Creation and Validation of a Sports Vocational Guidance Protocol *#

Michael Douglas Celestino Bispo
Tiradentes University (UNIT)
Darlan Tavares Santos (profdarlansantos@gmail.com)
Federal University of Rio de Janeiro (UNIRIO)
Marcos Antonio Almeida Santos
Tiradentes University (UNIT)
Rudy José Nodari-Júnior
Research Department Salus Dermatoglifia
Antonio Carlos Gomes
Brazilian Olympic Institute – Brazilian Olympic Committee (COB)
Estélio Henrique Martin Dantas
Tiradentes University (UNIT)

Research Article

Keywords: Result Reproducibility, Reliability and Validity, Dermatoglyphics, Anthropometry, Vocational Guidance

Posted Date: March 20th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2214999/v1

Abstract

Scientific studies that explore guidelines for sports vocation are scarce. The objective of this study is to develop and validate (through verification of content and face validity, reliability and objectivity) a protocol to guide sports vocation. The protocol established to accomplish vocational guidance is the result of the variables attributed to dermatoglyphic analysis and anthropometric measurements. Validity was established based on the development of a Table of Epigenetic Characteristics for Sports (QCEE), subsequently validated using the computerized Delphi method. After validation, reliability and objectivity were evaluated using an intra and interrater correlation, respectively. To that end, an experimental sample group of 105 children; 55 females and 50 males, between the ages of 8 and 17 (age $\bar{x}$=12.0 ±2.30 years) was used. Protocol validation obtained significant results, as follows: **Validity** (100% agreement in the 3rd round; **Reliability** (r_{mean}=1.00; p<0.001 and α ≥ 0.99) and **Objectivity** (r_{mean}= 0.99; p<0.001 and α ≥ 0.99). This result provides the scientific community with a reliable sports vocational guidance protocol for young people and contributes to the aims of sustainable development until 2030 and worldwide post-pandemic recovery.

Introduction

Sports and regular physical exercise or physical activity lead to a healthy lifestyle and provide benefits such as improved mood, sleep, self-esteem and quality of life; as well as reduced depression, anxiety and stress, enhanced school performance and cognition, the prevention and recovery from chronic noncommunicable diseases, improved cardiorespiratory conditioning and a consequent decline in cardiovascular disorders, improved metabolism, and overall health status [1–8].

The benefits mentioned above also corroborate the Sustainable Development Goals – SDG [9] in regard to the aim of Healthy Living and the idea that a healthy individual will affect his environment in the same way. They also corroborate the directive established by the World Health Organization, stating that maintain regular physical exercise is of fundamental importance in post-pandemic recovery [10–11].

The main problem with sports is the high turnover among modalities and low adherence as a result of a lack of motivation caused by a sense of defeat and poor performance [12]. Individuals usually take up a sport casually, without considering the biological factors linked to a specific modality or their own compatibility with the sport [13].

Among the biological factors that encourage a person's adherence to a given sport, one may consider the physical qualities needed to engage in a specific modality. Although there are several specifications regarding the physical qualities for each type of sport, Dantas' classification [14] was used in this study. In addition, sports that could be determined according to their dermatoglyphic potential were considered. Hence, the following items were contemplated: endurance, force, flexibility, power, speed, motor coordination, and agility [15].

A tool that enables the characterization of physical qualities by means of biological individuality is dermatoglyphics [16]. Its name comes from the Greek words *derma* and *glyphos*, which translate into “skin” and “symbols” respectively. In other words, when applying this tool per se, it is the field of study involving the study of fingerprints. Thus, dermatoglyphic analysis enables the identification of standardized patterns that indicate physical qualities and can be applied to an appropriate sports vocational guidance. These patterns are: Arch = Force, Whorls in W or WS = motor coordination, Ulnar Loop = Speed and Radial Loop = Cognition (output) [17].

Anthropometry, in turn, comes from the Greek *anthropos metrikos*, or man and measure; that is, the study of human measures based on variations in body dimensions. It is a fundamental tool in aiding dermatoglyphics: while the latter directs a person to sports practice according to individual biological aspects, anthropometry helps adjust the chosen modality to biotype characteristics. Thus, measurements such as Height, Reach, Body Mass and their ratios must be mentioned: Body Mass Index and Height/Reach Ratio [18].

Understanding the dermatoglyphic and anthropometric profile of individuals and its correlation with a specific set of physical qualities can help these individuals choose a sport that best fits their physical potentials. Furthermore, according to the Two-Factor Theory, Herzberg *et al.* [19], this can lead to greater adherence to the chosen modality and subsequently to the previously mentioned benefits. In sum, a person who practices a sport that is best attuned to his biological characteristics tends to be more invested in it.

Thus, in order to bridge the gaps presented, this study aims at creating and validating a sports vocational guidance protocol (by assessing its content and face; reliability and objectivity). It is an exploratory study since there is no solidity in evidence concerning the issue; it is limited because it is not a longitudinal study and depends on initial validation for further research to take place.

Results

At the onset of the process, based on the information available in the literature, a Table of the Epigenetic Characteristics for Sports (QCEE) was created, consisting of 74 Olympic sports as well as those culturally pertaining to Brazil. The dermatoglyphic and anthropometric characteristics of each of these sports were determined, after which the most important characteristic for the modality was selected followed by the values of those of lesser importance, as shown in the spreadsheet available at https://portal.unit.br/labimh/planilhas/.

The first experimental step was to verify the content and face validity of the QCEE, using the Delphi methodology [20]. To that end, a questionnaire was sent as a link to trainers, specialists, doctors, and individuals with expertise in the field of sports in order to obtain their opinion. When clicking on the link, the QCEE proposal appeared, with the expertise modality of the evaluator and the order of physical and anthropometric characteristics needed. The evaluator could agree with the proposition or suggest a new order. The level of agreement among specialists regarding the variables in the chart was noted.

The results of this validation are presented in Table 1:

Table 1
– Content and face validity results using the Delphi method

Link sent	Sample	% agreement	% disagreement
1st dispatch	50		
Returned	42	72.2	27.8
2nd dispatch	42		
Returned	37	84.6	15.4
3rd dispatch	37		
Returned	35	100	0.0

In this study, a ≤ 99% level was estimated due to the responsibility of carrying out sports guidance being decisive for an individual's future and sports development. In this type of study, usually between five and ten specialist samples are used [21]; however, we used 50 specialists due to the quantity of validations and the need for expertise in the modalities. From there, rounds started with the link being sent for assessment. The following aspects were assayed:

Round 1

In the first round, the link was sent with the QCEE proposition. With the link, evaluators received clear explanations about the aim of the study, the procedure that would be done, and a consent form. After that, they filled in their personal data with information on their sport of expertise as a researcher and the scope of their activities.

When the table with the physical and anthropometric characteristics of each modality according to a scale of requirement was presented, the specialist could agree or disagree with the proposal. In case of disagreement, they could suggest a change. Thus, in the first round, only 42 out of the 50 evaluators answered the report concerning the table (in time). Of the 42, there was no minimal agreement for acceptance of the tool, representing an agreement level of 72.2%.

Round 2

With similar points that needed correction, the table was adapted to the evaluators' opinions and sent back again with pertinent guidelines. At this second moment, a minimal agreement value was reached (80%), though it was not yet what was set as a goal by the research. 37 evaluators answered the report out of the 42 sent out; with this, the agreement level of 84.6% of returned answers was reached.

Round 3

Finally, the corrected material was sent back to 37 specialists and only 35 answered, an expected sample loss. In this third and last Delphi round, a 100% consensus among the evaluators' answers was reached, validating the Sports Epigenetic Characteristics Table, composed of 74 sports modalities classified according to levels of physical and anthropometric requirements for each one. This enabled us to advance with anthropometric and dermatoglyphic data collection and attain the remaining levels of validation.

After the content and face validity of the instrument was determined, the next validation procedures were conducted to assess their reliability (intrarater error) and objectivity (interrater error).

The **Reliability** assessment (intrarater error) showed significant correlations ($p < 0.001$) greater than or equal to $r = 0.97$, a number which in fact indicates a very strong correlation (Table 2).

Table 2
– Reliability assessment (intrarater) of the instrument

Variable	Ratio	α	p-value
Weight (Kg)	1.0	1.0	< 0.001
Height (cm)	1.0	1.0	< 0.001
Reach (cm)	1.0	1.0	< 0.001
HRR	1.0	1.0	< 0.001
BMI	1.0	1.0	< 0.001
Force	1.0	1.0	< 0.001
Speed	0.99	1.0	< 0.001
Motor Coordination	1.0	1.0	< 0.001
Power	1.0	1.0	< 0.001
Agility	1.0	1.0	< 0.001
Hypertrophy	0.99	1.0	< 0.001
Flexibility	0.97	1.0	< 0.001
Endurance	1.0	1.0	< 0.001

When the dermatoglyphic and anthropometric variables are observed, and the tool's reliability is tested, one can see that the closer to $r = 1.0$, the better. The variables speed and flexibility are the most distant, though still within a very strong correlation.

Objectivity (interrater error) also expressed high result reliability, with all values obtained greater than or equal to 0.94, demonstrating a very strong correlation (Table 3).

Table 3
– Objectivity assessment (interrater) of the instrument

Variable	Ratio	p-value	α
Weight (Kg)	1.0	< 0.001	1.0
Height (cm)	1.0	< 0.001	1.0
Reach (cm)	1.0	< 0.001	1.0
HRR	1.0	< 0.001	1.0
IMC	1.0	< 0.001	1.0
Force	0.99	< 0.001	1.0
Speed	0.98	< 0.001	1.0
Motor Coordination	1.0	< 0.001	1.0
Power	0.99	< 0.001	1.0
Agility	0.99	< 0.001	1.0
Hypertrophy	0.97	< 0.001	1.0
Flexibility	0.94	< 0.001	1.0
Endurance	0.94	< 0.001	1.0

When the error in objectivity among researchers is observed, it is clear that this was greater when compared with the intra-evaluation error. This is also expected since it involves the applier's particularities, even when considering protocol and training control.

As to objectivity, the variables force, speed, power, agility, flexibility and resistance were the most distant among the criteria of evaluation. Flexibility and resistance stood out with a 0.94 relation; this can most likely be explained by the error among evaluators regarding the counting of dermatoglyphic lines. Nevertheless, the correlation still stood out as being very strong.

Hence, concerning general criteria, the validation process of the Protocol for Sports Vocation Guidance occurred as follows (Table 4):

Table 4
– General Levels of Protocol Validation

Variable	Agreement Level (validity)/average relation	p-value	α
Validity	100%	-	-
Reliability	1.00	$p < 0,001$	$\alpha \geq 0,99$
Objectivity	0.99	$p < 0,001$	$\alpha \geq 0,99$

The instrument can therefore be considered valid, according to the indices obtained in each validation stage, as follows: **Validity** (100% agreement in the 3rd round; **Reliability** ($r_{mean} = 1.00$; $p < 0.001$ and $\alpha \geq 0.99$) and **Objectivity** ($r_{mean} = 0.99$; $p < 0.001$ and $\alpha \geq 0.99$).

Discussion

Scientific data found validity, reliability and objectivity are important for the validation of tools, as suggested by Thomas; Nelson; Silverman [22]. Among the methods used for this type of study, the Delphi is recommended as an important scientific tool to validate instruments and protocols.

Studies such as those by Barros and Triani [23], Mohammadi and Azizi [24], and Tóbio et al. [25] successfully used the Delphi method offline and online to validate instruments and protocols in sports, which suggests its effectiveness in determining content and face validity for the health area, especially in sports.

In their research, Kirschbaum; Barnett and Cross [26] used Delphi as one of their validation stages; the aim of using the method was to obtain a consensus in a group of interdisciplinary specialists regarding patient addiction to codeine. The literature stipulates the success of consensus among evaluators when it is above 80% [21]. However, the responsibility involved in sports guidance may be decisive for an individual's sports development in the future. Therefore, in this study, a $\leq$ 99% agreement solidity level among the evaluators of the proposal was adopted.

Another aspect concerning the performance of Delphi is its applicability. Some researchers used a systematic revision before applying rounds as a way to expand the state of the art. In these cases, a collection of publications about a specific topic is needed, which is not the case concerning sports vocation guidance. Thus, we followed studies such as those by Silva; Silva e Barreto [27] e Lange et al. [28] who went straight to the consensus evaluation stage.

Another important aspect in the validation process is the observation of application error to establish the efficacy of the application and reproduction of the tool. According to Leão et al. [29], observing intra and interrater agreement allows one to identify the quality of assessment, thereby minimizing possible errors that may occur during research.

There is strong scientific evidence regarding the use of correlation to identify intra and interrater data. Instrument-based studies such as those by Lopes, Silva, Pazetto, Rocha and Stanganelli [30]; Aburachid, Ribas, Araújo and Greco [31]; Pinto, Claumann, Klen, Marquez, Silva and Pelegrini [32]; and Barroso, Silva, Façanha, Gomes and Materko [33] also used correlation to ensure the reliability and objectivity of the studies they performed.

In a study with similar methodology, Nogueira, Araújo, Morano, Cavalcante, Bruin and Paddison [34] assessed intra and interrater reliability. When applying their instrument, they divided actions into two moments: V1 (first visit), and V2 (second visit, one week later), using the same statistical analysis as this study.

In order to validate an instrument aimed at a sample of patients with arthritis, Conceição, Neto, Neto, Mendes, Baptista and Sá [35] also evaluated the reliability of this instrument using the intra and interrater error, in this case, divided by class. The same occurred with the study done by Rangul et al. [36] in which the validity and reliability of two self-conducted questionnaires on physical activity applied in scale for teenagers was observed.

A validation of this importance can direct new perspectives for sports, Physical Education, the sustainable development of the planet, and even the post-pandemic scenario [37].

Furthermore, sports can achieve many positive results if we observe that, according to Assis [38], its regular practice can bring about benefits to physical health and improvement in mental well-being. It also increases the capacity to reason, as well as memory, perception and self-control, besides helping to decrease absenteeism, substance abuse and psychological problems such as depression.

Lastly, Garcia [39] demonstrates that sports balance body and soul, energy and affectivity, the group and the individual.

Attaining these benefits that result from sports practice enable, within the process of Body Ecology, an individual to take care of him/herself as a living being, as well as the environment in which he/she lives, thus promoting aspects related to health and the environment [40].

Materials And Methods

The design used in this study was a survey which, according to Batista and Campos [41], aims to obtain data or information on the characteristics, actions and possibilities of a certain group of people that represent the target population, using adequate research instruments.

In addition, this is a descriptive, cross-sectional, exploratory study, conducted when knowledge of a particular problem is limited and information on the study object is scarce [42]. The sample consisted of **N** = 105 children (55 girls and 50 boys) between the ages of 8 and 17 enrolled in the school system, applied in three different phases by different examiners, as seen in Table 5:

Table 5
– Observation Methodology of intra and inter deviation evaluation

	Collection 1	Collection 2	Collection 3
Day of the week	Monday	Wednesday	Friday
Examination	1st examination	2nd examination	3rd examination
Researcher	Researcher A	Researcher A (again)	Researcher C
Sample	N = 105	N = 105	N = 105
Type of Error	Intra-examiner error		Inter-examiner error

Collection was done in three phases; the same researcher carried out the collection twice and an intra-examiner error was observed. In the third phase, this was done by another researcher and an inter-examiner error was observed.

Data collected followed examinations in similar phases, with an interval of 48 hours between each collection, in the same week, attempting to find similar conditions as those during collection, set by: same place, same collection time and same order of examination of tools. Subsequently, collected data was handed to a third researcher who was responsible for receiving data with no exchange of information between researcher A and B, and carrying out the adequate statistical treatment.

The children in the study were characterized after the following mean data and standard deviation were collected: age - $\bar{X}$ =12.0 ±2.30 years; body mass -$\bar{X}$ = 46.3 ±13.9 kg; height - $\bar{X}$ = 151.2 ±13.6 cm; reach - $\bar{X}$ = 152.9 ±16.6 cm; height/reach ratio $\bar{X}$ = 1.0 (± 0.0), body mass index - $\bar{X}$ = 19.85 ± 3.9 Kg/cm^2.

The present study met the human research guidelines, in line with Resolution 466/12 of the National Health Council of 12/12/2012 [43] and the Declaration of Helsinki [44]. The study was approved by the Tiradentes University (UNIT) Human Research Ethics Committee on December 18, 2019, under protocol no. 2.523.578 — CAE: 67747517.0.0000.5371.

The selected entities were given a **Notification Form to Institution**, in which the conditions for carrying out the study were explained.

The children's parents were consulted beforehand regarding the authorization to participate in the study. They agreed to cooperate by signing the **Declaration of Free and Informed Consent – TCLE**, while the minors signed the **Research Consent Form – TA**.

The forms stated the objective of the study, evaluation procedures, possible consequences, emergency procedures and the voluntary nature of the participation. Based on the bibliographic sources consulted, the following factors were established as premises for creating the sports vocational guidance protocol:

- Simple procedures that enable its application in a large number of individuals.
- The use of indicators that remain stable from childhood to adulthood, characterizing epigenetic influence on the gene expression of individuals.
- The correlation between these indicators and the characteristics of each sport in relation to the physical qualities of participants.
- Tools that could assess to some degree the biological individuality of the individual.

Based on these premises, two assessment groups were adopted: those related to anthropometric ratios and those concerning dermatoglyphic patterns, both important in sports.

Anthropometry

For anthropometric measures, weight, height and reach were used. All the anthropometric measures were conducted according to International Standards for Anthropometric Assessment [45].

However, the indicators used were not the raw anthropometric measures of height, weight and reach. What was effectively used were the epigenetic relationships between body mass index (BMI) and height/reach ratio (HRR). The equations presented in Chart 1 were applied to stratify data (Table 6):

Table 6
– Anthropometric ratios that interfere in sports practice

Variable	Formula
Height/Reach ratio – HRR	Height (cm) / Reach (cm)
Body Mass Index – BMI	Weight (Kg) / Height^2 (m)

Source: Rezende et al. (38).

Dermatoglyphics

The Dermatoglyphic Reader® was used for data collection, analysis and interpretation [46]. The collection protocol followed these steps:

- Initial recording of the children's personal data.
- Fingerprints were taken with the Dermatoglyphic Reader®.
- Collections start with the little finger on the left hand, following progressively to its counterpart on the right hand.
- The finger must roll over the Dermatoglyphic Reader®, from right to left, or vice versa.
- Analysis starts after collection.
- Analysis involves observing the presence of nuclei and deltas or their absence.

- After identification, Galton's line was marked, whereby a straight line is established between the central point of the nucleus and the delta present in the image.
- After all points are marked, the software counts the necessary data in numbers and transforms the results into easy-to-understand language, following the scheme illustrated in Table 7:

Table 7
– Relationships between Dermatoglyphics and Physical Qualities

Physical Quality	Epigenetic Characteristic
Force	A
Power	(LU + A) / 2
Motor Coordination	(W + WS + Δ10) / 3
Agility	(W + WS + Δ10 + 3 LU) / 6
Hypertrophy	(W + WS + Δ10 + A) / 4
Flexibility	(MET2 ⊇ LU)
Endurance	TNL (Total number of lines)
Speed	LU or (LU + LR)

Source: Dantas [47].

Subtitle: A = Arch; LU = Ulnar Loop; LR = Radial Loop; W = Whorl; WS = Whorl in S; MET2 = Left hand index finger; Δ = delta.

After the Table of Epigenetic Characteristics for Sports (QCEE) was created, **Validity** (content and face), **Reliability** and **Objectivity** were assessed.

The Delphi method was used to determine validity based on the following steps: 1) selecting a facilitator outside the research group; 2) identifying and sending the product to be validated to a group of 105; 3) defining the problem to be investigated; 4) establishing the material dispatched when a consensus is reached; and, finally, validating the material - in this case, an instrument that provides vocational guidance [48, 21].

Reliability and **objectivity** were assessed using Pearson's "r" and Cronbach's alpha. Student's unpaired t-test was applied for sex-based comparisons and Hedges' g to assess effect size. The two-tailed significance criterion was set at $p < 0.05$. In all the estimates, Stata software was used (College Station, Texas, USA) version 15.1.

Conclusion

The results obtained when assessing the scientific validity of the protocol created were as follows: content and face **validity** (100% agreement in the 3rd round; **reliability** (r_{mean} = 1.00; $p < 0.001$ and $\alpha \geq 0.99$) and **objectivity** (r_{mean} = 0.99; $p < 0.001$ and $\alpha \geq 0.99$). This is a promising protocol that can be used by the scientific and sports community for sports vocational guidance among young people.

The effect of the quality of this instrument will only be confirmed in one or two decades, when there is feedback of individuals submitted to the protocol, when assessing their adherence, adaptation, satisfaction and performance in the sport in question.

Declarations

Ethics approval and consent to participate.

The study was approved by the Tiradentes University (UNIT) Human Research Ethics Committee on December 18, 2019, under protocol no. 2.523.578 — CAE: 67747517.0.0000.5371. The children's parents were consulted beforehand regarding the authorization to participate in the study. They agreed to cooperate by signing the declaration of Free and Informed Consent – TCLE, while the minors signed the Research Consent Form – TA.

The present study met the human research guidelines, in line with Resolution 466/12 of the National Health Council of 12/12/2012 and the Declaration of Helsinki. Item served in the document attached.

Consent for publication

Not applicable.

Availability of data and materials

The data will be available to all interested parties with valid reasons, who request them from the corresponding author.

Competing interests

I declare that the authors have no competing interests as defined by BMC, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

Funding

*The present study was funded by the Coordination for the Improvement of Higher Education Personnel (CAPES) - Funding code 001.

Project funded by the Brazilian Olympic Committee. Protocol no. 64/2020 – RS/DJ of January 29, 2020.

Author's contributions

All authors contributed equal to the content of this research article. Item served in the document attached.

Acknowledgements

Not applicable.

References

1. Axsom JE, LibonatI JR. Impacto do exercício dos pais nas modificações epigenéticas herdadas da prole: uma revisão sistemática. Relatórios fisiológicos. 2019;7(22).
2. Bekhet AH, Abdalla AR, Ismail HM, Genena DM, Osman NA, Khatib AE, et al. Benefits of Aerobic Exercise for Breast Cancer Survivors: A Systematic Review of Randomized Controlled Trials. Apjcp. 2019;20(11):3197-3209.
3. Davis CL, Litwin SE, Pollock NK, Waller JL, Zhu H, Dong Y, et al. Exercise effects on arterial stiffness and heart health in children with excess weight: The SMART RCT. Int J Obes. 2019;44:1152-63.
4. Lora-Pozo I. Anthropometric, Cardiopulmonary and Metabolic Benefits of the High-Intensity Interval Training Versus Moderate, Low-Intensity or Control for Type 2 Diabetes: Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2019;1(22):4524.
5. Speer KE, Naumovski N, Semple S, McKune AJ. Modificação do estilo de vida para melhorar a regulação cardíaca autonômica em crianças: o papel do exercício. Filhos. 2019;6(11):127.
6. Vainshelboim B, Chen Z, Lima RM, Myers J. Cardiorespiratory Fitness, Smoking Status, and Risk of Incidence and Mortality From Cancer: Findings From the Veterans Exercise Testing Study. J Phys Act Health. 2019;16(12):1098-1104.
7. Wang Y, Song H, Yin Y, Feng L. Cancer Survivors Could Get Survival Benefits from Postdiagnosis Physical Activity: A Meta-Analysis. J Evid Based Complementary Altern Med. 2019:1940903.
8. Warburton DER, Bredin SSD. Health Benefits of Physical Activity: A Strengths-Based Approach. J Clin Med. 2019 Nov;8(12):2044.
9. PNUD. Programa das Nações Unidas para o Desenvolvimento: os objetivos do desenvolvimento sustentável dos ODM aos ODS. http://www.pnud.org.br/ods.aspx. Accessed 10 Oct 2015.
10. PAHO. OMS lança novas diretrizes sobre atividade física e comportamento sedentário. 2020. https://www.paho.org/pt/noticias/26-11-2020-oms-lanca-novas-diretrizes-sobre-atividade-fisica-e-comportamento-sedentario.
11. Amraei R, Rahimi N. COVID-19, Renin-Angiotensin System and Endothelial Dysfunction. Cells. 2020;9(7):1652.
12. Kim SY, Park S. The queer sport of failure: Representations of female athletes in Korean sport films. Sociol Sport J. 2017;34(4):354-63.

13. Dantas EHM. Diagnóstico da situação e sugestão de metodologia para a elaboração de políticas públicas para a orientação da vocação esportiva dos jovens da Grande Aracaju. 2017.
14. Dantas EHM. A prática da Preparação Física. 7th ed. Barueri: Manole; 2021.
15. BISPO, MDC. Criação de validação de um instrumento de orientação da vocação esportiva [master's thesis]. Aracaju: Universidade Tiradentes; 2020.
16. Cummins H, Midlo C. Finger prints, palms and soles an introduction to dermatoglyphics. Philadelphia: Blakiston; 1961.
17. Nodari Junior R, Fin G. Dermatoglifia: impressões digitais como marca genética e de desenvolvimento fetal. Joaçaba: Editora Unoesc; 2016.
18. Roebuck JA. Anthropometric methods: Designing to fit the human body. Santa Monica: Human Factors and Ergonomics Society; 1993.
19. Herzberg GF, Mausner BG, Snyderman BB. Motivação para trabalhar. Rio de Janeiro: CRA; 2012.
20. Fernández-Domínguez JC, Sesé-Abad A, Morales-Asencio JM, Sastre-Fullana P, Pol-Castañeda S, de Pedro-Gómez JE. Content validity of a health science evidence-based practice questionnaire (HS-EBP) with a web-based modified Delphi approach. Int J Qual Health C. 2016;28(6):764-73.
21. Eubank BH, Mohtadi NG, Lafave MR, Wiley JP, Bois AJ, Boorman RS, et al. Using the modified Delphi method to establish clinical consensus for the diagnosis and treatment of patients with rotator cuff pathology**.** BMC Med Res Methodol. 2016;16:56.
22. Thomas JR, Nelson JH, Silverman SJ. Métodos de pesquisa em atividade física. 6th ed. Porto Alegre: ARTMED; 2012.
23. Barros SG, Triani FS. A utilização de recursos tecnológicos por professores de Educação Física do município do Rio de Janeiro. Motriviv. 2019;31(58):1-17.
24. Mohammadi M, Azizi B. Determining The Effect Of Educational Characteristics Of Sports Coaches In Their Ability (A Case Study Of Sport Coaches In Hamadan Province). Humanidades & Inovação. 2019;6(13):77-88.
25. Tóbio GT, Celeiro IR, Reigosa DR, Valeiro MAG, Alvarez AIA. Efeitos do treinamento resistido na capacidade funcional de pacientes com DPOC hospitalizados: revisão sistemática. Rev Pesquisa em Fisioterapia. 2019;9(4).
26. Kirschbaum M, Barnett T, Cross M. Q sample construction: a novel approach incorporating a Delphi technique to explore opinions about codeine dependence. BMC Med Res Methodol. 2019;19:101.
27. Silva MT, Silva EN, Barreto JOM. Rapid response in health technology assessment: a Delphi study for a Brazilian guideline. BMC Med Res Methodol. 2018;18:51.
28. Lange T, Kopkow C, Lützner J, Günther KP, Gravius S, Scharf HP, et al. Comparison of different rating scales for the use in Delphi studies: different scales lead to different consensus and show different test-retest reliability. BMC Med Res Methodol. 2020;20:28.
29. Leão L, Cunha RB, Assis BS, Nascimento HS, Santos CRB, Aquino LA, et al. Padronização e Confiabilidade de Medidas Antropométricas em Estudantes Universitários. Rev Alimentação,

Nutrição e Saúde. 2019;1(1):14-21.

30. Lopes JA, Silva KA, Pazetto NF, Rocha MA, Stanganelli LCR. Análise temporal no Voleibol masculino: contribuição dos sistemas energéticos a partir da relação esforço/pausa na dinâmica intermitente do jogo. RBPFEX. 2019;13(82):234-40.
31. Aburachid LMC, Ribas S, Araújo N, Greco PJ. Badminton: possibilidades de ensino aplicadas ao contexto da educação física escolar. J Phys. 2019;30(1):e-3055.
32. Pinto AA, Claumann GS, Klen JÁ, Marquez G, Silva DAS, Pelegrini A. Deslocamento Ativo Para A Escola E Indicadores Antropométricos De Obesidade Em Adolescentes. Rev Bras Ciênc Mov. 2019;27:90-8.
33. Barroso JB, Silva CLA, Façanha CCR, Gomes CRM, Materko W. Comparação entre diferentes compassos de dobras cutâneas para estimativa da gordura corporal relativa. RBNE. 2019;13(80):543-9.
34. Nogueira IC, Araújo AS, Morano MT, Cavalcante AG, Bruin PF, Paddison JS, et al. Assessment of fatigue using the Identity-Consequence Fatigue Scale in patients with lung cancer. J Bras Pneumologia:, 2017;43(3):169-75.
35. Conceição da CS, Neto MG, Neto AC, Mendes SMD, Baptista AF, Sá KN. Analysis of the psychometric properties of the American Orthopaedic Foot and Ankle Society Score (AOFAS) in rheumatoid arthritis patients: application of the Rasch model. Rev Bras Reumatol. 2016;56(1):8-13.
36. Rangul V, Holmen TL, Kurtze N, Cuypers K, Midthjell K. Reliability and validity of two frequently used self-administered physical activity questionnaires in adolescents. *BMC Med Res Methodol.* 2008;8:47.
37. Bispo et al. Políticas Públicas para a Orientação da Vocação, Detecção e Desenvolvimento de Talentos Esportivos. 11. Políticas Públicas para a Orientação da Vocação, Detecção e Desenvolvimento de Talentos Esportivos. 388-416.
38. Oliveira SA. Reinventando o esporte: possibilidades da prática pedagógica. 2nd ed. Campinas, SP: Autores Associados; 2005.
39. Gomes Tubino MJ. Metodología Científica do Treinamento Desportivo. 1980.
40. Andrieu B, Nobrega P, Sirost O. Body ecology: a new philosophy through cosmotic emersiology. AUC Kinanthropologica. 2018;54(1):16–27.
41. Batista MN, Campos DC. Metodologias de pesquisa em ciências: análises quantitativa e qualitativa. In: Baptista MN, Corrêa de Campos D. Metodologias de Pesquisa em Ciências: análises quantitativa e qualitativa. Rio de Janeiro: LTC; 2015.
42. Gomes AS, Gomes CRA. Classificação dos tipos de pesquisa em Informática na Educação. In: Jaques PA, Pimentel M, Siqueira S, Bittencourt I. Metodologia de Pesquisa em Informática na Educação: concepção da pesquisa. Porto Alegre: SBC; 2019.
43. Brasil. Conselho Nacional de Saúde Normas para a Realização de Pesquisa em Seres Humanos. Resolução 466/12. 2012.

44. World Medical Association. Declaration of Helsinki. Ethical Principles for Medical Research Involving Human Subjects. 59th WMA General Assembly. Seoul; October 2008.
45. Marfell-Jones MJ, Stewart AD, de Ridder H, Olds T. International standards for anthropometric assessment. Wellington: International Society for the Advancement of Kinanthropometry; 2012.
46. Nodari Junior R, Heberle A, Ferreira-Emygdio R, Knackfuss M. Impressões Digitais para Diagnóstico em Saúde: validação de protótipo de escaneamento informatizado. Rev Salud Pública, 2008;10(5):767-76.
47. Dantas EHM. A prática da preparação física. [in print]. 7th ed. Barueri: Manole; 2021.
48. Antunes MM. Delphi Technique: methodology for research in education in Brazil. Education Magazine PUC-Camp. 2014;19(1):63-71.