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Effects of a recreational sport intervention associated with nutritional counseling on cardiovascular risk factors in adolescents: a study protocol of a randomized clinical trial

Efeitos do esporte recreacional associado ao aconselhamento nutricional sobre fatores de risco cardiovascular em adolescentes: estudo de protocolo de um ensaio clínico randomizado

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ABSTRACT

Introduction: Physical activity can provide cardiovascular and metabolic benefits in youth, and adequate nutrition provides the necessary nutrients to meet the demands of growth and development in childhood and adolescence, impacting health-related outcomes. Objective: To investigate whether the combination of nutritional counseling and recreational sport leads to greater improvements in cardiometabolic risk factors in adolescents compared to recreational sport alone. Methods: This study will be a randomized, parallel group, two-arm, superiority trial. Forty teenagers aged between 11 and 14 years old will be divided into two groups: sports training + nutritional counseling group and active control group, which will only perform sports training. Sessions will be held two days a week and will last 12 weeks. The following parameters will be evaluated pre- and post-intervention: High-Density Lipoprotein (HDL-C) (Primary outcome), total cholesterol and fractions, triglycerides, glucose, insulin, 25-hydroxyvitamin-D, C-reactive protein, systolic and diastolic blood pressure, body mass index, body fat percentage, lean mass percentage, food intake, muscle strength, and cardiorespiratory demand. Primary and secondary outcomes will be analyzed using a generalized estimating equation model for correlated measures, and adjustment for multiple comparisons will be accomplished using the sequential Bonferroni test. Final considerations: It is expected that the multidisciplinary strategy, with the association of nutrition and physical activity, will be more effective than the isolated intervention in physical activity in the primary stages of the study, evidencing the positive effect of the combined approach on the cardiovascular health of adolescents. Trial registration: Brazilian Registry of Clinical Trials (ReBEC): RBR-10bfs3gm.

Keywords: Adolescent; Cardiovascular health; Food guide; Exercise; Sports.

RESUMO

Introdução: A atividade física pode proporcionar benefícios cardiovasculares e metabólicos na juventude, e a nutrição adequada fornece os nutrientes necessários para atender às demandas de crescimento e desenvolvimento na infância e adolescência, impactando desfechos relacionados à saúde. Objetivo: Investigar se a combinação de aconselhamento nutricional e esporte recreativo leva a maiores melhorias nos fatores de risco cardiometabólico em adolescentes em comparação ao esporte recreativo sozinho. Métodos: Este estudo será um ensaio randomizado, de grupos paralelos, de dois braços, de superioridade. Quarenta adolescentes com idade entre 11 e 14 anos serão divididos em dois grupos: grupo treinamento esportivo + aconselhamento nutricional e grupo controle ativo, que realizará apenas treinamento esportivo. As sessões serão realizadas dois dias por semana durante 12 semanas. Os seguintes parâmetros serão avaliados pré e pós-intervenção: High-Density Lipoprotein (HDL-C) (desfecho primário), colesterol total e frações, triglicerídeos, glicose, insulina, 25-hidroxivitamina D, proteína C-reativa, pressão arterial sistólica e diastólica, índice de massa corporal, percentual de gordura corporal, percentual de massa magra, ingestão alimentar, força muscular e demanda cardiorrespiratória. Os desfechos primários e secundários serão analisados por meio de um modelo de equações de estimativas generalizadas para medidas correlacionadas, e o ajuste para comparações múltiplas será realizado pelo teste sequencial de Bonferroni. Considerações finais: Espera-se que a estratégia multidisciplinar, com associação de nutrição e atividade física, seja mais efetiva que a intervenção isolada em atividade física nas etapas primárias do estudo, evidenciando o efeito positivo da abordagem combinada na saúde cardiovascular de adolescentes. Registro do ensaio: Registro Brasileiro de Ensaios Clínicos (ReBEC): RBR-10bfs3gm.

Palavras-chave: *Adolescente; Saúde cardiovascular; Guias alimentares; Exercício físico; Esportes.*

Introduction

Adolescence is a phase of life with a high percentage of physical inactivity and unhealthy eating habits[1]. Regular physical activity improves several health-related outcomes and psychological well-being[2-4]. In particular, recreational sports have been shown to contribute to the promotion of physical and mental health, in addition to having positive effects on cardiovascular parameters in children and adolescents[5-7]. Throughout childhood and adolescence, diets are poor in nutritious foods[8] and are associated with cardiometabolic risk factors[9].

To implement lifestyle changes such as physical exercise and proper nutrition is necessary to improve the growth and development of this population, with a multidisciplinary intervention program presenting better effects than isolated strategies, reducing the risk of cardiovascular disease and contributing to current and future health[10-12]. The literature evaluating the impact of sports participation on cardiovascular health in children and adolescents is scarce[13]. At the same time, there is growing evidence supporting the role of nutritional strategies in modulating cardiovascular risk factors from an early age. However, well-designed clinical trials evaluating dietary interventions in adolescents remain scarce[14]. Evidence from a recent meta-analysis suggests that combining physical exercise and dietary interventions leads to greater improvements in biochemical parameters in adolescents compared to either strategy alone, although the magnitude of the biochemical response varies between studies[15]. Additionally, multicomponent interventions that integrate both physical activity and nutrition have shown greater effectiveness in reducing blood pressure, reinforcing the relevance of comprehensive and integrated strategies in adolescent health promotion[16].

Although there is evidence on the individual benefits of physical activity and nutritional interventions in adolescents, many of the existing studies are based on very short intervention periods, low adherence, and limited applicability to real-life contexts. Studies that incorporate the use of recreartional beach tennis, an easy-to-learn sport that is of growing interest among young people in Brazil, combined with nutritional counseling in adolescents are unknown. This study aims to fill this gap by evaluating whether a multidisciplinary intervention (beach ternnis and nutritional counseling) is more effective than a recreational sport intervention alone in reducing cardiovascular risk factors in adolescents. The results may contribute to the development of preventive programs, strengthening integrated strategies to promote cardiovascular health in this population.

Methods

Study design

This study describes the methodological approach of a Protocol for a Randomized Controlled Clinical Trial, and follows the recommendations of SPIRIT 2013[17]. The clinical trial was registered in Brazilian Registry of Clinical Trials (ReBEC): RBR-10bfs3gm and will follow the CONSORT Statement[18].

Population and sample

The study will be carried out with adolescents, cisgender and transgender, aged between 11 and 14 years, from public and private schools, and residents of the metropolitan region of Porto Alegre, Rio Grande do Sul, Brazil..

Eligibility criteria

Inclusion criteria for participants in this study include being male or female adolescents, aged between 11 and 14 years old, who are available to participate on the days and times determined. Adolescents with any pathology or injury that limits the total or partial execution of the training protocol; using medications that influence the results (for example: statins, hypoglycemic agents or beta-blockers); pregnancy; who have been participating in any physical activity/exercise or following any nutritional counseling program for, at least, six months, will be excluded from the research.

Sample size

A sample size of 32 participants (16 for each group) was calculated to test whether there is a minimum difference of 8 mg/dL in the High-Density Lipoprotein (HDL) means between the groups (with the addition of 20% for possible losses and refusals, this number should be 40). The calculation considered a power of 80%, a significance level of 5% and a standard deviation equal to 8 mg/dL (based on the study by Marques et al.[19]). We rounded the standard deviation of 7.75 mg/dL to 8 mg/dL reported for intragroup HDL-c values, with recurring improvements over time, as a parameter of expected variability, and adopted a minimum clinically relevant difference of 8 mg/dL between groups as the basis for sample size calculation. This difference was not defined based on the previously demonstrated statistical significance, but rather on its potential clini-

cal impact in adolescents, given that modest elevations of HDL-c in this age group may represent long-term beneficial effects on the cardiovascular profile. This calculation was performed using the Power and Sample Size Health tool, online version[20].

Recruitment

In order to minimize selection bias — such as including only adolescents already interested in sports — recruitment efforts will be made across diverse school settings (public and private), basic health units; online media, including social networks; printed materials such as folders and posters, and other media will also be used. During the recruitment process, we will record the total number of adolescents approached, as well as the number of those who agreed or declined to participate. To confirm participation in the study, interested parties and their guardians will be contacted by telephone to schedule an in-person interview.

Randomization

Participants will be randomized into two groups, followed for 12 weeks: sports training + nutritional counseling or sports training + habitual eating behavior. The sequence of allocation and assignment of participants to the groups will be carried out by an independent researcher, who will not participate in the other phases of the research. Participants will be randomized in a 1:1 ratio to two groups, using stratified randomization by body mass index category (underweight, normal weight, overweight, and obesity) and by gender (male or female). Within each stratum, a simple randomization sequence will be generated by means of a computational algorithm, using a reference value to ensure the reproducibility of the sequence. Randomization will be organized with the support of an artificial intelligence-based language tool, used to generate and automate the stratified allocation of participants.

Data collection

The participants and their respective guardians will be received by the researcher in charge to clarify any doubts about the procedures that will be adopted and the risks and benefits of the study. The guardians will sign the informed consent form and the adolescent will sign the assent form containing detailed information about the study. Upon acceptance, physical tests, blood pressure and anthropometric measurements will be conducted. Furthermore, socioeconomic characteristics, and 24-hour food recall questionnaires will be administered. The second visit will be scheduled afterwards, involving blood collection to assess the biochemical profile. Subsequently, participants will be slated for a third visit, where body composition and cognitive tasks will be assessed. The cognitive tasks will be presented on a computer, which will be used to record the responses. The order of the tasks will be: Arrows, Points, Abstract Shapes and Images. This cognitive task protocol is the same as that used by Davidson et al[21].

Interventions

- **Sports training**

The sports training program will be carried out in both groups in two sessions/week, on non-consecutive days, with an average duration of 60 minutes, for 12 weeks. Participants will be supervised throughout the period and will be given guidance on basic technique and execution of the training program. Adherence will be calculated as the total number of exercise sessions the participant completed divided by the total number of prescribed sessions.

The sports training program will be carried out in the beach tennis modality, on the School of Physical Education, Physiotherapy and Dance of the Federal University of Rio Grande do Sul sand courts. One week before the start, participants will undergo one or two familiarization training sessions. The familiarization sessions intend to teach Beach Tennis fundamentals, as well as to assess their level in order to maintain groups of similar levels. The training sessions will have the structure described in Table 1. General warm-up will consist of strength and joint mobility movements. Specific warm-up will introduce hand and ball low intensity coordination exercises. Technical-tactical exercises will incorporate simple control drills with racket and ball, partner up teens to rally to each other with or without the net, to practice service, and the service return. The games part of the session will comprehend cooperative, mixed, and regular (following the official rules) matches. The final component of the session will be the cooldown, when the coach will talk about the session, answer questions, give extra information about the modality, or make any announcements. The first mesocycle objective will be to introduce the modality's basic skills, as well as to prepare the adolescents physically for the program. After the preparation cycle, the program progression will focus on the time duration dedicated to the games.

Table 1 – Beach tennis training periodization in adolescents.

Session structure	Weeks 1-2	Weeks 3-4	Weeks 5-8	Weeks 9-12
General/specific warm-up (minute)	10	5	5	5
Technical-tactical exercises (minute)	45	13	8	0
Games (minute)	0	10	3 x 12	3 x 15
Cooldown (minute)	5	5	5	5

- **Nutritional Counseling**

There will be 12 weekly meetings, with only one group, with an average duration of thirty minutes each. Nutritional counseling activities will be carried out by a nutritionist. The meetings will include guidance on eating habits, with a view to reducing the consumption of foods high in fat, sugar and sodium; increasing the consumption of fruits, vegetables and lean meats, proposals for educational activities related to knowledge of ultra-processed foods and products, health risks and ways to replace or reduce them, reading labels, healthy snack options, with encouragement to adopt a healthy eating pattern. Participants will not be instructed to follow a pre-established diet or with energy restriction.

The following topics will be addressed during the meetings: 1- Natural and minimally processed foods; 2 - Processed and ultra-processed foods; 3 - Nutritional labeling: Sodium; 4 - Nutritional labeling: Sugar; 5 - Nutritional labeling: Fats; 6 - Food, Health and Diseases. All participants and their guardians will also receive written instructions and images with instructions/guidance on healthy eating, via the Whatsapp® messaging application, sent once a week, for 12 weeks.

The educational strategy will prioritize the reality of adolescents, with the use of interactive tools, such as games, activities, visual materials (labels, packaging) and discussion groups, to stimulate critical thinking, behavior change, awareness of the risks of consuming ultra-processed foods and the benefits of healthy eating, connecting the content to the reality of adolescents and encouraging behavior change.

At the end of the intervention period, participants in the group exclusively playing beach tennis will receive an individual nutritional counseling session.

Outcome measurements

- **Biochemical parameters**

Blood samples will be obtained by venipuncture after an overnight fast, following standardized procedures. HDL – High-Density Lipoprotein will be considered the primary outcome. Secondary outcomes will include LDL – Low-Density Lipoprotein, total cholesterol, triglycerides, glucose, insulin, 25-hydroxyvitamin D, and C-reactive protein, all of which will be determined from the same samples. To calculate the homeostatic model assessment for insulin resistance (HOMA-IR), fasting insulin and glucose values will be used.

- **Blood Pressure**

Systolic blood pressure and diastolic blood pressure will be checked using an automatic oscillometric device (Omron, Healthcare, HBP-1100), duly validated for the age group. The participants will remain seated at rest for at least 10 minutes, prior to the measurements. They will have their back leaned against the chair, both feet on the floor, and their arm supinated. Blood pressure will be measured once on each arm, and measured two more times on the arm with the higher systolic blood pressure. The average of both measurements will be used.

- **Anthropometric parameters**

Weight, height, and waist circumference will be assessed. Body weight will be measured using an analogue scale, with a precision of 0.1 kilograms (kg), with individuals barefoot and wearing light clothing. Height will be measured using a stadiometer, divided into cm and subdivided into mm, with individuals barefoot, feet together and parallel, and head positioned horizontally at the end of maximum inspiration. Based on these measurements, the body mass index will be calculated. Nutritional status will be defined based on the body mass index z-score for age (z body mass index) according to the cut-off points of the World Health Organization. Waist circumference will be measured at the midpoint between the iliac crest and the last rib, and at the end of a normal expiration with a flexible and inelastic tape measure.

- **Body composition**

It will be assessed using Dual Energy X-ray Absorption provided by the School of Physical Education,

Physiotherapy and Dance of the Federal University of Rio Grande do Sul to analyze the different components of body composition based on the differences in density between bone mineral content, fat mass and lean mass.

- **Food consumption**

Food consumption will be assessed with 2 individual, non-consecutive, 24-hour recalls. Items will be grouped according to nature, purpose and degree of industrial processing.

- **Muscle Strength**

The sit-to-stand test will be performed using a folding chair without arms. The test will begin with the participant sitting in the middle of the chair, with the back straight, feet approximately shoulder-width apart and placed on the floor at a slight angle behind the knees. The arms should be crossed at the wrists and held against the chest. At the signal "go", the participant will stand up (body erect and straight) and then return to the initial seated position. The total number of lifts performed correctly in 30 seconds and the time to perform the first five repetitions will be used during the analyses.

Isometric handgrip strength will be measured on both arms with an analog hand dynamometer. The participant will remain seated in an upright posture, placing the forearm parallel to the floor (elbow flexed at 90°). After this, the participants will be instructed to perform a maximum compression contraction with sustained effort (isometric) lasting 5 s. Three attempts will be made on each hand with 30 s rest intervals.

Data storage

In order to promote greater security, confidentiality and data availability, the RedCap (Research Electronic Data Capture) software will be used to collect and store research data. A copy of the data will be stored in the Google Drive of our research group's institutional email.

Ethical considerations

The present work was submitted to the Ethics Committee for Research with Human Beings from the Porto Alegre Clinical Hospital (CAAE: 7.194.028). Ethical criteria will be followed in accordance with Resolution 466/12 and 510/16 of the National Health Council, as well as other current and applicable regulations and legislation that address Ethics in Research with human beings. Participants and their guardians will receive all information pertinent to the research, use of data collectively and for scientific purposes and will be included in this study only after signing the Free and Informed Consent Form and Free and Informed Assent Form, confirming their consent, and may withdraw their consent at any time without any prejudice or risk of harm.

Potential risks: The possible risks or discomforts arising from participation in the research are: the possibility of risks and discomforts related to venous blood collection to assess blood parameters, even if rare and temporary, such as localized pain, bruising, fainting and infection; the possibility of discomfort or embarrassment during the application of the sociodemographic questionnaire and the assessment of food consumption; low exposure to ionizing radiation during the assessment of body composition; during the performance of sports training, it is possible to feel muscle injury or discomfort, tiredness, fatigue, sensation of heat, pain in the thighs, legs and feet. To minimize these risks, mitigation measures will be implemented. For blood tests, guidance will be provided on the need to adjust routine habits in the period preceding the collection. The assessment of the adolescent's body composition will be carried out in an environment that respects preventive and safety measures, within the radiation limits recommended by law. During the application of the questionnaires, a private place will be guaranteed and the freedom to not answer embarrassing questions for the adolescent. The sports sessions will be held at a comfortable temperature in the study environment and we will provide appropriate procedures for rest during the sessions.

Potential benefits: improvement in the lipid profile, in the blood pressure profile and other cardiovascular parameters assessed, as well as muscle strength. Although this may not be true for everyone who performs the proposed activities. Nevertheless, it may contribute to the understanding of the factors that affect the cardiovascular health of adolescents and to updating strategies for preventing related health risks.

Statistical analysis

Descriptive data will be presented with mean values ± standard deviation, relative values (%) and calculation of the absolute delta (Δ = post-intervention minus pre-intervention values). Data normality will be confirmed using the Kolmogorov–Smirnov or Shapiro-Wilk tests. To calculate the association between variables, the Chi-

square test and logistic regression will be used. The Student's paired t-test or the Wilcoxon test will be used to compare pre- and post-intervention, according to the data distribution. To compare possible intragroup (baseline vs. 12-week follow-up) and intergroup (intervention vs. control) differences, the Generalized Estimating Equations model will be used. The Bonferroni post hoc test will be applied if there is a significant difference. Statistical significance $p<0.05$.

Discussion

Recreational sports are enjoyable activities that provide a positive atmosphere and the opportunity to learn new skills[22]. Playing sports during adolescence is associated with benefits for cardiovascular health[13]. Nutritional counseling approach is also promising since it focuses on natural or minimally processed foods being the basis of the diet and the risks of processed and ultra-processed foods consumption[23], resulting in an improved cardiovascular and metabolic profile[24]. Our protocol describes a randomized controlled trial designed to evaluate the impact of a 12-week recreational beach tennis intervention, with or without nutritional counseling, on adolescents' cardiovascular risk. We hypothesize that the combined intervention will promote greater improvements in anthropometric measures (e.g., body mass index, waist circumference), biochemical markers (e.g., lipid profile, glycemia, insulin), and blood pressure compared to the isolated program[15,25,26].

Physical inactivity and an unhealthy diet contribute to the development of cardiovascular risk during childhood and adolescence and, therefore, to the promotion of non-communicable diseases later in life[27], highlighting the importance of effective combined non-pharmacological interventions that promote appropriate health behavior as early as possible[28]. Beach tennis is a promising exercise strategy as it can be attractive and effective for different populations, including adolescents. Particularly in Brazil, this modality has become highly popular due to the easy access to sand courts, the necessity of only 2–4 participants per match, allowing people of different age groups and levels of fitness/skills to play a sport that promotes pleasure and satisfaction during the activity. In addition to requiring intermittent moderate-to-vigorous efforts, beach tennis favors energy expenditure and potential metabolic benefits[29]. Dietary patterns associated with decreased risk of cardiovascular disease are characterized by higher intakes of vegetables, fruits, whole grains, and seafood, lower intakes of red and processed meat, and lower intakes of refined grains and sugar-sweetened foods and beverages[30]. Considering the scarcity of studies evaluating the effects of recreational sport interventions combined with nutritional counseling on adolescents, especially using beach tennis, our trial intend to provide evidence to guide future public health strategies. If effective, the program can be integrated into school or community settings and adapted to other regions, strengthening early prevention of cardiovascular diseases in youth.

Conflict of interest

The authors declare no conflict of interest.

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Author's contributions

Pereira DM: Conceptualization; Methodology; Validation; Resources; Project administration; Visualization; Writing – original draft; Writing – review & editing; Approval of the final version. Jung NN: Methodology; Resources; Project administration; Writing – review & editing; Approval of the final version. Pedroso R, Heck GP, Vieira LIC, Fontana CR & Dahmer R: Resources; Writing – review & editing; Approval of the final version. Ferrari R: Conceptualization; Methodology; Resources; Project administration; Supervision; Visualization; Writing – original draft; Writing – review & editing; Approval of the final version.

Declaration regarding the use of artificial intelligence tools in the article writing process

The authors did not use artificial intelligence tools for preparation of the manuscript.

Availability of research data and other materials

The data of this study is available on demand from referees.

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Reviewers' assessment

The reviews of this article were originally conducted in Portuguese. This version has been translated using ChatGPT and subsequently reviewed by the Chief Editors.

Reviewer A

Ricardo Oliveira

Universidade Federal do Rio Grande do Norte, Natal, Rio Grande do Norte, Brazil.

Format

- Does the manuscript comply with the submission guidelines of the Revista Brasileira de Atividade Física e Saúde?
  Yes.
- Is the manuscript formally well-structured, containing the sections: introduction, methods, results, and discussion (with conclusion as part of the discussion)?
  Yes.
- Is the language appropriate, and is the text clear, precise, and objective?
  Yes.
- Was any evidence of plagiarism observed in the manuscript?
  Yes.

  Suggestions/comments:
- Comments are in the comments to authors section.

Abstract

- Are the abstract and resumo adequate (including: objective, information on study participants, studied variables, main results, and a conclusion) and do they reflect the manuscript's content?
  Yes.

  Suggestions/comments:
- The aim in the abstract should be changed to better reflect the aims of the investigation: To investigate whether nutrition counselling is superior to only sports participation.

Introduction

- as the research problem clearly stated and defined?
  Partially.
- Is the research problem adequately contextualized within the existing knowledge, moving from general to specific?
  Partially.
- Are the reasons that justify the study (including the authors' assumptions) well established in the writing?
  Partially.
- Are the references used to support the presentation of the research problem current and relevant to the topic?
  Yes.
- Was the objective clearly stated?
  Partially.

  Suggestions/comments:
- A better rationale for the investigation is needed, especially presenting how the study will add to the existing body of knowledge about nutrition (multidisciplinary) interventions in adolescents.

Methods

- Are the methodological procedures generally appropriate for the study of the research problem?
  Yes.
- Are the methodological procedures adopted for the study sufficiently detailed?
  Yes.
- Was the procedure for selecting or recruiting participants appropriate for the research problem and clearly, sufficiently, and objectively described?
  Partially.
- Were details provided about the instruments used for data collection, their psychometric properties (e.g., reproducibility, internal consistency, and validity), and, when appropriate, the operational definition of variables?
  Yes.
- Is the data analysis plan appropriate and properly described?
  Yes.
- Were inclusion and/or exclusion criteria for participants described and appropriate for the study?
  Yes.
- Did the authors provide information on the ethical procedures adopted in the research?
  Yes.

  Suggestions/comments:
- Sample size and recruitment strategies deserve more attention by the authors.

Results

- Is the use of tables and figures appropriate and helpful for presenting the study's results?
  Not applicable.
- Is the number of illustrations in accordance with the journal's submission guidelines?
  Not applicable.
- Are the number of participants at each stage of the study, as well as the number and reasons for drop-outs and refusals, presented in the manuscript?
  Not applicable.
- Are the participants' characteristics presented and sufficient?
  Not applicable.
- Are the results adequately presented, highlighting the main findings and avoiding unnecessary repetition?
  Not applicable.
  Suggestions/comments:
- No comments.

Discussion

- Are the main findings of the study presented?
  Not applicable.
- Are the strengths and limitations of the study presented and discussed?
  Not applicable.
- Are the results discussed considering the study's limitations and existing knowledge on the topic?
  Not applicable.
- Do the authors discuss the potential contributions of the main findings to scientific development, innovation, or real-world interventions?
  Not applicable.
  Suggestions/comments:
- A final version of the discussion will be improved in the final version of the clinical trial.

Conclusion

- Is the study's conclusion adequately presented and consistent with the study objective?
  Not applicable.
- Is the conclusion original?
  Not applicable.
  Suggestions/comments:
- No comments.

References

- Are the references up to date and sufficient?
  Yes.
- Are most of them original research articles?
  Yes.
- Do the references comply with the journal's guidelines (quantity and format)?
  Yes.
- Is the in-text citation appropriate, i.e., do the cited references actually support the claims made in the text?
  Yes.
  Suggestions/comments:
- No comments.

Comments to the Author

- Congratulation to the authors to propose an intervention study which are generally difficult to conduct and more informative than cross-sectional investigations. The article proposes a superiority clinical trial investigating whether nutritional counselling impacts a series of health outcomes in adolescents. The superiority in question is compared to a group participating in sports activities (beach tennis). The paper is well-written, and the intervention design is interesting. However, while the authors place strong emphasis on the inclusion of sports training, the presented model and design are intended to test the inclusion of nutritional counselling. Therefore, the hypotheses regarding the superiority of the nutritional intervention over the outcome variables should be explored in greater detail in the introduction.
- Regarding the rationale provided for the intervention design, the authors suggest:
- Lines 19-20: "However, well-designed clinical trials evaluating dietary interventions in adolescents remain scarce."
- Lines 21-23: "As this appears to be a promising yet underexplored strategy."
- However, there are a variety of clinical trials and systematic reviews on nutrition interventions in the population of interest. Rather than stating that few or no studies exist on the topic, I suggest the authors discuss the existing limitations in the literature and how the proposed study will address unanswered questions.
- Sample size: The value presented for the calculation basis and the reference used do not support a between-group difference of 8 mg/dL. The cited reference did not report significant changes between

groups, and the within-group standard deviation was 7.75. A better justification for the sample size is needed.
- Regarding recruitment: The authors may want to consider assessing how many adolescents were approached for recruitment to evaluate sample representativeness. It is possible that only adolescents already engaged in sports may have a greater interest in participating.

Decision
- Minor revisions required

Reviewer B

Donizeti de Jesus Pereira Domingues Junior
Universidade São Judas Tadeu, São Paulo, São Paulo, Brazil.

Format
- Does the manuscript comply with the submission guidelines of the Revista Brasileira de Atividade Física e Saúde?
  Partially.
- Is the manuscript formally well-structured, containing the sections: introduction, methods, results, and discussion (with conclusion as part of the discussion)?
  Yes.
- Is the language appropriate, and is the text clear, precise, and objective?
  Yes.
- Was any evidence of plagiarism observed in the manuscript?
  No.
  Suggestions/comments:
- Check the paragraph spacing;
- Review the paragraph distribution at the beginning of the introduction after the page break.

Abstract
- Are the abstract and resumo adequate (including: objective, information on study participants, studied variables, main results, and a conclusion) and do they reflect the manuscript's content?
  Yes.
  Suggestions/comments:
- Pay attention to the word count limit.

Introduction
- Was the research problem clearly stated and defined?
  Yes.
- Is the research problem adequately contextualized within the existing knowledge, moving from general to specific?
  Partially.
- Are the reasons that justify the study (including the authors' assumptions) well established in the writing?
  Yes.
- Are the references used to support the presentation of the research problem current and relevant to the topic?
  Yes.
- Was the objective clearly stated?
  Yes.
  Suggestions/comments:
- Review reference formatting.

Methods
- Are the methodological procedures generally appropriate for the study of the research problem?
  Yes.
- Are the methodological procedures adopted for the study sufficiently detailed?
  Yes.
- Was the procedure for selecting or recruiting participants appropriate for the research problem and clearly, sufficiently, and objectively described?
  Yes.
- Were details provided about the instruments used for data collection, their psychometric properties (e.g., reproducibility, internal consistency, and validity), and, when appropriate, the operational definition of variables?
  Yes.
- Is the data analysis plan appropriate and properly described?
  Yes.
- Were inclusion and/or exclusion criteria for participants described and appropriate for the study?
  Yes.
- Did the authors provide information on the ethical procedures adopted in the research?
  Yes.
  Suggestions/comments:
- As expected.

Results
- Is the use of tables and figures appropriate and

helpful for presenting the study's results?
Not applicable.
- Is the number of illustrations in accordance with the journal's submission guidelines?
Not applicable.
- Are the number of participants at each stage of the study, as well as the number and reasons for drop-outs and refusals, presented in the manuscript?
Yes.
- Are the participants' characteristics presented and sufficient?
Yes.
- Are the results adequately presented, highlighting the main findings and avoiding unnecessary repetition?
Partially.
Suggestions/comments:
- Review the results presented and consider highlighting the main findings.

Discussion

- Are the main findings of the study presented?
Partially.
- Are the strengths and limitations of the study presented and discussed?
Yes.
- Are the results discussed considering the study's limitations and existing knowledge on the topic?
Yes.
- Do the authors discuss the potential contributions of the main findings to scientific development, innovation, or real-world interventions?
No.
Suggestions/comments:
- No comments.

Conclusion

- Is the study's conclusion adequately presented and consistent with the study objective?
No.
- Is the conclusion original?
Not applicable.
Suggestions/comments:
- No conclusion heading was found in the document.

References

- Are the references up to date and sufficient?
Yes.
- Are most of them original research articles?
Yes.
- Do the references comply with the journal's guidelines [quantity and format]?
Yes.
- Is the in-text citation appropriate, i.e., do the cited references actually support the claims made in the text?
Yes.
Suggestions/comments:
- Review formatting in the References section.

Comments to the Author

- Congratulations on the proposal presented in the article titled "Effects of recreational sports combined with nutritional counselling on cardiovascular risk factors in adolescents: protocol study of a randomized clinical trial." The topic is highly relevant, especially considering the growing concern with cardiovascular health in adolescence and the importance of multidisciplinary interventions.
- I would like to congratulate the authors for the methodological clarity in describing the protocol, particularly in how the design of the clinical trial and the combination of recreational sports with nutritional counselling were structured.
- I have just a few observations to offer as constructive feedback:
- It would be interesting to better understand the criteria for choosing the recreational sport used and the intensity throughout the sessions.
- In the nutritional counselling section, I was curious about the pedagogical approach adopted with the adolescents, considering the challenges posed by this age group.
- Lastly, I would like to know whether there are already any preliminary results or a projected date for the final results to be published.
- Thank you for your contribution to the advancement of this field. I remain available for further discussion.

Decision:

- Minor revisions required.

Reviewer C

Danielle de Campos Silva
Centro Universitário Governador Ozanam Coelho, Ubá, Minas Gerais, Brazil.

Format

- Does the manuscript comply with the submission

guidelines of the Revista Brasileira de Atividade Física e Saúde?
Yes.

- Is the manuscript formally well-structured, containing the sections: introduction, methods, results, and discussion (with conclusion as part of the discussion)?
  Partially.
- Is the language appropriate, and is the text clear, precise, and objective?
  Yes.
- Was any evidence of plagiarism observed in the manuscript?
  No.

Suggestions/comments:

- The discussion is still very incomplete. Even though there are no results yet to conclude the study, I suggest the discussion present a more developed rationale by considering the various variables that will be analyzed. For example: What is currently known about the relationship between biochemical variables and physical activity and nutrition? What do you expect might happen based on your analysis?

Abstract

- Are the abstract and resumo adequate (including: objective, information on study participants, studied variables, main results, and a conclusion) and do they reflect the manuscript's content?
  Yes.

Suggestions/comments:

- No suggestions for this section.

Introduction

- Was the research problem clearly stated and defined?
  Yes.
- Is the research problem adequately contextualized within the existing knowledge, moving from general to specific?
  Yes.
- Are the reasons that justify the study (including the authors' assumptions) well established in the writing?
  Yes.
- Are the references used to support the presentation of the research problem current and relevant to the topic?
  Yes.
- Was the objective clearly stated?
  Yes.

Suggestions/comments:

- No suggestions for this section.

Methods

- Are the methodological procedures generally appropriate for the study of the research problem?
  Yes.
- Are the methodological procedures adopted for the study sufficiently detailed?
  Partially.
- Was the procedure for selecting or recruiting participants appropriate for the research problem and clearly, sufficiently, and objectively described?
  Yes.
- Were details provided about the instruments used for data collection, their psychometric properties (e.g., reproducibility, internal consistency, and validity), and, when appropriate, the operational definition of variables?
  Yes.
- Is the data analysis plan appropriate and properly described?
  Yes.
- Were inclusion and/or exclusion criteria for participants described and appropriate for the study?
  Yes.
- Did the authors provide information on the ethical procedures adopted in the research?
  Yes.

Suggestions/comments:

- Page 06, line 10: "Subsequently, participants will be slated for a third visit, where body composition and cognitive tasks will be assessed." What cognitive tests will be used? I could not identify whether this cognitive variable was described in the introduction or the methods. Please clarify what type of cognitive information will be collected.

Results

- Is the use of tables and figures appropriate and helpful for presenting the study's results?
  Partially.
- Is the number of illustrations in accordance with the journal's submission guidelines?
  Partially.
- Are the number of participants at each stage of the study, as well as the number and reasons for drop-

outs and refusals, presented in the manuscript?
Yes.
- Are the participants' characteristics presented and sufficient?
Yes.
- Are the results adequately presented, highlighting the main findings and avoiding unnecessary repetition?
No.
Suggestions/comments:
- What is the timeline for writing and presenting the study results?

Discussion

- Are the main findings of the study presented?
No.
- Are the strengths and limitations of the study presented and discussed?
No.
- Are the results discussed considering the study's limitations and existing knowledge on the topic?
No.
- Do the authors discuss the potential contributions of the main findings to scientific development, innovation, or real-world interventions?
No.
Suggestions/comments:
- The discussion based on the data obtained from the study's intervention has not yet been written.

Conclusion

- Is the study's conclusion adequately presented and consistent with the study objective?
No.
- Is the conclusion original?
Not applicable.
Suggestions/comments:
- The conclusion has not yet been written.

References

- Are the references up to date and sufficient?
Yes.
- Are most of them original research articles?
Yes.
- Do the references comply with the journal's guidelines [quantity and format]?
Yes.
- Is the in-text citation appropriate, i.e., do the cited references actually support the claims made in the text?
Yes.
Suggestions/comments:
- No suggestions for this section.

Comments to the Author

- I suggest paying close attention to the comments provided in each section of the manuscript.

Decision

- Major revisions required.