RELATIONSHIPS BETWEEN PERSONALITY TRAITS AND PERCEPTION OF TACTICAL KNOWLEDGE IN BRAZILIAN FEMALE FIELD HOCKEY PLAYERS

Dirceu R. N. Gama[1,2], Camilo A. M. Souza[3], Jomilto L. P. dos Santos[3], Wecisley R. do Espírito Santo[3], Juliana B. P. Castro[1,4], and Rodrigo G. S. Vale[1,4,5]

[1]Postgraduate Program in Exercise and Sport Sciences, Rio de Janeiro State University, Rio de Janeiro, Brazil
[2]Laboratory of Philosophical Themes in Knowledge Applied to Physical Education, Rio de Janeiro State University, Rio de Janeiro, Brazil
[3]Institute of Physical Education and Sports, Rio de Janeiro State University, Rio de Janeiro, Brazil
[4]Laboratory of Exercise and Sport, Rio de Janeiro State University, Rio de Janeiro, Brazil
[5]Laboratory of Exercise Physiology, Estacio de Sá University, Cabo Frio, RJ, Brazil

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Abstract:

The present study aimed to investigate the relationships between personality traits and tactical knowledge of field hockey players. The sample consisted of 53 Brazilian female field hockey athletes. The collection instruments were the Big Five Personality Factors Inventory, the Self-Assessment Inventory of Tactical Skills in Collective Sports Games, and a sociodemographic questionnaire. The data were treated according to descriptive and correlational statistics. Percentage values were calculated when the variables showed significant differences. The normality and homogeneity of the data were verified by the Shapiro-Wilk and Levene tests, respectively. The partial correlation test, controlled by the position of the players, was used to analyze associations between the variables. A one-way ANOVA was applied to compare participants' age and practice time with their field positions. The Kruskal-Wallis test was used to compare the positions of the players. The value of $p<.05$ was adopted for statistical significance. As a result, a moderate positive correlation was obtained between practice time and age; a moderate negative correlation of Neuroticism with age and practice time; moderate positive correlations between practice time and declarative and procedural knowledge. The Openness exhibited moderate positive correlations with declarative and procedural knowledge. The midfield players had higher scores in Extraversion when compared to the defensive players. In Agreeableness, the midfield players had higher scores when compared to defense and attack. The study allowed concluding that Openness was associated with the tactical knowledge domain.

Key words: *sports, learning, tactical performance, sports psychology, personality, athletes*

Introduction

Hockey is a team sport game that involves high levels of interaction, mutual dependency between team members, technical and tactical challenges, and intensity (Wikman, et al., 2018). Field hockey is a collective invasion sport in which two teams compete for ball possession on the playing field intending to cast off the ball, using strikes applied with a stick, against the opponent's goal. The winning team is the one that has reached the highest score at the end of the match (Collet, Nascimento, & Santos, 2009).

Without detracting from the relevance of proper physical and technical preparation as fundamental requirements for sports performance, the achievement of competitive performances in team invasion sports also requires athletes to master a wide range of tactical knowledge (Ávila-Moreno, Chirosa-Ríos, Urena-Espa, Lozano-Jarque, & Ulloa-Díaz, 2018; Hughes & Bartlett, 2002). This knowledge concerns the procedures to be adopted by the teams to optimize personal and group performances (Ávila-Moreno, et al., 2018; Grehaigne, Caty, & Godbout, 2010; Lamas, Barrera, Otranto, & Ugrinowitsch, 2012).

In field hockey, the following are important tactical skills: the rational occupation of spaces on the playing field; constant and coordinated changes of players' positions; the ability to combine technical motor skills (driving, passing, throwing, finishing, tackling) in the face of contextual needs; the use of rules in favor of the team; the identification of opponents' technical and emotional weaknesses; the exploitation of the opponents' flawed points during matches (Celestino, Leitão, Sarmento, Routen, & Pereira, 2015; Hristov, 2017; Rouhollahi, Rozan, & Mehrotra, 2019).

The process of acquiring such skills is not immediate and depends on extrinsic and intrinsic aspects to the individual (Mammadov, Cross, & Cross, 2019). Concerning extrinsic aspects, the amount and variability of training sessions offered since sports initiation, the didactic strategies adopted by the coaches in the training process organization; the education level of the player, the social support given by the responsible ones, and the set of cultural situations to which the individual was exposed are decisive. As for the intrinsic aspects, it is worth mentioning the biological peculiarities, temperament, and personality (Mammadov, et al., 2019; Parma, et al., 2019).

Personality is shaped both by the set of personal experiences obtained throughout life, and by an individual's pattern of relatively stable and permanent traits (Flores-Mendoza, et al., 2016; Parks-Leduc, Feldman, & Bardi, 2015). The traits contribute so that individual's behaviors remain regular amid different types of events. Hence, a person can resemble another in many points, but this does not mean that the person does not have a personality with particular aspects (Flores-Mendoza, et al., 2016; Parma, et al., 2019).

Therefore, based on the information presented, it can be said that the personality traits of hockey players are factors that, hypothetically, are related to the effective acquisition, mastery, and application of basic tactical contents to the practice of this sport. Thus, the aim of the present study was to investigate the relationships between personality traits and tactical knowledge of athletes in this modality.

Methods

Research design and participants

The present study corresponds to a descriptive applied research, of the survey type, with a transversal cut (Pereira, Passos, Pesca, & Cruz, 2020). The study population consisted of 144 field hockey players enrolled in the 2019 Brazilian Women's Field Hockey Championship, whose matches took place on June 29 and 30, July 20 and 21, and September 14 and 15 at the premises of the School of Physical Education, Federal University of Rio de Janeiro, Brazil.

As an inclusion criterion, we opted for athletes from the four teams that played the final and the dispute of the third and fourth place in the competition, aged over 18 years completed by July 21, 2019, the day on which the data collection was executed. From these 72 athletes, 19 players were excluded due to the age lower than 18 years on the previous date. The final sample was composed of 53 participants.

The Research Ethics Committee of the Rio de Janeiro State University (UERJ) approved this work. The informed consent form was signed by the research participants according to the Declaration of Helsinki (World Medical Association, 2008).

Procedures

The accomplishment of this work counted on the collaboration of the Organizing Committee of the 2019 Brazilian Women's Field Hockey Championship.

To assess personality traits, the Big Five Personality Factors Inventory (IGFP-5) was used, originally prepared in English by John, Donahue, and Kentle (1991) with the name of the Big Five Inventory. This instrument was translated into Portuguese and validated by Andrade (2008). It consists of 44 items grouped in five dimensions: Openness (10 items); Agreeableness (9 items); Conscientiousness (9 items); Extraversion (8 items), and Neuroticism (8 items). The respondent must evaluate the usual attitudes using a five-point Likert scale, applied to five alternative answers: I totally disagree (1 point); I partly disagree (2 points); I neither agree nor disagree (3 points); I partially agree (4 points); I totally agree (5 points). The overall score ranged from 44 to 220 points.

Tactical knowledge was measured through the Self-Assessment Inventory of Tactical Skills in Collective Sports Games, a version that Pereira (2018) translated and adapted to the Portuguese language like the Tactical Skills Inventory for Sports (TACSIS) questionnaire, developed by Elferink-Gemser, Visscher, Richart, and Lemmink (2004). This instrument has 22 items, distributed in four subscales: declarative knowledge about ball actions (Knowing About Ball Actions – KABA: four items); declarative knowledge about the actions of colleagues or opponents (Knowing About Others – KAO: five items); procedural knowledge about positioning and decision making (Positioning and Deciding – PD: nine items); procedural knowledge about acting in changing situations (Acting in Changing Situations – ACS: four items). The athlete must choose an option from the Likert-type scale applied to six alternative answers: very weak (1 point); weak (2 points); slightly weak (3 points); regular (4 points); strong (5 points); very strong (6 points). The total achievable score ranged from 22 to 132 points.

A sociodemographic supplementary questionnaire was also applied to collect information on age, practice time, and sector of the field where the athletes played.

Statistical analysis

The data were processed using the IBM SPSS 23 program and presented as mean, standard deviation, and minimum and maximum values. Percentage values (Δ%) were calculated when the study variables showed significant differences. The normality and homogeneity of the data were verified by the Shapiro-Wilk and Levene tests, respectively. The partial correlation test, controlled by the position of the players, was used to analyze possible associations between the study variables. A one-way ANOVA, followed by the adjusted Bonferroni *post-hoc*, was applied to compare the variables age and time of practice in the sport between the tactical positions: defender (D), midfielder (M), and attacker (A). The Kruskal-Wallis test, followed by the Dunn's *post-hoc* test, was used to compare the variables of the personality trait and tactical knowledge between the different positions of the players. The level of $p<.05$ was considered for statistical significance.

Results

Table 1 presents the descriptive results of the sample. A low dispersion of data was observed in all the variables analyzed, except for the variable time.

Table 2 shows the partial correlation matrix controlled by the position of the players between personality traits, age, practice time, personality factors, and subscales of tactical knowledge. The practice time and the age of the players presented a moderate positive correlation. A moderate negative correlation of Neuroticism was detected with the age and practice time of the athletes. Moderate positive correlations were observed between KABA, KAO, PD, and ACS regarding the practice time. The Openness personality factor exhibited moderate positive correlations with KAO and PD. The positive correlations showed that the variables showed the same behavior regarding the trend of the achieved scores, that is, when one variable increased, the other followed the same pattern. However, the negative correlations represented the opposite, that is, while one variable increased, the other decreased.

Table 3 shows the comparison between the variables age, practice time, scores of the personality factors, and subscales of tactical knowledge by playing positions. In the variable Extraversion, the midfield players had higher scores when compared to the defenders (Δ% = 12.3%; p=.010). In the variable Agreeableness, the players in the midfield position presented higher scores when compared to the players in defensive positions (Δ% = 7.9%; p=.042) and the attackers (Δ% = 11.3%; p=.003). The other variables did not show significant variances between the different tactical positions.

Discussion and conclusions

The present study aimed to investigate the relationships between personality traits and tactical knowledge of female field hockey players. There was a positive and moderate correlation between the athletes' practice time and age, that is, the older the age, the longer they stayed in the sport. Likewise, the younger, the less experienced the player was. Therefore, it is noted that, with advancing age, adherence to this sport tends to decrease. Bezuglov et al. (2020) identified a similar trend in Russia, but in ice hockey. For the authors, this reduction occurred due to the predilection of coaches for young beginners and the belief that the progressive increase in the age group restricted the female apti-

Table 1. Descriptive results of the sample (n=53)

	Mean	SD	Minimum	Maximum
Age (years)	27.45	5.56	17	44
Time (years)	7.94	5.22	1	22
Neuroticism	24.08	3.14	17	31
Openness	34.94	3.92	27	42
Conscientiousness	30.94	3.42	23	40
Extraversion	28.26	3.30	20	36
Agreeableness	32.81	3.32	26	43
KABA	18.04	3.23	9	24
KAO	21.43	4.40	11	30
PD	38.28	7.82	20	54
ACS	17.74	3.28	10	23

Note. SD: standard deviation; values of variables in scores: Neuroticism, Openness, Conscientiousness, Extraversion, Agreeableness; KABA: Knowing About Ball Actions; KAO: Knowing About Others; PD: Positioning and Deciding; ACS: Acting in Changing Situations.

Table 2. Correlation analysis between study variables controlled by the position of the players

		Age	Time	NEUR	OPEN	CONS	EXT	AGR	KABA	KAO	PD
Time	r	0.406									
	p-value	0.003									
NEUR	r	-0.348	-0.417								
	p-value	0.012	0.002								
OPEN	r	-0.153	-0.026	0.044							
	p-value	0.279	0.854	0.755							
CONS	r	-0.087	-0.216	0.132	0.213						
	p-value	0.539	0.125	0.349	0.129						
EXT	r	-0.185	-0.038	0.143	0.351	0.261					
	p-value	0.189	0.787	0.313	0.011	0.061					
AGR	r	-0.002	0.010	0.127	0.246	0.324	0.311				
	p-value	0.991	0.945	0.370	0.078	0.019	0.025				
KABA	r	0.193	0.369	-0.179	0.111	0.043	0.123	0.095			
	p-value	0.170	0.007	0.205	0.434	0.764	0.386	0.504			
KAO	r	0.189	0.397	-0.214	0.303	-0.006	0.194	0.131	0.701		
	p-value	0.179	0.004	0.127	0.029	0.964	0.168	0.355	<0.001		
PD	r	0.276	0.404	-0.262	0.377	-0.017	0.104	0.266	0.715	0.627	
	p-value	0.048	0.003	0.061	0.006	0.905	0.464	0.057	<0.001	<0.001	
ACS	r	-0.009	0.317	-0.234	0.219	-0.089	0.273	0.229	0.743	0.779	0.675
	p-value	0.947	0.022	0.095	0.120	0.532	0.050	0.103	<0.001	<0.001	<0.001

Note. NEUR: Neuroticism; OPEN: Openness; CONS: Conscientiousness; EXT: Extraversion; AGR: Agreeableness; KABA: Knowing About Ball Actions; KAO: Knowing About Others; PD: Positioning and Deciding; ACS: Acting in Changing Situations.

Table 3. Comparison between study variables by position of the players; defender (D; n=18), midfielder (M; n=17), and attacker (A; n=18)

Variables	D (Mean±SD)	M (Mean±SD)	A (Mean±SD)
Age (years)	27.94±5.85	28.29±6.13	26.17±4.73
Time (years)	9.39±5.59	8.76±4.67	5.72±4.84
Neuroticism	24.00±3.11	24.29±3.41	23.94±3.08
Openness	34.44±3.42	35.88±3.33	34.56±4.85
Conscientiousness	30.33±3.58	31.41±3.00	31.11±3.72
Extraversion	26.56±3.18	29.82±3.13*	28.00±3.16
Agreeableness	32.33±2.99	34.88±3.24*#	31.33±2.85
KABA	17.44±3.55	19.18±2.43	17.56±3.43
KAO	21.72±4.94	22.29±3.89	20.33±4.28
PD	36.78±9.23	40.53±6.47	37.67±7.39
ACS	17.72±3.53	18.76±2.73	16.78±3.39

Note. SD: standard deviation; values of variables in scores: Neuroticism, Openness, Conscientiousness, Extraversion, Agreeableness; KABA: Knowing About Ball Actions; KAO: Knowing About Others; PD: Positioning and Deciding; ACS: Acting in Changing Situations; * p<.05, M *versus* D; # p<.05, M *versus* A.

tude to learn the sport. In the case of field hockey practiced in Brazil, studies are needed to record whether these behaviors are also repeated.

In the current study, there was a moderate negative correlation between the athletes' age and practice time with the personality factor called Neuroticism. The greater the neuroticism in someone, the lower their tolerance to situations of a prolonged stress. This circumstance makes the person prone to excessive anxiety states, the lack of emotional control, phobias, and impulsive behaviors (Eysenck, Nias, & Cox, 1982; Gama, et al., 2019). The reduction in Neuroticism with the increase of the age and practice time of the players means that the accumulation of their personal experiences inside and outside the sports environment contributed to

making them more balanced in what concerns the self-control of emotions.

The study by Boora (2016), conducted with male Indian cricket players, also detected a moderate negative association between the athletes' age, their practice time, and Neuroticism. Piepiora, Witkowski, and Piepiora (2018) observed the same relationship between karatekas from different fighting styles. In research carried out with volleyball and soccer players in Poland, Piepiora and Witkowski (2018) reported that the older and more experienced individuals in these sports were those who could better deal with the anxiety and stress produced in training and competitions.

According to Clough, Earle, and Sewell (2002), the several positive and negative situations to which the individual is exposed during his/her personal and professional existence help to reinforce his/her mental strength. Mental strength is defined as the ability to deal with frustrations and disagreements according to three facets: the person's rational commitment and perseverance; autonomy and ability to manage daily life; and sense of adaptation to unusual events. The authors reiterate that mental strength is a behavioral characteristic prone to be improved in performance athletes since the competitiveness of the sports environment puts them in frequent contacts with events that demand maturation, learning, and overcoming challenges (injuries, defeats, performance decreases, and layoffs).

In the present study, declarative and procedural knowledge showed a moderate positive correlation with practice time. Declarative knowledge refers to conceptual structures that can be represented by articulating notions and ideas between concepts. Therefore, it refers to the athlete's ability to express tactical actions that must be performed in a given game situation (Giacomini, Silva, & Greco, 2011). As for procedural knowledge, it denotes the subject's domain of effectively using declarative knowledge in certain processes or routines, in other words, the process of identifying and actually applying this knowledge in concrete situations (Oliveira, 2001).

The investigation by Américo et al. (2017) confirms this result. In it, the scores of tactical declarative knowledge of soccer players in the under-15 category (n=18) showed significant differences in comparison with those in the under-11 category (n=18), being proportional to the number of hours of training (2663.55 ± 594.91 hours in U-15 *versus* 1404.00 ± 469.52 hours in U-11). Similarly, the study of Borges, Guilherme, Rechenchosky, Costa, and Rinadi (2017) concluded that under-17 players with more experience knew how to perform complex tactical actions better in games than their under-15 colleagues. On the other hand, Amaral et al. (2018) found evidence that among handball players of both sexes in the adult category, the practice time did not influence declarative knowledge. Therefore, it is assumed that specific aspects of the type of invasion sport practiced can exert some type of influence on this relationship, corroborating the need to understand them in a greater depth.

The personality factor Openness exhibited moderate positive correlations with both KAO and PD. Openness is the condition of those who are willing to learn new concepts and contents through the addition of experiences. Individuals with this profile are generally frank, witty, and seek to recycle the knowledge they have through different ways of applying it. As a result, they are imaginative and prone to creative acts (Mammadov, et al., 2019). The KAO concerns the notions and conceptual ideas about how the athlete should behave tactically in relation to his/her teammates and the opponents, while the PD is related to the execution, in the game, of the most appropriate decisions and to occupation of spaces with and without ball possession (Oliveira, 2001). Consequently, the athletes who achieved the highest scores in both are those supposedly more inclined to update their tactical condition and learn to put it into practice.

Ivković, Mavra, and Mandić (2016) obtained a similar result in a study conducted with 46 female professional basketball players in Croatia, who competed in the student finals of the Croatian Women Championship 2016. Using the Big Five, the authors found that the athletes with tactical behaviors considered more efficient in matches, according to their teammates' evaluation, had a high propensity to Openness, in terms of personality factor. In a survey conducted with 49 professional and semi-professional South African rugby players, Kruger, Du Plooy, and Kruger (2019) found that the most refined verbal tactical intelligence belonged to the athletes whose dominant personality traits were Openness and Extraversion.

Zhang, Sun, Jiang, and Zhang (2019) seek to explain this relationship by emphasizing that the individuals with a personality marked by an openness to experience absorb more information than the others who do not feel the need to expand their range of knowledge. This characteristic makes the former supposedly better able to build and apply effective solutions to the problems of a tactical nature. However, the authors emphasize this idea needs to be subjected to empirical tests, since the advancement of research discriminating the factors involved in the processes that generate tactically important attitudes in team sports is still infrequent.

The present study registered significant differences between personality factors and the athletes' positions on the field. The midfield players had higher scores in the variable Extraversion than the defensive players. Extraversion is about sociable, eloquent, and talkative people. In front of others, they tend to be assertive, communicative, and present well their points of view. When faced with

problems, they exhibit positive emotions and are not emotionally overwhelmed (Eysenck, et al., 1982). The results of the investigations by Veysel and Kazim (2019) with 116 Turkish female field hockey players differ from those obtained in the present study since the presence of Extraversion predominated in attackers, but not in defenders or midfielders.

The same midfield players also showed significantly higher scores in Agreeableness compared to their defense and attack companions. In Agreeableness, the conduct is marked by cooperation, generosity, and the intention to please. Subjects with this trait, when inserted into groups, prove to be confident, altruistic, and modest (Mammadov, et al., 2019). Conway (2016) stresses that Agreeableness is an important behavioral characteristic for field hockey midfielders, as participation in this playing position requires athletes to communicate with defenders and attackers. Nonetheless, the author did not find the prevalence of this factor in athletes of this position in the main North American university sports league, the National Collegiate Athletic Association (NCAA). Therefore, the information exposed does not allow to state that Agreeableness or Extraversion correspond to the dominant personality traits among female hockey midfielders.

A limitation of the present study concerns the fact that it is transversal in nature. This approach does not make it possible to verify temporal variations in the degrees of declarative and procedural tactical knowledge of athletes given the identification of their personality traits. Another limitation may be related to the profile of the sample since only female players composed it. However, the study brings important analyses about the players' behavior according to their tactical roles on the team.

The present study allows us to conclude that, in the investigated players, a personality trait was associated with the manifestation of tactical knowledge. The factor Openness maintained moderate positive correlations with both KAO and PD. Thus, the guiding hypothesis of the investigation, according to which personality traits are associated with the acquisition, mastery, and application of tactical knowledge, has been ratified with this personality factor and these two categories. Furthermore, the longer the players' practice time, the more pronounced were the KABA, KAO, PD, and ACS. Along with the advancing age, the practice time contributed to raising the level of stress control. Thus, practice time and age can play a relevant role both for learning tactical information and for improving personal mechanisms of emotional regulation.

The present study indicates that the more the coach provides diversified experiences of tactical learning to the athletes over time, the greater the chances of this knowledge being acquired and used correctly. Therefore, in addition to effective training that simulates situations common in games, the use of complementary strategies such as watching matches of other teams in person or via films, conducting collective debates, and adopting theoretical classes would be beneficial. Finally, in the present study, there was no verification of the dominance of specific personality factors when it comes to the players' field positions. Future studies should analyze the associations between personality traits and the degree of tactical knowledge based on a longitudinal perspective as well as on the inclusion of male players in the sample.

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Correspondence to:
Juliana Brandão Pinto de Castro, Ph.D.
Laboratório do Exercício e do Esporte
Universidade do Estado do Rio de Janeiro,
Rua São Francisco Xavier, 524, Rio de Janeiro, RJ,
Brasil
Phone: (+5521) 2334-0448
E – mail : julianabrandaoflp@hotmail.com