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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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Содержание:

A STUDY ON THE ASSOCIATION BETWEEN EXERCISE INTENSITY, EXERCISE TYPE, AND NEGATIVE EMOTIONS AMONG COLLEGE STUDENTS

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Abstract.

Objective: Investigating the Correlation Between Exercise Intensity, Exercise Type, and Negative Emotions Among College Students.

Method: A questionnaire survey was conducted among 3,810 college students in Wuhu City, Anhui Province, China, from March to May 2024. The questionnaire included information on general demographic characteristics, a physical activity type scale, the International Physical Activity Questionnaire-Short Form (IPAQ-S), and the Depression Anxiety and Stress Scale-21 (DASS-21).

Results: The detection rates of depression, anxiety, and stress among college students were 32.20%, 42.91%, and 19.92% respectively; The proportions of college students participating in only adversarial sports, only non-adversarial sports, and mixed types of sports were 17.11%, 25.07%, and 53.73% respectively. The overall physical activity levels of college students were distributed as 23.18% low, 38.48% moderate, and 38.35% high. The multivariate logistic regression adjusted model showed that adversarial sports were a protective factor against depressive mood (OR=0.632, P<0.05), while non-adversarial sports served as protective factors against depressive mood (OR=0.622), anxiety (OR=0.644), and stress (OR=0.648) (all P<0.05). Moderate-intensity exercise was a protective factor against depressive mood (OR=0.573), anxiety (OR=0.724), and stress (OR=0.569) (all P<0.05). Similarly, high-intensity exercise acted as a protective factor against depressive mood (OR=0.544), anxiety (OR=0.640), and stress (OR=0.560) (all P<0.05); Further stratified adjustment models by exercise type revealed that moderate-intensity exercise served as a protective factor against depressive mood in both adversarial sports (OR=0.579) and mixed sports (OR=0.570) (P<0.05). High-intensity exercise acted as a protective factor against depressive mood in adversarial sports (OR=0.458), non-adversarial sports (OR=0.621), and mixed sports (OR=0.576) (P<0.05). Moderate-intensity exercise served as a protective factor against anxiety in both adversarial sports (OR=0.608) and mixed sports (OR=0.701) (P<0.05). High-intensity exercise acted as a protective factor against anxiety in both adversarial sports (OR=0.630) and mixed sports (OR=0.604) (P<0.05). Moderate-intensity exercise served as a protective factor against stress emotions in adversarial sports (OR=0.381), non-adversarial sports (OR=0.617), and mixed sports (OR=0.593) (P<0.05). High-intensity exercise acted as a protective factor against stress emotions in adversarial sports (OR=0.371), non-adversarial sports (OR=0.565), and mixed sports (OR=0.597) (P<0.05).

Conclusion: Moderate-to-high intensity exercise helps alleviate depression, anxiety, and stress in both adversarial and mixed sports. Moderate-to-high intensity exercise helps reduce stress in non-adversarial sports. High-intensity exercise helps reduce depression in non-adversarial sports.

Key words. Negative emotions, exercise intensity, exercise type, college students.

Introduction.

Physical activity refers to the sum of bodily movements undertaken in physical education classes and extracurricular sports activities, aimed at enhancing physical fitness and promoting health through the planned development of physical qualities by adjusting exercise intensity, frequency, and duration [1-2]. In daily life, this is typically achieved through varying intensities and types of exercise. Negative emotions refer to a subjective experience of low mood and unpleasantness, encompassing emotional states such as anxiety, tension, anger, disgust, and sadness [3]. Among these, symptoms of depression, anxiety, and stress are the most prevalent emotional issues among college students [4]. Negative emotions exert multifaceted impacts on both the mental and physical well-being of college students. Those enduring prolonged negative mental states are prone to engaging in self-harm or harmful behaviors toward others, which may further escalate into suicidal tendencies [5-7], posing significant risks to families and society.

In recent years, campus suicides have occurred with alarming frequency, making it an indisputable fact that college students exhibit weaker psychological resilience and face more negative emotional issues. Correlational studies indicate that the continuous rise in mental health conditions such as depression, anxiety, and stress is significantly linked to the inability to regulate negative emotions effectively [8]. Effectively regulating emotional stability among contemporary college students has become an urgent public health priority. Numerous studies indicate that physical exercise significantly reduces negative emotional levels among college students, alleviating and inhibiting the expression of negative emotions [8-9]. However, most research on physical exercise focuses on exercise intensity and duration, with few studies examining the combined effects of exercise intensity and type (adversarial sports, non-adversarial sports, mixed sports) on negative emotions among college students. This study investigates the relationship between physical exercise patterns and negative

emotions among undergraduate and vocational college students in Wuhu City, Anhui Province. By analyzing the multifaceted connections between depression, anxiety, stress, exercise intensity, and exercise type, it aims to deepen understanding of how exercise intensity and type influence negative emotions. This research provides a scientific theoretical basis for reducing negative emotions and promoting the physical and mental health development of college students.

Objects and Methods.

Object: This research team conducted a cross-sectional survey from March to May 2024 using stratified random cluster sampling. A total of 3,810 college students were selected as subjects from five medical and non-medical institutions in Wuhu City, Anhui Province, China. A total of 4,100 questionnaires were distributed, with 3,810 valid responses collected (response rate: 92.93%). The sample comprised 1,976 males (51.94%) and 1,831 females (48.06%), with a mean age of 19.46±1.25 years. All participants provided informed consent to participate in this study.

Survey of Personal Basic Information:

Gender, grade level, Professional Type, undergraduate/ associate degree type, whether the student is an only child, smoking/drinking habits, family structure (nuclear family, single-parent family, three-generation household, remarried family, other), relationship with parents (good, average, poor), etc.

Exercise Type:

Referencing Yang Jianying's [10] research and based on the principles of cluster theory (which categorizes adversarial sports according to several distinct criteria, including dominant factors determining athletic ability, the movement structure of the sport, and methods for evaluating performance), this study classifies sports into adversarial, non-adversarial, and hybrid categories. adversarial sports include basketball, soccer, badminton, tennis, etc.; non-adversarial sports encompass gymnastics, running, cycling, swimming, etc.; while hybrid sports combine elements of both adversarial and non-adversarial disciplines.

International Physical Activity Questionnaire-Short Form, IPAQ-SF:

This questionnaire measures college students' physical activity levels over the past week. It comprises seven questions corresponding to the duration and frequency of sedentary behavior, walking, moderate-intensity, and vigorous-intensity activities within a 7-day period [11]. The questionnaire assigns metabolic equivalent (MET) values of 3.3, 4.0, and 8.0 to walking, moderate-intensity, and vigorous-intensity activities, respectively. The sum of the three activity intensity levels represents the total physical activity level. Following the IPAQ Working Group's recommended criteria, individual activity levels are categorized as low, moderate, or high intensity [12].

Depression Anxiety Stress Scales-21, DASS-21:

The DASS-21 scale [13] comprises three subscales (depression, anxiety, and stress dimensions), totaling 21 items (7 items per dimension). It employs a 4-point rating scale ranging from 0 to 3 points. The sum of scores for each dimension is doubled to yield the subscale score, with a total range of 0 to 42 points. Higher scores indicate more severe levels of depression, anxiety, or stress.

Quality control:

Our research team refined and revised the questionnaire based on feedback from a preliminary survey. We contacted counselors from the surveyed departments and secured their cooperation. Before distributing questionnaires on-site, interviewers explained the purpose of the survey to alleviate participants' concerns and requested truthful responses. The survey was administered collectively using standardized instructions. Students were instructed to carefully read the instructions before completing the questionnaire as directed. All collected questionnaires underwent secondary verification to exclude invalid responses.

Statistical methods:

Data analysis was performed using SPSS 26.0 software. Continuous variables were described using mean ± standard deviation, while categorical variables were described using frequency and percentage. Comparisons between groups of categorical data were performed using the chi-square test. Analysis of influencing factors employed binary univariate logistic regression analysis. A P value < 0.05 was considered statistically significant.

Results.

The Occurrence of Negative Emotions Among College Students:

The overall detection rate of negative emotions among 3,810 college students was 47.38% (1,805/3,810), with depression, anxiety, and stress detected at rates of 32.20% (1,227/3,810), 42.91% (1,635/3,810), and 19.92% (759/3,810), respectively. The primary manifestations of depression, anxiety, and stress among college students were mild to moderate, as detailed in Table 1.

Types and Intensity Levels of Exercise Among College Students:

Among 3,810 college students, 652 (17.11%) participated exclusively in adversarial sports, 955 (25.07%) engaged solely in non-adversarial sports, and 2,407 (53.73%) participated in a mix of both. 883 (23.18%) students had low-intensity overall physical activity levels, 1,466 (38.48%) had moderate-intensity levels, and 1,461 (38.35%) had high-intensity levels.

Table 1. *Specific types of negative emotions among college students (n/%).*

Type	None	Mild	Moderate	Severe	Very Severe
Depression	2583(67.80)	406(10.66)	556(14.59)	171(4.49)	94(2.47)
Anxiety	2175(57.09)	337(8.85)	771(18.66)	226(5.93)	361(9.48)
Stress	3051(80.08)	332(8.71)	283(7.43)	120(3.15)	24(0.63)

Table 2. *Comparison of negative emotions among college students with different demographic characteristics (n/%).*

	Group(n)	**Depression**	**Anxiety**	**Stress**
Gender	Male(1979)	714(36.08)	867(43.81)	427(21.58)
	Female(1831)	513(28.02)	768(41.94)	332(18.13)
	$\chi 2$	28.308	1.351	7.073
	P	<0.001	0.245	0.008
Professional Type	Medical students(1542)	417(27.04)	590(38.26)	235(15.24)
	Non-medical students(2268)	810(35.71)	1045(46.08)	524(23.10)
	$\chi 2$	31.613	22.877	35.585
	P	<0.001	<0.001	<0.001
Type of Undergraduate and Junior College	Undergraduate(2534)	856(33.78)	1071(42.27)	536(21.15)
	Junior College(1276)	371(29.08)	564(44.20)	223(17.48)
	$\chi 2$	8.606	1.298	7.188
	P	0.003	0.255	0.007
Grade	Freshman(1898)	563(29.66)	814(42.89)	348(18.34)
	Sophomore(1170)	402(34.36)	516(44.10)	256(21.88)
	Junior and above(742)	262(35.31)	305(41.11)	155(20.89)
	$\chi 2_{trend}$	10.165	0.298	3.807
	P_{trend}	0.001	0.585	0.051
Only child	Yes(1190)	417(35.04)	535(44.96)	268(22.52)
	No(2620)	810(30.92)	1100(41.98)	491(18.74)
	$\chi 2$	6.381	2.953	7.332
	P	0.012	0.086	0.007
Place of previous residence	Cities(853)	291(34.11)	393(46.07)	191(22.39)
	County seats/towns(1449)	488(33.68)	622(42.93)	287(19.81)
	Rural areas(1508)	448(29.71)	620(41.11)	281(18.63)
	$\chi 2$	7.172	5.468	4.841
	P	0.028	0.065	0.089
Smoking	Yes(257)	121(47.08)	141(54.86)	72(28.02)
	No(3553)	1106(31.13)	1494(42.05)	687(19.34)
	$\chi 2$	27.937	16.066	11.318
	P	<0.001	<0.001	<0.001
Drinking	Yes(610)	241(39.51)	298(48.85)	151(24.75)
	No(3200)	986(30.81)	1337(41.78)	608(19.00)
	$\chi 2$	17.744	10.457	10.633
	P	<0.001	0.001	0.001
Family type	Nuclear families(2619)	807(30.81)	1080(41.24)	506(19.32)
	Single-parent families(245)	108(44.08)	132(53.88)	65(26.53)
	Three-generation households(823)	257(31.23)	356(43.26)	156(18.96)
	Remarried and other family types(123)	55(44.72)	67(54.47)	32(26.02)
	$\chi 2$	27.329	21.773	10.648
	P	<0.001	<0.001	0.014
Relationship with father	Harmonious(3188)	938(29.42)	1280(40.15)	566(17.75)
	Average(547)	249(45.52)	307(56.12)	163(29.80)
	Disharmonious(75)	40(53.33)	48(64.00)	30(40.00)
	$\chi 2_{trend}$	69.542	61.223	61.677
	P_{trend}	<0.001	<0.001	<0.001
Relationship with mother	Harmonious(3400)	994(29.24)	1368(40.24)	599(17.62)
	Average(371)	206(55.53)	239(64.42)	142(38.27)
	Disharmonious(39)	27(69.23)	28(71.79)	18(46.15)
	$\chi 2_{trend}$	128.625	90.118	103.659
	P_{trend}	<0.001	<0.001	<0.001

Comparative Study of Negative Emotions Among College Students with Different Demographic Characteristics:

Results indicate that male students exhibit higher rates of detected depression and stress compared to female students (P<0.01). Non-medical students demonstrate higher rates of detected negative emotions (depression, anxiety, and stress) than medical students (P<0.05). The prevalence of depressive symptoms among college students showed an increasing trend with advancing academic year (P_{trend}<0.01). The prevalence rates of depressive and stressful emotions were higher among only children than among non-only children (P<0.05). College students residing in urban areas exhibited higher prevalence rates of depressive symptoms than those in rural areas (P<0.05). College students who smoke or drink alcohol exhibit significantly higher rates of negative emotions (depression, anxiety, and stress) compared to those who do not smoke or drink (P<0.01). Among all family types, single-parent households showed the highest detection rates for depression and anxiety (P<0.01). Poorer parent-child relationships were associated with higher detection rates of negative emotions (depression, anxiety, stress) (P_{trend}<0.01). See Table 2 for further details.

Correlation Between Negative Emotions and Exercise Type and Intensity Among College Students:

Results indicate that the detection rates for depression, anxiety, and stress were highest among those with no exercise habits (P<0.001). Among college students, higher exercise intensity was associated with lower detection rates of negative emotions (depression, anxiety, stress) (P_{trend}<0.001). See Table 3 for details.

Multivariate Logistic Analysis of Factors Influencing Negative Emotions Among College Students:

Based on the results of univariate analysis, a binary-category multivariate unconditional logistic regression analysis was conducted using inclusion (α=0.05) and exclusion (β=0.10) criteria. The unadjusted model revealed that adversarial sports, non-adversarial sports, mixed sports, and moderate-to-high intensity exercise were protective factors against depressive mood (P<0.05). Non-adversarial sports and moderate-to-high intensity exercise were protective factors against anxiety and stress (P<0.05). The adjusted model revealed that adversarial sports, non-adversarial sports, and moderate-to-high intensity exercise were protective factors against depressive mood (P<0.05), while non-adversarial sports and moderate-to-high intensity exercise were protective factors against anxiety and stress (P<0.05). See Table 4 for details. Further stratified analysis by exercise type (adversarial, non-adversarial, and mixed) revealed in the unadjusted model that moderate-to-high intensity exercise served as a protective factor against depressive and stressful emotions across all exercise types (P<0.05). Moderate intensity exercise acted as a protective factor against anxiety in adversarial exercise, while moderate-to-high intensity exercise did so in mixed exercise types (P<0.05). The adjusted model revealed that moderate-to-high-intensity exercise was a protective factor against depressive mood in both adversarial and mixed sports (P<0.05). Only high-intensity exercise served as a protective factor against depressive mood in non-adversarial sports (P<0.05). Moderate-to-high-intensity exercise was a protective factor against anxiety in both adversarial and mixed sports (P<0.05). and both moderate- and high-intensity exercise served as protective factors for stress across all three exercise types (P < 0.05). See Table 5 for details.

Discussion.

Prolonged exposure to negative emotional experiences among college students can lead to declining academic performance, increased dropout rates, strained interpersonal relationships, and heightened risks of suicidal behavior, severely impacting their physical and mental health [14,15]. In this study, the detection rates for negative emotions were 32.20% for depression, 42.91% for anxiety, and 19.92% for stress, higher than those reported by Meng [16]. This discrepancy may stem from differences in sample size, survey timing, and environmental conditions during data collection. Anxiety exhibited the highest detection rate in this study, consistent with findings from Jin Zhengge [17]and Zou [18]. Related research also indicates adolescence as a period with heightened risk for developing anxiety and depression [19,20].

This study indicates that the detection rate of depression is higher among male students than female students, consistent with Jiang Minming's findings [21] but contrary to those of Vieira [22]and Pan Zhaoxia [23]. This discrepancy may be attributed to differences in survey scales and cultural backgrounds among university students, suggesting that multiple factors influence negative emotions among college students. Comprehensive

Table 3. *Correlation between negative emotions and movement type and exercise intensity among college students (n/%).*

Variable	Group	N	Depression	Anxiety	Stress
Type of Exercise	Non-athletic activities	156	72 (46.15)[a]	83 (53.21)[a]	45 (28.85)[a]
	Adversarial sports	652	214 (32.82)[b]	284 (43.56)[ab]	136 (20.86)[ab]
	Non-adversarial sports	955	272 (28.48)[b]	363 (38.01)[b]	156 (16.34)[b]
	Mixed sports	2047	669 (32.68)[b]	905 (44.21)[a]	422 (20.62)[a]
	$\chi 2$		20.293	17.634	16.466
	P		<0.001	<0.001	<0.001
Exercise Intensity	Low Intensity	883	387 (43.83)	453 (51.30)	256 (28.99)
	Moderate Intensity	1466	418 (28.51)	607 (41.41)	249 (16.98)
	High Intensity	1461	422 (28.88)	575 (39.36)	254 (17.39)
	$\chi 2_{trend}$		46.360	28.732	38.115
	P_{trend}		<0.001	<0.001	<0.001

Note: *For pairwise comparisons among multiple groups, completely different superscript symbols indicate P<0.05.*

Table 4. *Multivariate logistics regression analysis of negative emotions among college students.*

Dependent variable	Independent Variable	Dummy Variable Settings	Model 2					
			B	***SE***	***Wald***	***OR***	***OR95%CI***	***P***
Depression	Type of Exercise	Non-athletic activities			8.200	1.000		
		Adversarial sports	-0.459	0.192	5.731	0.632	0.434-0.920	0.017
		Non-adversarial sports	-0.474	0.187	6.433	0.622	0.432-0.898	0.011
		Mixed sports	-0.336	0.180	3.502	0.714	0.502-1.016	0.061
	Exercise Intensity	Low Intensity			46.747	1.000		
		Moderate Intensity	-0.558	0.095	34.796	0.573	0.476-0.689	<0.001
		High Intensity	-0.608	0.097	39.661	0.544	0.450-0.658	<0.001
Anxiety	Type of Exercise	Non-athletic activities			12.066	1.000		
		Adversarial sports	-0.311	0.185	2.842	0.733	0.510-1.052	0.092
		Non-adversarial sports	-0.440	0.181	5.949	0.644	0.452-0.917	0.015
		Mixed sports	-0.189	0.174	1.183	0.827	0.588-1.164	0.277
	Exercise Intensity	Low Intensity			24.565	1.000		
		Moderate Intensity	-0.323	0.089	13.008	0.724	0.608-0.863	<0.001
		High Intensity	-0.447	0.091	24.124	0.640	0.535-0.765	<0.001
Stress	Type of Exercise	Non-athletic activities			7.220	1.000		
		Adversarial sports	-0.289	0.213	1.849	0.749	0.493-1.136	0.174
		Non-adversarial sports	-0.434	0.209	4.304	0.648	0.430-0.976	0.038
		Mixed sports	-0.188	0.199	0.895	0.829	0.561-1.223	0.344
	Exercise Intensity	Low Intensity			35.656	1.000		
		Moderate Intensity	-0.564	0.107	27.644	0.569	0.461-0.702	<0.001
		High Intensity	-0.579	0.110	27.950	0.560	0.452-0.695	<0.001

Model 1 (Unadjusted Model): *Includes exercise intensity and exercise type as independent variables. Model 2 (Adjusted Model): Adjusts for depression, gender, professional type, type of undergraduate and junior college, only child status, grade level, place of previous residence, smoking status, drinking status, family type, relationship with father, and relationship with mother. Anxiety adjusted for gender, professional, only child status, place of previous residence, smoking status, drinking status, family type, relationship with father, and relationship with mother; Stress adjusted for gender, professional Type, type of undergraduate and junior college, only child status, grade level, place of previous residence, smoking status, drinking status, family type, relationship with father, and relationship with mother; Table 5 is similar.*

Table 5. *Multivariate Logistic Regression Analysis of Negative Emotion Correlation in College Students.*

Type of Exercise	Exercise Intensity	Depression		Anxiety		Stress	
		OR* and 95%*CI	***P***	***OR* and 95%*CI***	***P***	***OR* and 95%*CI***	***P***
Adversarial sports	Low Intensity	1.000		1.000		1.000	
	Moderate Intensity	0.579 (0.385-0.871)	0.009	0.608 (0.416-0.888)	0.010	0.381 (0.236-0.617)	0.009
	High Intensity	0.458 (0.293-0.716)	<0.001	0.630 (0.421-0.945)	0.025	0.371 (0.222-0.620)	<0.001
Non-adversarial sports	Low Intensity	1.000		1.000		1.000	
	Moderate Intensity	0.746 (0.510-1.090)	0.130	0.925 (0.648-1.320)	0.667	0.617 (0.393-0.969)	0.036
	High Intensity	0.621 (0.413-0.934)	0.022	0.754 (0.518-1.098)	0.141	0.565 (0.348-0.916)	0.021
Mixed sports	Low Intensity	1.000		1.000		1.000	
	Moderate Intensity	0.570 (0.432-0.751)	<0.001	0.701 (0.540-0.910)	0.008	0.593 (0.436-0.807)	<0.001
	High Intensity	0.576 (0.440-0.753)	<0.001	0.604 (0.469-0.778)	<0.001	0.597 (0.443-0.806)	<0.001

and targeted support interventions are therefore warranted. Medical students exhibited lower detection rates for negative emotions (depression, anxiety, stress) compared to non-medical students, consistent with Zhang Weixin's [24] findings. Medical students, due to their curriculum design, gain greater exposure to mental health education during their studies compared to non-medical students. This exposure enhances their ability to recognize and manage negative emotions [25]. The detection rate of depressive symptoms showed an increasing trend with academic year, consistent with findings by Li Haifeng [26]and Han [27]. This suggests that rising academic and employment pressures with increasing academic year contribute to elevated depression levels. It indicates that in the post-pandemic era, the negative impact of campus adaptation challenges on lower-year undergraduates in China is less pronounced than the effects of heavy academic and employment pressures faced by upper-year

students. Depression and stress detection rates were higher among only children than non-only children, consistent with previous studies [17]. This may stem from the excessive protection and attention received by China's only children within families, where high expectations often create psychological burdens. College students engaging in smoking or drinking exhibited higher detection rates of negative emotions (depression, anxiety, stress) compared to non-smokers/non-drinkers, aligning with findings by Zhang Weixin [24] and Tomita [28]. This may stem from two factors: students experiencing negative emotions may seek pleasure through unhealthy behaviors like smoking and drinking; additionally, as suggested by Zhao [29] in a cohort study, unhealthy lifestyles may contribute to emotional disorders by affecting polygenic risk, immune-metabolic functions, and brain structural alterations.

This study indicates that 17.11% of college students reported participating exclusively in adversarial sports, 20.07% engaged solely in non-adversarial sports, and 53.73% participated in mixed sports. Among non-exercising college students, the overall detection rates for depression, anxiety, and stress were higher than those in the three exercise groups. This further indicates that physical exercise among college students can exert varying degrees of positive effects on negative emotions (depression, anxiety, stress), contrary to some previous studies [30,31]. It also indicates that physical exercise cannot entirely eliminate negative emotions but only reduces their intensity. Further in-depth research is still required to determine the extent to which different types of exercise vary in their effectiveness in alleviating the same negative emotions. The results of college students' exercise intensity showed that 23.18% engaged in low-intensity exercise, 38.48% in moderate-intensity exercise, and 38.35% in high-intensity exercise. These findings are similar to the exercise intensity detection rates reported by Li Yi [32]. Furthermore, the lower the exercise intensity, the higher the detection rate of negative emotions (depression, anxiety, stress), consistent with the results of Wu Jingtao et al. [9]. Higher exercise intensity is more conducive to developing an individual's emotional control abilities, helping college students cope with negative emotions arising from setbacks and difficulties [9,33,34].

Multivariate logistic regression analysis revealed that college students engaged in adversarial sports exhibited lower depression levels, while those in non-adversarial sports demonstrated lower anxiety and stress levels. Additionally, students participating in moderate-to-high intensity exercise showed lower levels of depression, anxiety, and stress. After stratifying by exercise type, further multivariable logistic stratified regression analysis revealed that students participating in moderate-to-high intensity adversarial and mixed sports exhibited lower depression and anxiety levels. Among non-adversarial sports, high-intensity exercise was associated with lower depression. Across all three exercise types, moderate-to-high intensity exercise was linked to lower stress levels. Adversarial and mixed sports typically involve teamwork, competition, and physical confrontation. These factors effectively enhance participants' self-efficacy and perceived social support, exerting significant positive effects on mental health and thereby reducing depressive and anxious emotions [35-37]. Moreover, moderate-to-high-intensity exercise significantly promotes the secretion of dopamine and endorphins in the brain. These neurotransmitters are closely related to emotional regulation and help alleviate depressive and anxious feelings [38,39]. Considering that moderate-to-high-intensity exercise in adversarial and mixed sports is generally more enjoyable and challenging, it can better stimulate positive emotions in participants [37,40]. Gu Hongbo [41] also found that moderate-to-vigorous exercise among college students reduces the risk of elevated depression and anxiety levels. While high-intensity non-adversarial sports can also alleviate depressive symptoms through physiological mechanisms, their monotonous and repetitive nature limits their effectiveness in relieving anxiety. Moderate-to-high-intensity exercise significantly reduces stress emotions across all activity types, consistent with relevant research findings [42]. Exercise-induced stress reduction in college students involves a multi-pathway process, including direct emotional regulation, enhancement of psychological resources (psychological resilience, self-efficacy), improvement of physiological states (sleep, oxidative stress), and synergistic effects of social support systems [43-45].

Conclusion.

In summary, from the perspective of physical exercise, the following recommendations are proposed for preventing negative emotions: (1) Families and schools should actively cultivate students' awareness of physical exercise, educating them to incorporate effective physical activities into daily life to reduce the occurrence of negative emotions; (2) Strengthen school support by reasonably arranging exercise types and intensity levels, emphasizing the development of students' physical exercise capabilities and the selection of appropriate sports, intensity, duration, and frequency; (3) Monitor college students' negative emotional states, promptly identify those experiencing or at risk of negative emotions, and encourage participation in physical activities to promote physical and mental well-being and alleviate negative emotions. This study has the following limitations: (1) Regional differences across provinces and areas, coupled with disparities in physical exercise resources among institutions, limit its applicability to other regions; (2) The study relied on self-reported questionnaires, which may introduce subjective bias in exercise assessment. Future research should employ more objective data collection methods; (3) This study did not address the physical fitness aspects of university students. Future research should explore the underlying mechanisms linking physical exercise and negative emotions from multiple perspectives, including biology and immunology.

This study has the following limitations:

(1) Regional differences across provinces and regions, coupled with disparities in physical exercise resources among institutions, limit the applicability of these findings to other areas.

(2) Since this study employed convenience sampling and selfreport questionnaire surveys, causal inferences cannot be made.

(3) This study did not address university students' physical fitness. Future research should explore the underlying

mechanisms linking physical exercise and negative emotions from multiple perspectives, including biology and immunology.

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