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A EUROPEAN INITIATIVE PROMOTING A HEALTHY LIFESTYLE AMONG YOUNG PEOPLE AGED 10-17: THE ROCK YOUR HEALTH PROJECT (RYHEALTH)



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ABSTRACT

Background: The RYHEALTH project is a European initiative aimed at promoting a healthy lifestyle among young people aged 10-17.9 years. The project focuses on four key pillars: physical activity, nutrition, mental health, and sustainability, recognizing their interconnected impact on adolescent well-being.

Objective: The project aims to assess the lifestyle behaviors of European adolescents, examining the interrelationships between physical activity, nutrition and mental health. Additionally, the project seeks to develop a digital intervention platform (RYHEALTH HUB) to provide accessible, evidence-based resources for promoting healthy behaviors among youth, parents, and educators.

Methods: This cross-sectional study will collect data from adolescents in Germany, Portugal, Spain, and Sweden using the *RYHEALTH e-Questionnaire*, a validated, multilingual digital survey. The questionnaire assesses sociodemographic factors, physical activity, dietary patterns, and mental well-being. Statistical analyses will explore associations between lifestyle behaviors and key health indicators, adjusting for sociodemographic factors.

Expected Results: It is anticipated that a significant proportion of adolescents will not meet recommended guidelines for physical activity, diet, and mental well-being. Positive associations are expected between regular physical activity, Mediterranean diet adherence, and improved mental health outcomes. In contrast, sedentary behavior and poor dietary habits could correlate with increased stress, anxiety, and depressive symptoms. Additionally, exposure to nature is hypothesized to have protective effects on psychological well-being.

Conclusion: The findings will provide a comprehensive understanding of youth lifestyle behaviors across Europe, facilitating the development of evidence-based interventions. RYHEALTH HUB, an innovative digital platform, will serve as a resource to support adolescents, parents, and educators in adopting and maintaining healthy lifestyle habits.

Keywords: Physical Activity; Nutrition; Mental Health; Adolescents; Youth.

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UNA INICIATIVA EUROPEA PARA PROMOVER UN ESTILO DE VIDA SALUDABLE ENTRE JÓVENES DE 10 A 17 AÑOS: EL PROYECTO ROCK YOUR HEALTH (RYHEALTH)

RESUMEN

Antecedentes: El proyecto RYHEALTH es una iniciativa europea destinada a promover un estilo de vida saludable entre jóvenes de 10 a 17,9 años. El proyecto se centra en cuatro pilares clave: actividad física, nutrición, salud mental y sostenibilidad, reconociendo su impacto interconectado en el bienestar de los adolescentes.

Objetivo: El proyecto tiene como objetivo evaluar los comportamientos relacionados con el estilo de vida de los adolescentes europeos, examinando las interrelaciones entre la actividad física, la nutrición y la salud mental. Además, busca desarrollar una plataforma de intervención digital (RYHEALTH HUB) para proporcionar recursos accesibles y basados en evidencia que promuevan hábitos saludables entre los jóvenes, sus padres y educadores.

Métodos: Este estudio transversal recopilará datos de adolescentes en Alemania, Portugal, España y Suecia mediante el e-Cuestionario RYHEALTH, una encuesta digital validada y multilingüe. El cuestionario evalúa factores sociodemográficos, actividad física, patrones dietéticos y bienestar mental. Los análisis estadísticos explorarán las asociaciones entre los comportamientos de estilo de vida y los principales indicadores de salud, ajustando por factores sociodemográficos.

Resultados esperados: Se anticipa que una proporción significativa de adolescentes no cumplirá con las recomendaciones establecidas para la actividad física, la alimentación y el bienestar mental. Se esperan asociaciones positivas entre la práctica regular de actividad física, la adherencia a la dieta mediterránea y mejores resultados en salud mental. En contraste, el comportamiento sedentario y los hábitos alimentarios inadecuados podrían correlacionarse con un aumento del estrés, la ansiedad y los síntomas depresivos. Además, se plantea la hipótesis de que la exposición a la naturaleza tendrá efectos protectores sobre el bienestar psicológico.

Conclusión: Los hallazgos proporcionarán una comprensión integral de los comportamientos de estilo de vida juvenil en Europa, facilitando el desarrollo de intervenciones basadas en evidencia. RYHEALTH HUB, una innovadora plataforma digital, servirá como un recurso para apoyar a adolescentes, padres y educadores en la adopción y mantenimiento de hábitos de vida saludables.

Palabras clave: Actividad Física; Nutrición; Salud Mental; Adolescentes; Jóvenes.

UMA INICIATIVA EUROPEIA PARA PROMOVER UM ESTILO DE VIDA SAUDÁVEL ENTRE JOVENS DE 10 A 17 ANOS: O PROJETO ROCK YOUR HEALTH (RYHEALTH)

RESUMO

Antecedentes: O projeto RYHEALTH é uma iniciativa europeia destinada a promover um estilo de vida saudável entre jovens de 10 a 17,9 anos. O projeto foca em quatro pilares fundamentais: atividade física, nutrição, saúde mental e sustentabilidade, reconhecendo seu impacto interconectado no bem-estar dos adolescentes.

Objetivo: O projeto tem como objetivo avaliar os comportamentos relacionados ao estilo de vida dos adolescentes europeus, examinando as inter-relações entre atividade física, nutrição e saúde mental. Além disso, busca desenvolver uma plataforma de intervenção digital (RYHEALTH HUB) para fornecer recursos acessíveis e baseados em evidências que promovam hábitos saudáveis entre os jovens, seus pais e educadores.

Métodos: Este estudo transversal coletará dados de adolescentes na Alemanha, Portugal, Espanha e Suécia por meio do e-Questionário RYHEALTH, uma pesquisa digital validada e multilingue. O questionário avalia fatores sociodemográficos, atividade física, padrões alimentares e bem-estar mental. As análises estatísticas explorarão as associações entre comportamentos de estilo de vida e principais indicadores de saúde, ajustando-se para fatores sociodemográficos.

Resultados esperados: Espera-se que uma proporção significativa de adolescentes não cumpra as recomendações estabelecidas para atividade física, alimentação e bem-estar mental. São esperadas associações positivas entre a prática regular de atividade física, a adesão à dieta mediterrânea e melhores resultados em saúde mental. Em contraste, o comportamento sedentário e hábitos alimentares inadequados podem estar correlacionados com aumento do estresse, ansiedade e sintomas depressivos. Além disso, levanta-se a hipótese de que a exposição à natureza terá efeitos protetores sobre o bem-estar psicológico.

Conclusão: Os resultados fornecerão uma compreensão abrangente dos comportamentos de estilo de vida dos jovens na Europa, facilitando o desenvolvimento de intervenções baseadas em evidências. O RYHEALTH HUB, uma plataforma digital inovadora, servirá como um recurso para apoiar adolescentes, pais e educadores na adoção e manutenção de hábitos de vida saudáveis.

Palavras-chave: Atividade Física; Nutrição; Saúde Mental; Adolescentes; Jovens.

INTRODUCTION

Physical activity, mental health, and nutrition are critical components of overall health and well-being, particularly in children and adolescents. The World Health Organization (WHO) emphasizes the importance of these three factors in promoting good health and preventing chronic diseases later in life¹. However, despite the

well-established benefits of physical activity, healthy eating, and positive mental health, many children and adolescents fail to meet recommended guidelines in these areas².

Regular physical activity helps children and adolescents develop strong bones, muscles, and cardiovascular systems, improves overall physical health, and reduces the risk of chronic diseases such as obesity, diabetes, and heart disease^{3,4}. In addition to its physical benefits, physical activity has been linked to better mental health

outcomes, including reduced symptoms of depression and anxiety, improved self-esteem, and enhanced academic performance^{5,6}.

Healthy eating habits are also essential for promoting overall health and well-being in children and adolescents. Proper nutrition supports body and brain development and can reduce the risk of chronic diseases later in life⁷. However, many children and adolescents consume diets high in unhealthy fats, sugars, and processed foods while lacking nutrient-rich foods such as fruits, vegetables, and whole grains⁸.

Mental health is equally important for overall well-being. Poor mental health can negatively affect physical health, academic performance, and social relationships⁹. Mental health issues, such as anxiety and depression, are common among children and adolescents and can be exacerbated by factors such as stress, lack of physical activity, and poor nutrition^{10,11}.

In summary, physical activity, healthy eating, and positive mental health are crucial for the overall health and well-being of children and adolescents. Encouraging these behaviours early in life can provide long-term benefits for physical and mental health and help reduce the risk of chronic diseases later in life.

Therefore, the primary objectives of this project are to characterize youth lifestyle behaviours and analyze the interactions among healthy and unhealthy lifestyle factors. As a secondary objective, the project aims to develop and provide a comprehensive suite of digital tools for young people, parents, and teachers to facilitate easier access to a healthy lifestyle.

METHODS

Participants and selection criteria

The present cross-sectional project involves study research conducted in the partner countries participating in the RYHEALTH project consortium (<https://ryhealth.net/>), namely Spain, Portugal, Germany, and Sweden. RYHEALTH aims to increase the impact of European actions for health promotion and disease prevention, focusing on health-enhancing physical activity, a healthy environment, healthy eating, and mental health and well-being among young individuals.

Eligible participants are youth from European countries. Inclusion criteria include: i) being between 10 and 17.9 years old, ii) having parental or guardian consent to participate in the questionnaire, and iii) having sufficient comprehension of one of the available languages for the questionnaire (i.e., German, Spanish, Portuguese, Swedish, or English). Participants who do not meet these criteria will be excluded from the study.

Data Collection

To gain insight into the lifestyles of children and adolescents and their perspectives on health-related behaviors, the RYHEALTH consortium has established four fundamental pillars, which correspond to subprojects: *The Happiness Project*, *The Activity Project*, and *The Food Project*. These pillars guide the measurements, focusing on three evaluation blocks: i) sociodemographic aspects, ii) mental health, and iii) lifestyle behaviors. Participants will complete a multidisciplinary, digital, and online questionnaire called the "RYHEALTH e-Questionnaire" (<https://hub.ryhealth.net/survey>). The questionnaire has been developed in English and subsequently translated into German, Spanish, Portuguese, and Swedish. It will be available online through the RYHEALTH platform. To engage the target group and collect data anonymously, the RYHEALTH consortium employs various strategies. These include dissemination through the social media channels of the project and its partners, outreach to traditional media outlets, and direct contact

with educational centers to promote participation among students. Additionally, project staff distribute the questionnaire directly at RYHEALTH and externally organized events.

Outcomes measures

The RYHEALTH e-Questionnaire includes participants' history along with validated questionnaires focusing on the main 4 subprojects of a healthy lifestyle promoted by the project. Therefore, the final RYHEALTH e-Questionnaire consists of 4 sections; the first includes questions on anthropometric, sociodemographic information, and relevant covariates such as socioeconomic level. The remaining 3 sections are based on behavioral and lifestyle factors related to 3 RYHEALTH subprojects:

Section 1: RYHEALTH-specific section

This section comprises information on sociodemographic aspects, socioeconomic status, as well as self-reported anthropometric information such as height and weight. Precisely, The Family Affluence Scale (FAS)¹² will measure the socioeconomic level of families. The FAS consists of four items that ask about the family's material possessions and experiences, such as owning a car, having their own bedroom, going on vacations, and the number of computers. The children are asked to indicate whether each item applies to their family. The responses are then combined to create a composite score that provides an estimate of the family's level of material affluence. The FAS has shown a high internal consistency, good test-retest reliability, and validity.

Section 2: Mental health – The happiness project

Stress will be evaluated by The Perceived Stress Scale (PeSS)¹³, a widely used questionnaire designed to measure the degree to which individuals perceive their lives as stressful. The PeSS consists of 10 items, each asking about feelings and thoughts related to stress in the past month. Participants rate each item on a 5-point scale ranging from 0 (never) to 4 (very often). Examples of items on the PeSS include "In the last month, how often have you felt that you were unable to control the important things in your life?" and "In the last month, how often have you felt nervous and 'stressed'?". The PeSS has been used to assess stress in a wide range of populations, including college students, medical patients, and community samples. It has also been translated into many languages and has been used in cross-cultural research. The PeSS has shown a high internal consistency, good test-retest reliability, and validity.

Health-related quality of life (HRQoL) will be assessed by the KIDSCREEN-27¹⁴, a self-reported questionnaire applied in children and adolescents aged 8-18 years old. The KIDSCREEN-27 consists of 27 items that are grouped into five dimensions: physical well-being, psychological well-being, autonomy and parent relations, social support and peers, and school environment. Each item is scored on a 5-point Likert scale. The KIDSCREEN-27 has shown high internal consistency, good test-retest reliability, and validity.

Section 3. Lifestyle behaviours – The activity and food projects

In this section, physical activity, self-reported physical fitness, sedentary behaviour, sleep, eating behaviour and adherence to the Mediterranean diet will be assessed by using the following questionnaires, respectively.

The International Physical Activity Questionnaire (IPAQ) for Children and Adolescents¹⁵ is a questionnaire designed to assess physical activity levels in young people aged 5-17 years. The IPAQ for Children and Adolescents consists of seven items that ask about the amount of time spent doing different types of physical activity, such as walking, running, cycling, and playing sports, over the past

seven days. Participants are asked to indicate the frequency, duration, and intensity of each type of physical activity they engaged in during the past week. The IPAQ has shown a high internal consistency, good test-retest reliability, and validity.

The International Fitness Scale (IFIS)¹⁶ is a self-reported questionnaire designed to measure physical fitness (cardiorespiratory fitness, muscular strength, speed-agility, and flexibility) in children and adolescents. The IFIS consists of 5 items asking about how the participant thinks that is his/her physical fitness level compared to their friends. Each item is scored on a 5-point Likert scale. The IFIS has shown good test-retest reliability and validity.

The Youth Leisure-time Sedentary Behavior Questionnaire (YLSBQ)¹⁷ is a self-report questionnaire designed to assess sedentary behavior in children and adolescents aged 10-18 years. The YLSBQ consists of 12 items that ask about the amount of time spent engaged in different sedentary behaviors, such as watching TV, playing video games, and using the computer, during leisure time on a typical weekday and weekend day. Participants will be asked to indicate the amount of time they spend engaged in each activity in hours and minutes. The YLSBQ has shown a high internal consistency, good test-retest reliability, and validity.

Sleep quantity will be measured by asking the wake-up and fall asleep either for weekdays and weekends. In addition, we will measure sleep quality by the Epworth Sleepiness Scale (ESS) for children and adolescents¹⁸ is a self-report questionnaire designed to assess daytime sleepiness in children and adolescents aged 6-18 years. The ESS for children and adolescents consists of eight items that ask about the likelihood of falling asleep during different activities, such as sitting and reading, watching TV, and sitting and riding in a car, on a scale of 0-3. The ESS has shown a high internal consistency, good test-retest reliability, and validity.

The 21-item Three-Factor Eating Questionnaire (TFEQ-R21)¹⁹ is a self-report questionnaire designed to assess three factors related to eating behavior: cognitive restraint, disinhibition, and hunger. The TFEQ-R21 is a modified version of the original TFEQ, which consisted of 51 items. The TFEQ-R21 consists of 21 items that ask about various aspects of eating behavior, such as how often the participant thinks about food, how much they enjoy eating, and how often they eat when feeling anxious or stressed. The TFEQ-R21 has shown a high internal consistency, good test-retest reliability, and validity.

The KIDMED questionnaire²⁰ is a tool that was developed to assess the quality of the Mediterranean diet in children and adolescents aged 2-24 years old. The KIDMED questionnaire consists of 16 items that assess various aspects of the Mediterranean diet, such as the consumption of fruits, vegetables, fish, nuts, and olive oil, as well as the intake of foods that are high in sugar and saturated fat. Each item is assigned a score of +1 or -1 based on the "yes" or "no" responses. The KIDMED has shown a high internal consistency, good test-retest reliability, and validity. The estimate duration will be 2 minutes.

Sample size

It is expected to obtain a minimum of 200 and up to 500 completed questionnaires from each of the four countries, which makes a total of expected responses ranging from 800 to 2,000. This estimation will provide a comprehensive understanding of children and adolescents that accurately reflects the general population and their characteristics. It will enable statistical analysis of cohorts, including potential sensitivity analyses based on factors such as age, gender, demographics, lifestyle behaviors, mental health outcomes, or any other unique group relevant to research interest.

Digital HUB for Youth

The RYHEALTH project aims to create and deliver a comprehensive set of digital tools for parents, teachers, and students to facilitate access to a healthy lifestyle and promote a network among them, called the "RYHEALTH HUB". This platform will host resources based on updated scientific evidence, adapted for easy understanding and applicability. It will include learning and empowerment tools in each of the four RYHEALTH subprojects: **Activity** (Physical Activity), **Food** (Healthy Eating), **Happiness** (Mental Well-being), and **Sustainability**.

The HUB will feature various tools such as podcasts, videos, infographics, interactive guides, online challenges, games on healthy lifestyles on interactive platforms, and resources for educational sessions, among others.

Ethical considerations

All participants will require parental or guardian consent, provided by confirming online, to allow the data collected in the questionnaire to be used for research purposes within the framework of the European RYHEALTH project. Parents or guardians will be informed that the data are completely anonymous, do not personally identify their children, and will only be used for the purposes established in the research project. They will also confirm their understanding that the questionnaire complies with the General Data Protection Regulation (GDPR) for the processing of personal data in the European Union, published on 17 April 2016, repealing the former Directive 95/46/EC.

Statistical analyses

Descriptive analyses will be performed for continuous and categorical variables. The mean, standard deviation, minimum, maximum and quartiles or percentages will be calculated for continuous and categorical variables, respectively. Covariates will be identified through examining associations between specific questions in each questionnaire and demographic or other variables. Multiple linear regression analyses will be used to examine the association of Linear regression models, logistic regression, and ANCOVA will be conducted to study the associations and interactions between the variables across different dimensions, with a particular focus on analyzing the relationship between healthy and unhealthy patterns and characteristics. All analyses will be performed using the STATA software for Windows version 14.0. The level of significance was set at $p < 0.05$ in the statistical model.

EXPECTED RESULTS

The RYHEALTH project is expected to provide a comprehensive understanding of the lifestyle behaviors of European youth aged 10-17.9, offering valuable insights into the interconnections between physical activity, nutrition, mental well-being, and environmental factors.

First, we anticipate that a substantial proportion of participants will probably fail to meet the recommended guidelines for physical activity, dietary habits, and mental health, aligning with previous literature indicating low adherence to health-promoting behaviors in adolescents. Furthermore, significant differences may emerge based on sociodemographic factors such as age, gender, and socioeconomic status, providing an opportunity to identify high-risk subgroups requiring targeted interventions.

Regarding **physical activity**, we expect to observe an association between higher levels of engagement in structured and unstructured exercise with improved self-perceived fitness, better mental health outcomes, and/or lower sedentary time. Conversely, excessive screen time and sedentary behavior are likely to correlate

with poorer self-rated health, lower adherence to a balanced diet, and higher levels of stress and anxiety.

For **nutrition**, it is hypothesized that a considerable percentage of adolescents will demonstrate suboptimal adherence to a Mediterranean diet, with a higher prevalence of processed food consumption and low fruit and vegetable intake. This dietary pattern may be negatively associated with mental well-being indicators such as stress levels and self-reported health status.

In the **mental health domain**, we anticipate that higher engagement in physical activity, better sleep quality, and frequent exposure to nature will be protective factors against anxiety and depressive symptoms. Additionally, perceived stress is expected to be inversely correlated with quality of life and overall well-being, reinforcing the importance of integrated health promotion strategies.

Finally, the **RYHEALTH HUB**, the digital intervention platform, is expected to enhance accessibility to evidence-based health education resources for adolescents, parents, and educators, ultimately facilitating behavior change and long-term adherence to a healthier lifestyle. The project outcomes will contribute to developing innovative policies and interventions aimed at improving adolescent health across multiple European contexts.

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DISCLOSURE STATEMENT

The authors declare that they have no competing interests.

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