysis in this work), it was required to the respondents to evaluate in general terms the importance of some factors and indicators to the success of the senior handball player (further designated by handball player, HP) and the importance of the same factors and indicators to the success of each of the game’s position that characterize the modality (wing, W; backward right and left, BLR; backward center, BC; pivot, Pi; goalkeeper, GK). Variables were classified according to a descriptive scale similar to Lickert 5 points (1=Little Important; 2=Not Important; 3=Important; 4=Very Important; 5=Extremely Important).

The variables below described (n=47) were studied for each of the situations (HP, W, BLR, BC, Pi and GK), totaling a number of 282 variables).

Variables… Importance given to: anthropometric factor (F1); physical condition (F2); technical factor (F3); tactic factor (F4); psychological factor (F5); social factor (F6); height (F1_I01); weight (F1_I02); armspan (F1_I03); biacromial diameter (F1_I04); handspan (F1_I05); total length of the upper limb (F1_I06); total length of the lower limb (F1_I07); fat percentage (F1_I08); displacement velocity (F2_I01); speed–agility (F2_I02); lower-extremity muscle strength (e.g., vertical
jump; F2_I03); lower-extremity muscle strength (e.g., horizontal jump; F2_I04); back-strength (F2_I05); upper muscle strength (F2_I06); medium strength (F2_I07); handgrip strength (F2_I08); flexibility (sit and reach; F2_I09); aerobic power (F2_I10); defensive displacements (F3_I01); different types of covering opponents (F3_I02); the capacity of recovering balls (F3_I03); the ability to escape to opponents (F3_I04); pass and reception (F3_I05); shooting types (F3_I06); solve on one to one situation (F3_I07); the capacity of creating and occupy spaces (F4_I01); the tactical repertoire (offensive and defensive; F4_I02); defensive collaboration (F4_I03); the capacity of diversifying the actions (F4_I04); the anxiety trait in competition (F5_I01); motivation (F5_I02); social acceptance/rejection (F5_I03); self-efficiency (F5_I04); psychological maturity (F5_I05); impulsivity-activity (F5_I06); the type of housing (F6_I01); the family circle (F6_I02); the literacy level (F6_I03); profession (F6_I04); leisure activities (F6_I05); the pleasure of practicing handball (F6_I06).

Informatics program SPSS for Windows (Statistical Package for the Social Sciences Inc, version 15.0, Chicago, Illinois) was used for the organization and statistical treatment. Statistic techniques used: (i) Descriptive statistic; (ii) Kruskall-Wallis Tests, to verify the existence of significant differences between the sample groups (F, S and NT); (iii) Mann-Whitney Test with Bonferroni correction, to verify which groups differ from one another separately (Hill and Hill, 2002; Martinez and Ferreira, 2007).

**Results**

The total sample is composed by 71 individuals, 60 of which (84.5%) are male and 11 (15.5%) are female. Furthermore, 28 of the men (46.7%) belong to the group of coaches of teams in formation stages (F), 26 (43.3%) to the group of senior teams
coaches (S) and 6 (10%) to the group of Portugal national managers (NT), while with regard to women, 3 (27.3%) belong to group F, 6 (54.5%) to group S and 2 (18.2%) to group NT. The sample being random comprises coaches from 13 out of 24 Local Handball Associations, from which 55% belong to two of the larger Handball Associations in Portugal (Lisbon and Oporto).

It is followed the presentation of the results of the opinion of the coaches in regards to the importance of the performance factors considered in the questionnaire (Table 1). Although the analysis of the multiple comparisons of averages Ranks allows to verify which group of trainers attributes greater (or minor) importance to a given performance factors, in general it shows that the differences between the groups studied are not statistically significant ($p>0.05$).

|TABLE 1|

There are, however, some significant differences when groups of coaches are compared with regard to different indicators included in each factor. There are significant differences between the coaches in the formation stages and the coaches of senior teams, in regards to the importance rate given to the anthropometric factor of the wing ($U=310.500$, $p<0.05$), and among the National teams managers and the seniors’ coaches about the rate of importance given to the physical condition of the handball player ($U=69.000$, $p<0.05$) and backward left/right ($U=71.500$, $p<0.05$).

Coaches’ opinions diverge about some indicators (i.e., anthropometric factor, physical condition and technique; Table 2). So, according to the study of anthropometrical indicators, significant differences can be observed in regards to the importance given to fat percentage of handball players ($U=336.500$, $p<0.05$) and
stature of goalkeeper (U=355.000, \( p<0.05 \)) by coaches from senior teams and from the formation stages. Statistical analysis also showed significant differences in the opinion of handball coaches about the handspan of the goalkeeper (\( H(2)=8.146, \ p<0.05 \)), being obvious that coaches from the formation stages consider it more important than the technical staff from Portuguese national teams (\( U=52.500, \ p<0.01 \)). Also to backward center and pivot, the technical staff from Portuguese national teams consider the handspan less important than coaches from senior teams (\( BC, \ U=72.000, \ p<0.05 \)) and formation stages (\( Pi, \ U=68.500, \ p<0.05 \)) respectively.

By studying the indicators associated to physical condition factor, it is noted that the importance given to aerobic power is significantly different (\( H(2)=6.671, \ p<0.05 \)), between coaches of formation stages and the technical staff from Portuguese national teams when considered the handball players (\( U=65.000, \ p<0.05 \)), and between the coaches from senior teams and national managers when considered the backward right/left (\( U=60.000, \ p<0.05 \)). Also significant differences were observed between coaches from formation stages and from senior teams about the importance of the back-strength in pivot players (\( U=322.500, \ p=0.05 \)).

With regard to the importance given to technical indicators, it is noted that coaches give different rates of importance to the defensive displacements of the handball player (\( H(2)=7.563, \ p<0.05 \)), to the pass and reception of the backward right/left (\( H(2)=5.953, \ p<0.05 \)) and to shooting types of the wing (\( H(2)=6.553, \ p<0.05 \)) and backward right/left player (\( H(2)=6.761, \ p<0.05 \)).
The formation stage coaches and national managers give greater importance to the
defensive displacements of the handball player than the coaches of senior teams (F vs.
S: U=364.000, \( p<0.05 \); NT vs. S: U=67.500, \( p<0.01 \)). National managers give greater
importance to the pass and reception of the wing player than the coaches of the
formation stages (U=66.000, \( p<0.05 \)). At last it is noted that Portuguese national
managers give greater importance than senior stages coaches to shooting types of the
wing’s (U=65.500, \( p<0.05 \)), backward right/left (U=66.000, \( p<0.05 \)) and pivot
(U=67.000, \( p<0.05 \)). National managers also consider significantly more important
the shooting types done by the right and left backward than coaches from the
formation stages (U=321.000, \( p<0.05 \)). Although significant differences were not
observed among the sample groups (Table 2), when indicators are studied in separate
it becomes evident that, in regards to the importance of solve on one to one situation,
the opinion of senior teams coaches diverges slightly of the national managers when
considered the backward right/left player (U=64.500, \( p<0.05 \)), and of the coaches
from formation stages when considered the pivot player (U=321.500, \( p=0.05 \)).

The study of the following factors: tactical, psychological and social showed
that there were no significant differences between the opinion of the sample groups
used whether it was taken in consideration the handball player and each of the game
positions (Table 3).

**[TABLE 3]**

Nevertheless, by studying each of the indicators that refer to the mentioned factors
significant difference was observed between the rate of importance given by coaches
from formation stages and from senior teams with regard to the importance of the social acceptance/rejection of handball player (U=354.500, p<0.05).

Discussion

In order to reach high performance the athlete has to be confronted with a large number of factors (Sáenz-López et al., 2005). It is necessary to approach the handball player from a multidisciplinary point of view in order to meet the group of characteristics that can explain high performance (Saénz-López et al., 2006). Some studies in the literature had already contributed for the development of the modelling research in handball (Cercel, 1980; Czerwinski, 1993; Trosse, 1993; Moreno, 1996; Laguna and Torrecusa, 2000), and it appears that the study of anthropometrical, physical condition, technical, tactical, psychological and social factors, as well as its relation with each specific game position represent a current line of investigation with scientific pertinence. With this work we tried to identify and characterize the coaches’ opinion regarding the performance variables that influence the success of the handball athlete in general and for each game position.

The Figure 1 summarizes the results of this study, and the opinion of each group of respondents. This figure gives a good perspective of who give greater importance to each factor and performance indicator, according to each game position (W, BLR, BC, Pi and GK) and in general (HP). The group of national coaches is the one who gives greater importance to the physical condition and technical factors, for all game positions. This is in accordance with the rank of technical indicators, but it is not in accordance with the rank of physical condition indicators. The national coaches attribute more importance to speed, strength, and aerobic power while the senior team managers rarely appear as the ones who give greater importance to any of the ten
condition indicators considered. In respect to the anthropometric factor and to anthropometric indicators is evident from Figure 1 that they are especially important to youth team coaches. The study of anthropometric factors particularly done with athletes from youth levels is perhaps the research area with greater number of scientific works. So it's not surprising that the group of coaches from youth teams focus their opinion on anthropometry, although they also selected the physical condition and psychological dimension of the elite athletes. It is known that the anthropometric characteristics influence the result of a handball game (Fernández et al., 2004). However, although it is recognized that exceptional handball players have higher values in a set of anthropometrical measures such as stature, (Cercel, 1980; Bayer, 1986; Garcia, 1990; Czerwinski, 1993; Trosse, 1993; Moreno, 1996; Álvaro, 1996), body mass (Cercel, 1980; Bayer, 1986; Czerwinski, 1993; Álvaro, 1996; Moreno, 1996; Román, 2001), armspan (Cercel, 1980; Bayer, 1986; Czerwinski, 1993; Moreno, 1996), biacromial bone breadth (Czerwinski, 1993; Álvaro, 1996; Moreno, 1996), handspan (Cercel, 1980; Bayer, 1986; Czerwinski, 1993; Trosse, 1993; Moreno, 1996), calf girth (Czerwinski, 1993), leg length (Trosse, 1993), girth and length of the arm (Czerwinski, 1993; Trosse, 1993), a hip diameter proportionally narrow (Czerwinski, 1993), long extremities (Czerwinski, 1993), and a certain type of somatotype (Álvaro, 1996), until now, it has not been presented a morphologic model of the high performance handball player.

In a study of senior teams managers (men and women), of the Brazilian first division, Santos (1997) found that the technical and coordinative factors (91.7%), psychological (83.3%) and tactical-cognitive (75%) were the most relevant in the selection process of athletes of handball. In this study, the classification of tactical, psychological and social factors reveals some balance considering the ordering of the
rating of each group. However, the analysis of the weight associated to each indicator show that national coaches give greater importance to tactical and social indicators. Also with regard to physiological indicators is clear the position of this group considering the importance given to motivation and self-efficacy.

Although the group of national coaches express a stronger position about the importance of the physical condition and technical factors, it seems that they give greater importance to most of technique and tactics indicators, to some psychological indicators already presented and also to socio-economic status of athletes, in particular to the indicators (i) type of housing, (ii) family circle and (iii) type of profession. But what is the justification for the observed distribution? It is certainly not controversial to say that history is full of examples of coaches that, based on their experience and intuition, made the right choices, confirmed by the consecration of their athletes (Estriga, 2000). However, it seems that each group of respondents considers and emphasizes what is their specific practice concerns, i.e., the coaches of the youth team select the anthropometric characteristics because they know that athlete anthropometric characteristics may influence the result of the game, as national coaches, who work with the elite players, they just have to focus their investment for a short period of time (e.g., traineeship) on technical and tactical intelligence, because as already mentioned, the contribution of individual tactics can make all the difference to achieve success. We are thus led to think that the specificity, the context and stage of performance, and the requirements and constraints of the structure of training and competition explain the differences
observed between the three groups of trainers, and logically determined their selections (factors and indicators). This would mean that trainers and coaches could not dissociate the idea about high performance athletes from the concerns they experience during their daily practice. However, the results of this study suggested that the opinion of coaches (F, S and NT) is similar, since from the 282 variables studied it were only observed significant differences in 19, which means the coaches are in agreement in 93.26% of the cases (Figure 1). Also Maia (1993) noted that the trainers and national coaches have the same understanding about what should be the selection factors of performance considering a group of handball athletes aged between 13 and 16 years. Most of the significant differences (19 variables) occurred between coaches from senior teams and technical staff from Portuguese national teams (50%), mainly in technical indicators. Also in anthropometrical indicator the major differences occurred between the coaches from formation stages and any of the others coaches groups, i.e., coaches from senior teams (stature and fat percentage indicators), and national managers (the handspan of pivot and goalkeeper players). Once more, these observations were in accordance with ours initial observations, i.e., coaches emphasizes what are their specific practice concerns.

Conclusion

The results suggest that coaches have the same theoretical referential about a handball athlete which allows the researchers to invest on a theoretical model not only for the general handball player of high performance but also for each handball game position.
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References


Table 1. Kruskall-Wallis Tests results, to verify the existence of significant differences between the sample groups (F, S and NT); considering six performance factors, in regards to the handball player and each of the game positions.

| Factor   | F1 | S  | NT | F2 | S  | NT | F3 | S  | NT | F4 | S  | NT | F5 | S  | NT | F6 | S  | NT |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| F1       | 39.44 | 32.33 | 37.38 | 39.73 | 30.47 | 27.63 | 36.59 | 32.73 | 34.25 | 34.68 | 31.81 | 40.13 | 38.36 | 31.38 | 32.79 | 38.37 | 30.34 | 36.36 | Ns |
| F2       | 34.19 | 34.25 | 50.00 | 35.25 | 30.39 | 43.63 | 33.63 | 31.40 | 45.38 | 32.83 | 33.40 | 44.81 | 35.30 | 31.73 | 46.56 | 36.07 | 31.11 | 41.94 | Ns |
| F3       | 34.27 | 34.36 | 49.25 | 36.69 | 33.03 | 36.75 | 32.07 | 33.26 | 43.63 | 34.34 | 33.71 | 38.13 | 34.95 | 32.63 | 40.13 | 36.60 | 32.28 | 40.06 | Ns |
| F4       | 33.23 | 36.13 | 46.25 | 35.38 | 33.19 | 32.31 | 34.86 | 34.66 | 32.56 | 37.24 | 34.78 | 27.75 | 29.91 | 37.74 | 38.56 | 32.55 | 35.68 | 32.57 | Ns |
| F5       | 37.02 | 35.14 | 35.50 | 32.75 | 36.48 | 28.75 | 37.55 | 32.06 | 32.88 | 34.50 | 35.42 | 35.25 | 33.76 | 35.00 | 31.13 | 34.84 | 34.77 | 32.19 | Ns |
| F6       | 38.24 | 32.86 | 39.88 | 34.52 | 31.35 | 34.00 | 36.40 | 31.65 | 34.50 | 38.07 | 30.35 | 37.63 | 38.22 | 30.32 | 37.19 | 36.33 | 31.47 | 39.63 | Ns |

*ns*: not significant; F: Coaches from formation stages; S: Coaches from senior stages; NT: Coaches from Portugal national teams; F1: Anthropometrical factor; F2: Physical condition factor; F3: Technical factor; F4: Tactical factor; F5: Psychological factor; F6: Social factor.
Table 2. Kruskal-Wallis Tests results, to verify the existence of significant differences between the sample groups (F, S and NT); considering anthropometrical indicators, physical condition and technique, in regards to the handball player and each of the game positions.

<table>
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<th>Handball player</th>
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<th>Backward Center</th>
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* p < 0.05; ns: not significant; F: Coaches from formation stages; S: Coaches from senior stages; NT: Coaches from Portugal national teams; F1_I01: importance given to height; F1_I04: importance given to biacromial diameter; F1_I05: importance given handspan; F1_I06: importance given to total length of the upper limb; F1_I07: importance given to total length of the lower limb; F1_I08: importance given to the fat percentage; F2_I01: importance given to displacement velocity; F2_I02: importance given to speed-agility; F2_I03: importance given to low-extremity muscle strength (e.g., vertical jump); F2_I04: importance given to lower-extremity muscle strength (e.g., horizontal jump); F2_I05: importance given to back-strength; F2_I06: importance given to upper muscle strength; F2_I07: importance given to medium strength; F2_I08: importance given to handgrip strength; F2_I09: importance given to flexibility (e.g., sit and reach); F2_I10: importance given to aerobic power; F3_I01: importance given to the defensive abilities; F3_I02: importance given to the different types of covering opponents; F3_I03: importance given to the capacity of recovering balls; F3_I04: importance given to the ability to escape to opponents; F3_I05: importance given to pass and reception; F3_I06: importance given to shooting types; F3_I07: importance given to solve on one to one situations.
psychological and social indicators, in regards to the handball player and each of their game positions.

Table 3. Wallis Tests results, to verify the existence of significant differences between the sample groups (F, S and NT); considering tactical, psychological and social indicators, in regards to the handball player and each of their game positions.

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<th>Pivot</th>
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*: p < 0.05; ns: not significant; F: Coaches from formation stages; S: Coaches from senior stages; NT: Coaches from Portugal national teams; F4_I01: importance given to the capacity of creating and occupying spaces; F4_I02: importance given to the tactical repertoire (offensive and defensive); F4_I03: importance given to defensive collaboration; F4_I04: importance given to the capacity of diversifying your actions; F5_I01: importance given to the anxiety trait in competition; F5_I02: importance given to motivation; F5_I03: importance given to social acceptance/rejection; F5_I04: importance given to self-efficiency; F5_I05: importance given to psychological maturity; F5_I06: importance given to impulsivity-activity; F6_I01: importance given to the type of housing; F6_I02: importance given to the family circle; F6_I03: importance given to the literacy level; F6_I04: importance given to profession; F6_I05: importance given to leisure activities; F6_I06: importance given to the pleasure of practicing handball.
High performance handball athlete. Importance given to… HP W BLR BC Pi GK

Anthropometric factor (F1)  
Physical condition factor (F2)  
Technical factor (F3)  
Tactical factor (F4)  
Psychological factor (F5)  
Social factor (F6)  
Height (F1_I01)  
Weight (F1_I02)  
Armspan (F1_I03)  
Biacromial diameter (F1_I04)  
Handspan (F1_I05)  
Total length of the upper limb (F1_I06)  
Total length of the lower limb (F1_I07)  
Fat percentage (F1_I08)  

Displacement velocity (F2_I01)  
Speed-agility (F2_I02)  
Lower-extremity muscle strength (e.g., vertical jump) (F2_I03)  
Lower-extremity muscle strength (e.g., horizontal jump) (F2_I04)  
Back-strength (F2_I05)  
Upper muscle strength (F2_I06)  
Medium strength (F2_I07)  
Handgrip strength (F2_I08)  
Flexibility (e.g., sit and reach) (F2_I09)  
Aerobic power (F2_I10)  

Defensive displacements (F3_I01)  
Different types of covering opponents (F3_I02)  
Capacity of recovering balls (F3_I03)  
Escape to opponents (F3_I04)  
Pass and reception (F3_I05)  
Shooting types (F3_I06)  
Solve on one to one situation (F3_I07)  

Capacity of creating and occupy spaces (F4_I01)  
Tactical repertoire (i.e., offensive and defensive) (F4_I02)  
Defensive collaboration (F4_I03)  
Capacity of diversifying your actions (F4_I04)  

Anxiety trait in competition (F5_I01)  
Motivation (F5_I02)  
Social acceptance/rejection (F5_I03)  
Self-efficiency (F5_I04)  
Psychological maturity (F5_I05)  
Impulsivity-activity (F5_I06)  

Type of housing (F6_I01)  
Family circle (F6_I02)  
Literacy level (F6_I03)  
Profession (F6_I04)  
Leisure activities (F6_I05)  
Pleasure of practicing handball (F6_I06)  

Legend: Coaches from the  
formation stages Coaches from  
the senior stages Coaches from the  
Portugal national teams  

W: Wing; BLR: Backward Left/Right; BC: Backward Center; Pi: Pivot; GK: Goalkeeper;  
Significantly different (p<0.05) according to results of the Mann-Witney test: A, F vs S; B, S vs NT; C, F vs NT.  

Figure 1. Representation of the results of the Kruskall-Wallis test, using as a reference the sample group (F, S and NT), that attributes more importance to each of the factors, and indicators of performance considered in the study and statistical differences between groups (Mann-Whitney test).