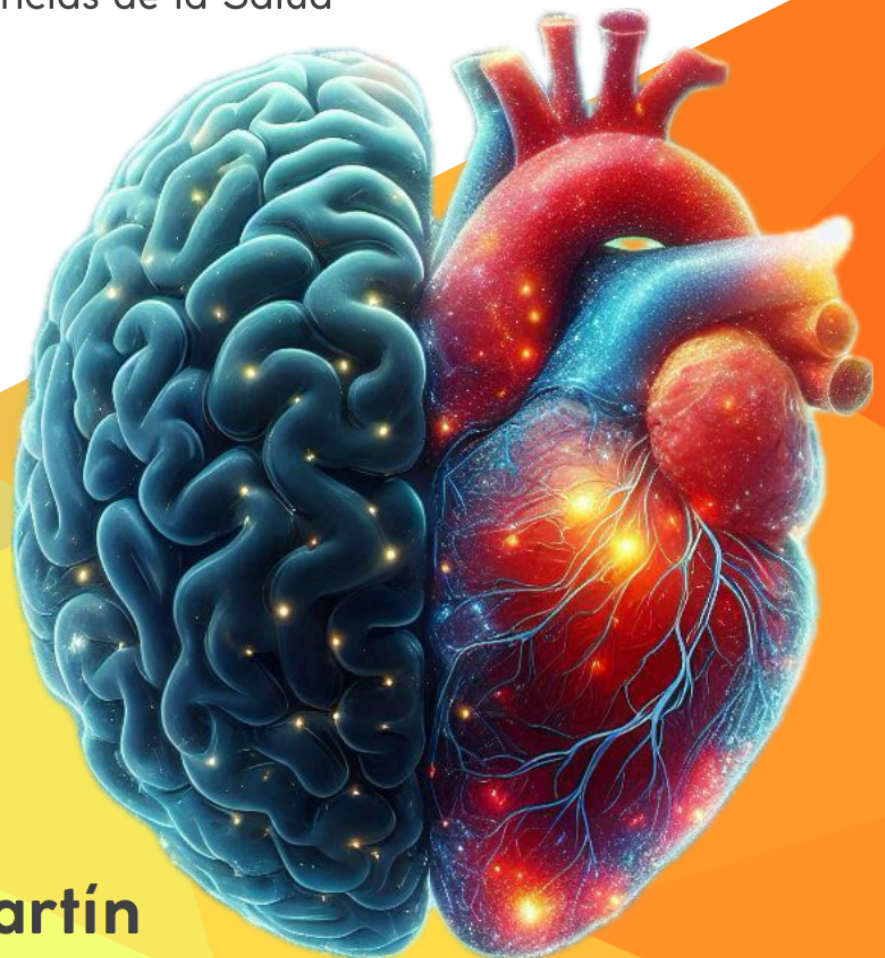


EXPLORING THE IMPACT OF LIFESTYLE AND PHYSICAL FITNESS ON CHILDHOOD OVERWEIGHT AND OBESITY PREVENTION IN SCHOOLCHILDREN: A QUASI-EXPERIMENTAL STUDY ASSESSING THE EFFECTIVENESS OF A MULTIMODAL INTERVENTION IN THE PROVINCE OF CÁDIZ.

The Previene-Cádiz Study

International Doctoral Thesis

Programa de Doctorado en
Ciencias de la Salud



Rubén Aragón Martín

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El estudio PREVIENE-CÁDIZ

International Doctoral Thesis / Tesis Doctoral Internacional



Programa oficial de doctorado en Ciencias de la Salud

Facultad de Ciencias de la Educación

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Rubén Aragón Martín

Julio 2024

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CERTIFICA:

Que la Tesis Doctoral titulada “Explorando el impacto del estilo de vida y la condición física en la prevención del sobrepeso y la obesidad infantil en escolares: un estudio cuasi-experimental que evalúa la eficacia de una intervención multimodal en la provincia de Cádiz. El proyecto PREVIENE-CÁDIZ” que presenta D. Rubén Aragón Martín al superior juicio del tribunal que designe la Universidad de Cádiz, ha sido realizada bajo mi dirección durante los años 2019-2024, siendo expresión de la capacidad técnica e interpretativa de su autor en condiciones tan aventajadas que le hacen merecedor del Título de Doctor, siempre y cuando así lo considere el citado Tribunal.

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En Cádiz, 10 de julio de 2024



Dra. Dña. Mónica Schwarz Rodríguez

Profesora Contratada Doctor del Centro Universitario de Enfermería Salus Infirmorum adscrito a la Universidad de Cádiz

CERTIFICA:

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El doctorando D. RUBÉN ARAGÓN MARTÍN y los directores de tesis D. DAVID JIMÉNEZ PAVÓN y D^a MÓNICA SCHWARZ RODRÍGUEZ:

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Fdo. Mónica Schwartz Rodríguez

En Cádiz, a 10 de julio de 2024

"La vida es como andar en bicicleta. Para mantener el equilibrio, debes seguir moviéndote."

- Albert Einstein.

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RESEARCH PROJECT AND FUNDING

RESEARCH PROJECT AND FUNDING

The present International Doctoral Thesis was performed under the framework of the PREVIENE-CÁDIZ project, which received the following funding:

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MERITS AND GRANTS

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- Research Stay in the UCD School of Public Health, Physiotherapy and Sports Science, University College Dublin, Ireland.
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ABBREVIATIONS

ABBREVIATIONS

ALSPAC: Avon Longitudinal Study of Parents and Children

BMI: Body Mass Index

CED: Cádiz Education Delegation

CI: Confidence Intervals

cm: centimetres

ECLS: Early Childhood Longitudinal Study

ENSE: Spanish National Health Survey

Food-PRICE: Policy Review and Intervention Cost-Effectiveness

GoPA: Global Observatory for Physical Activity

GUTS: Growing Up Today Study

IFIS: International Physical Fitness Scale

IOTF: International Obesity Task Force

ISAK: International Society for the Advancement of Kinanthropometry

ISCOLE: International Study of Childhood Obesity, Lifestyle, and the Environment

LSAC: Longitudinal Study of Australian Children

MDI: Material Deprivation Index

NCDs: Noncommunicable Diseases

NCMP: National Child Measurement Programme

NHANES: National Health and Nutrition Examination Survey

OW: Overweight

p: P-value

POIBA: Childhood Obesity Prevention Project in Barcelona

TV: Television

WHO: World Health Organization

YRBSS: Youth Risk Behaviour Surveillance System

ABSTRACT / RESUMEN

ABSTRACT

Childhood obesity is a growing public health concern worldwide, with significant implications for children's health and well-being. This International Doctoral Thesis aims to study the efficacy of a comprehensive intervention encompassing individual, school, and community-based approaches aimed at promoting healthy lifestyles and enhancing physical fitness to prevent overweight and obesity among 8 to 9-year-old schoolchildren of the province of Cadiz. The research encompasses three main studies conducted in the province of Cadiz, Spain, employing a quasi-experimental design with an intervention and control group.

The first study is a protocol study that describes the methodology of the PREVIENE-CÁDIZ research project, which is the project on which this doctoral thesis is based. The second study examines the association between lifestyle behaviours, physical fitness, and weight status among third-grade primary schoolchildren. The third study evaluates the effectiveness of a comprehensive intervention program in preventing childhood obesity among schoolchildren. Findings from the second study reveal an independent and combined association between lifestyle behaviours and physical fitness with children's weight status, highlighting the importance of promoting healthier lifestyles and improved physical fitness to combat childhood obesity. Moreover, despite promising findings in certain areas, the results of the third study suggested that the intervention produced moderate and at times variable effects in promoting healthier lifestyle behaviours among schoolchildren. While improvements were noted in the experimental group compared to the control group, these did not fully meet the initial expectations. This outcome underscores the need for further research and adjustments in implementation, such as the integration of specialised external personnel to support teachers, embedding the intervention into the school curriculum, and extending its duration throughout an entire academic year.

Moving forward, future research directions focus on refining the present intervention to increase the strength of effectiveness by addressing identified shortcomings. Longitudinal studies with extended follow-up periods are advocated to assess intervention sustainability and explore innovative intervention modalities, including digital health technologies and gamification, to enhance engagement and effectiveness among school-aged children. Furthermore, a multidisciplinary approach integrating insights from various domains such as public health, nutrition, and education is recommended to develop comprehensive and sustainable intervention strategies to address childhood obesity effectively.

This doctoral thesis contributes valuable insights into childhood obesity prevention and intervention strategies, paving the way for future research endeavours aimed at promoting the health and well-being of children worldwide.

RESUMEN

La obesidad infantil es una creciente preocupación de salud pública a nivel mundial, con implicaciones significativas para la salud y el bienestar de los niños. Esta Tesis Doctoral Internacional tiene como objetivo estudiar la eficacia de una intervención integral que abarca enfoques individuales, escolares y comunitarios, destinada a promover estilos de vida saludables y mejorar la condición física para prevenir el sobrepeso y la obesidad en escolares de 8 a 9 años en la provincia de Cádiz. La investigación abarca tres estudios principales realizados en la provincia de Cádiz, España, empleando un diseño cuasi-experimental con un grupo de intervención y un grupo de control.

El primer estudio es un protocolo que describe la metodología del proyecto de investigación PREVIENE-CÁDIZ, que es el proyecto en el que se basa esta tesis doctoral. El segundo estudio examina la asociación entre comportamientos relacionados con el estilo de vida, la condición física y el estado de peso en escolares de tercer grado de primaria. El tercer estudio evalúa la efectividad de un programa de intervención integral en la prevención de la obesidad infantil entre los escolares. Los hallazgos del segundo estudio revelan una asociación tanto independiente como combinada entre los comportamientos relacionados con el estilo de vida y la condición física con el estado de peso de los niños, destacando la importancia de promover estilos de vida más saludables y una mejor condición física para combatir la obesidad infantil. Además, a pesar de los hallazgos prometedores en ciertas áreas, los resultados del tercer estudio sugirieron que la intervención produjo efectos moderados y, en ocasiones, variables en la promoción de comportamientos de estilo de vida más saludables entre los escolares. Aunque se observaron mejoras en el grupo experimental en comparación con el grupo de control, estas no cumplieron completamente con las expectativas iniciales. Estos resultados subrayan la necesidad de realizar más investigaciones y ajustes en la implementación, como la integración de personal externo especializado para apoyar a los profesores, la incorporación de la intervención en el currículo escolar y la extensión de su duración a lo largo de un año académico completo.

De cara al futuro, las direcciones de investigación futura se centran en perfeccionar la intervención actual para aumentar la eficacia, abordando las deficiencias identificadas. Se aboga por estudios longitudinales con períodos de seguimiento prolongados para evaluar la sostenibilidad de la intervención y explorar modalidades de intervención innovadoras, incluidas tecnologías de salud digital y gamificación, para mejorar el compromiso y la efectividad entre los niños en edad escolar. Además, se recomienda un enfoque multidisciplinario que integre perspectivas de varios ámbitos como la salud pública, la nutrición y la educación

para desarrollar estrategias de intervención completas y sostenibles para abordar efectivamente la obesidad infantil.

Esta tesis doctoral aporta valiosos conocimientos sobre la prevención de la obesidad infantil y las estrategias de intervención, allanando el camino para futuros esfuerzos de investigación destinados a promover la salud y el bienestar de los niños en todo el mundo.

INTRODUCTION

INTRODUCTION

Overweight and obesity

The World Health Organization (WHO) defines obesity as an abnormal or excessive accumulation of fat that may be harmful to health (4). In 2019, higher-than-optimal Body Mass Index (BMI) caused an estimated 5 million deaths from Noncommunicable Diseases (NCDs) such as cardiovascular diseases, diabetes, cancers, neurological disorders, chronic respiratory diseases, and digestive disorders (5). As per the WHO, the International Obesity Task Force (IOTF), the Obesity Society, and a multitude of other reputable organizations and research studies (6–8), obesity has been unequivocally identified as a global pandemic.

According to the World Obesity Federation (9), the pervasive nature of obesity extends far beyond its association with individual diseases, permeating numerous aspects of global health. Its multifaceted impact encompasses not only physical health but also mental well-being, socioeconomic disparities, and healthcare systems worldwide (10–12). As a chronic progressive disease, obesity imposes a substantial burden on individuals, families, and communities, exacerbating healthcare costs and diminishing quality of life (13,14). Furthermore, its complex interplay with genetic, environmental, and socio-cultural factors underscores the need for comprehensive, multifaceted approaches to address this burgeoning health crisis effectively (15). Considering its profound implications, concerted efforts from policymakers, healthcare professionals, and communities are imperative to mitigate the prevalence and impact of obesity on a global scale.

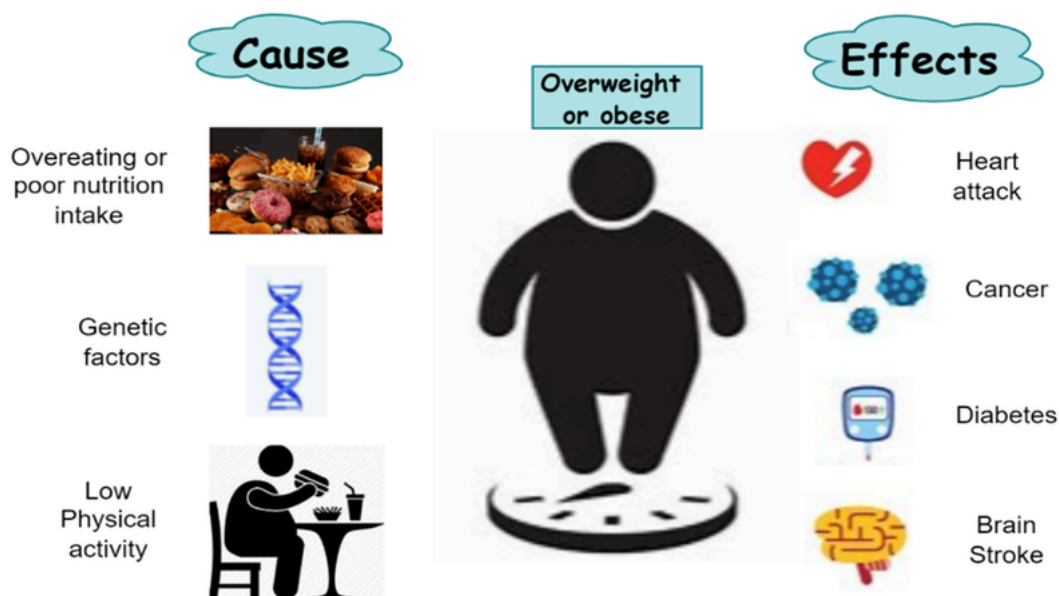


Figure 1. Main causes and effects of obesity. Adapted from Kaur et al. 2022 (2).

The pathophysiology of obesity underscores its multifaceted nature, intertwining genetic predispositions, environmental factors, and behavioural patterns. Adipose tissue, once viewed solely as a passive energy storage depot, is now acknowledged as an active endocrine organ, secreting various adipokines and cytokines that regulate metabolic homeostasis (16). Chronic low-grade inflammation, disturbances in appetite-regulating hormones like leptin and ghrelin, and insulin resistance are key physiological mechanisms implicated in obesity's development and progression (17). Furthermore, alterations in gut microbiota composition and function have emerged as significant contributors to metabolic dysregulation in obesity, illuminating the complexity of its pathophysiology (18).

This intricate interplay of physiological mechanisms in obesity underscores its profound impact on social well-being and life expectancy. Individuals grappling with obesity frequently confront stigma, discrimination, and social exclusion, which can adversely affect mental health and interpersonal relationships (19,20). Moreover, obesity is intricately linked with an array of comorbidities, including cardiovascular disease, type 2 diabetes, certain cancers, and musculoskeletal disorders, all of which contribute to a shortened lifespan (21–24). The pervasiveness of obesity-related comorbidities underscores the urgent need for holistic interventions that address both physical health and psychosocial well-being to mitigate the adverse consequences of obesity on individuals and society as a whole.

The global economic burden of obesity is staggering, with healthcare expenditures attributable to obesity-related conditions reaching unprecedented levels. Direct medical costs associated with the treatment of obesity-related illnesses, including hospitalizations, medications, and procedures, impose a substantial strain on healthcare systems worldwide. In Spain, the economic impact of obesity is particularly pronounced, with healthcare expenditures attributable to obesity estimated to be billions of euros annually (25). Furthermore, the indirect costs stemming from productivity losses, absenteeism, and disability add further strain to economic resources, highlighting the urgent need for concerted efforts to address the obesity epidemic from both a public health and economic standpoint (13).

In recent years, Spain has witnessed a concerning escalation in obesity prevalence rates, mirroring global trends (24). The rise in obesity rates is particularly alarming among children and adolescents, with sedentary lifestyles, poor dietary habits, and environmental factors contributing to this concerning trend. The burgeoning obesity epidemic in Spain poses significant challenges to the country's healthcare system, with increased demands for obesity-related healthcare services and interventions placing a strain on already limited resources. Addressing the root causes of obesity and implementing evidence-based prevention and treatment strategies are

imperative to mitigate the escalating burden of obesity on Spain's healthcare system and safeguard the health and well-being of its population.

Childhood obesity

Childhood obesity stands as a significant health concern, acknowledged by the WHO as a defining epidemic of the 21st century (26). It has become increasingly prevalent, posing substantial challenges to public health efforts. Notably, childhood obesity isn't just a temporary issue but can have lasting consequences throughout an individual's life span. Research indicates that children and adolescents struggling with excess weight are at a heightened risk of carrying this burden into adulthood, predisposing them to a multitude of health complications later in life (27,28).

Understanding the far-reaching implications of childhood obesity is crucial. Apart from its immediate physical effects, such as increased risk of chronic conditions, it also impacts social and psychological well-being. Studies have highlighted associations between childhood obesity and diminished self-esteem (29), as well as increased vulnerability to depressive symptoms (30). Furthermore, the trajectory of childhood obesity often persists into adulthood, making prevention and intervention efforts during childhood paramount.

Addressing childhood obesity requires a multifaceted approach that considers the complex interplay of genetic, environmental, and behavioural factors. Prevention strategies must extend beyond individual behaviours to encompass broader societal influences, including access to healthy food options, opportunities for physical activity, and supportive community environments. By prioritising early intervention and promoting healthy habits from an early age, the adverse consequences of childhood obesity can be mitigated, safeguarding the health and well-being of future generations.

Figure 2 graphically represents the vicious cycle of childhood obesity, providing a clear visualization of the various factors and processes that contribute to its development and perpetuation. This depiction essentially illustrates how childhood obesity can trigger a series of events that perpetuate its own existence, creating a cycle that is challenging to break.



Figure 2. The vicious cycle of childhood obesity. Adapted from The Heart Foundation 2018 (3).

Epidemiology of childhood obesity

Childhood obesity has reached alarming levels worldwide, with significant increases observed over the past few decades. In the United States, the prevalence of obesity among children and adolescents aged 2-19 years stood at approximately 19.3% in 2017-2018, according to the National Health and Nutrition Examination Survey (NHANES) (31). Similarly, Mexico has experienced a sharp rise in childhood obesity, with nearly one-third of children aged 5-11 years classified as overweight or obese (32). Other countries grappling with high rates of childhood obesity include Brazil (15,9% in 2019) (33), China (7,6% in 2012) (34), and India (6,5% in 2017-2018) (35), highlighting the global nature of this public health crisis.

In Europe, childhood obesity rates vary across countries but remain a significant concern. According to the WHO, the prevalence of overweight and obesity among European children aged 6-9 years ranged from approximately 20% to 40% in 2016

(4). Studies by Ahrens et al. and Cadenas-Sánchez et al. estimated that in the same year, the prevalence of overweight and obesity among European preschoolers exceeded 40%, with higher obesity rates in Southern European countries (36,37). Nations such as Greece, Italy, and Spain have reported particularly high rates of childhood obesity. In the United Kingdom, recent data from the National Child Measurement Programme (NCMP) revealed that approximately 20.2% of children in reception year (aged 4-5 years) and 34.3% of children in year 6 (aged 10-11 years) were overweight or obese (38).

In Spain, childhood obesity represents a growing public health challenge. Data from the Spanish National Health Survey (ENSE) indicate that the prevalence of overweight and obesity among children aged 2-17 years increased from 26.2% in 2011 to 29.3% in 2017 (39). Moreover, the ENSE also revealed regional disparities, with higher rates of childhood obesity observed in southern regions such as Andalusia and Extremadura (39). Additionally, researchers from our group found in 2013 in Cádiz a prevalence of overweight and obesity in children aged 6 to 12 years of 35% (40). Efforts to address childhood obesity in Spain have included the implementation of national strategies and initiatives aimed at promoting healthy eating habits and physical activity among children and adolescents.

Determinants of childhood obesity

Understanding the determinants of childhood obesity is crucial for developing effective strategies to address this multifaceted public health issue. Various factors contribute to the development and progression of obesity in children and adolescents, encompassing genetic, environmental, socio-economic, and behavioural influences. By exploring these determinants comprehensively, we can gain insights into the complex interplay of factors shaping childhood obesity trajectories and inform targeted interventions aimed at prevention and management.

- **At the individual level**
 - **Genetic, biological and gender factors**

Genetic, biological, and gender factors play significant roles in shaping the risk of childhood obesity. Numerous studies have highlighted the hereditary component of obesity, with estimates suggesting that genetic factors may account for up to 70% of individual differences in body weight (41). Variations in genes related to appetite regulation, metabolism, and fat storage have been implicated in predisposing individuals to obesity from an early age (42).

Additionally, biological factors such as hormonal imbalances can influence weight regulation and adiposity in children. For instance, disruptions in the secretion of hormones like leptin and ghrelin, which regulate appetite and energy balance, can

contribute to excessive weight gain (43,44). Moreover, differences in body composition, including fat distribution and lean muscle mass, can affect an individual's susceptibility to obesity (45).

Sex also plays a role in childhood obesity, with differences observed in prevalence rates and risk factors between boys and girls. While boys tend to have higher rates of obesity during childhood, girls often experience changes in body composition during puberty, which can influence weight status (45). Socio-cultural norms and expectations regarding body image may also impact gender disparities in obesity prevalence.

- **Family factors**

- **Mother's weight during pregnancy**

The weight status of the mother during pregnancy is a critical determinant of childhood obesity. Numerous studies have demonstrated a clear link between maternal obesity during pregnancy and an increased risk of offspring developing obesity later in life (46). Maternal obesity is associated with alterations in fetal programming, including changes in metabolism, appetite regulation, and adipose tissue development, which can predispose the child to obesity (47–50). Additionally, maternal obesity may impact the intrauterine environment, leading to epigenetic modifications that influence gene expression related to energy balance and fat metabolism in the offspring (51).

- **Breastfeeding**

Breastfeeding has been recognised as a protective factor against childhood obesity. Research suggests that breastfeeding provides numerous health benefits for both the mother and infant, including optimal nutrition, immune support, and bonding (52). Breast milk contains bioactive components that support healthy growth and development while reducing the risk of excessive weight gain (53). Studies have shown that longer durations of breastfeeding are associated with a lower risk of childhood obesity, likely due to the unique composition of breast milk and the positive feeding behaviours promoted during breastfeeding (54).

- **Obesity of the mother and/or father**

The obesity status of parents significantly influences the likelihood of childhood obesity. Children born to obese parents are at a higher risk of developing obesity themselves, with genetic predisposition, shared environmental factors, and familial lifestyle behaviours contributing to this association (55–57). Maternal obesity has been linked to an increased risk of childhood obesity, independent of genetic factors, suggesting that environmental influences during early life play a crucial role (58). Moreover, parental obesity may influence family dynamics, dietary patterns,

and physical activity levels within the household, further contributing to the intergenerational transmission of obesity (56,57).

- **Sociodemographic factors**

- **Socioeconomic level**

Socioeconomic status is a key determinant of childhood obesity, with significant disparities observed between children from different socioeconomic backgrounds. Research consistently demonstrates a higher prevalence of obesity among children from lower socioeconomic households compared to those from higher socioeconomic backgrounds (59). Limited access to nutritious foods, inadequate healthcare resources, and environmental factors such as neighbourhood safety and availability of recreational facilities contribute to higher obesity rates in low-income communities (60–62). Additionally, socioeconomic inequalities can impact parental education levels, nutritional knowledge, children's sporting resources, parental employment opportunities, and stress levels, all of which influence family lifestyle behaviours and contribute to the risk of childhood obesity (63,64).

- **Country of origin**

The country of origin plays a crucial role in shaping childhood obesity risk, reflecting variations in cultural norms, dietary practices, and environmental factors. Immigrant children often experience acculturation processes that influence their dietary habits and physical activity patterns, potentially increasing their susceptibility to obesity (65,66). Studies have shown that children from certain ethnic or racial backgrounds, such as Hispanic, African American, and Indigenous populations, may face higher obesity rates compared to their non-Hispanic white counterparts (67). Cultural preferences for energy-dense foods, limited access to healthy options, and sociocultural norms surrounding body image contribute to disparities in obesity prevalence across different ethnic and racial groups (68).

- **Kind of family**

The type of family structure, including factors such as single-parent households, dual-income families, and multigenerational households, can impact childhood obesity risk. Single-parent households, for example, may face greater challenges in providing healthy meals and promoting physical activity due to time and financial constraints (69). Dual-income families may rely more on convenience foods and have less time for home-cooked meals, potentially affecting dietary quality and obesity risk (70). Multigenerational households may have differing caregiving styles and cultural beliefs about child feeding practices, influencing children's eating behaviours and weight status (69,70).

- **Physical fitness**

Physical fitness is a critical component in combating childhood obesity, supported by empirical evidence indicating its protective role against weight gain and associated health complications. Research from the IDEFICS study reveals that children with higher levels of physical fitness exhibit lower cardiometabolic risk and reduced insulin resistance compared to their less fit counterparts (71,72). Furthermore, another study from the IDEFICS project indicates that enhancing physical fitness during childhood, particularly cardiorespiratory fitness, reduces odds of an inflammatory profile, independently of body composition and lifestyle behaviours (73). This underscores the importance of improving physical fitness, especially cardiorespiratory fitness, to prevent inflammatory states in children. Similar findings were observed in a study from the HELENA project, but this time in adolescents. The results showed a positive association between physical fitness and inflammatory markers in teenagers: higher levels of fitness were linked to lower inflammatory markers (74). Additionally, a systematic review revealed that approximately half of the articles examined indicated a significant correlation between higher cardiorespiratory fitness levels during childhood and adolescence and several positive outcomes, including lower BMI, reduced waist circumference, decreased body fat, and a lower prevalence of metabolic syndrome in later life stages (75).

Encouraging children to engage in regular physical activity is paramount for promoting physical fitness and averting obesity. Data from the Youth Risk Behaviour Surveillance System (YRBSS) indicates that only 24% of high school students meet the recommended guidelines for physical activity, underscoring the urgent need for intervention (76). Evidence-based interventions, such as school-based physical education programmes and community-wide initiatives, have been shown to improve physical fitness levels and mitigate obesity risk factors in children. A systematic review found that school-based physical activity interventions resulted in significant improvements in cardiorespiratory fitness and muscular strength among children and adolescents (77). Moreover, incorporating physical activity into daily routines, such as active commuting to school and outdoor play, can further enhance physical fitness and contribute to long-term weight management (78).

- **Lifestyle behaviours**

- **Physical activity levels**

Physical activity levels exert a profound influence on childhood obesity prevalence, with robust evidence linking regular physical activity to reduced adiposity and improved metabolic health (79). According to data from the Global Observatory for Physical Activity (GoPA), approximately 80% of adolescents worldwide fail to meet

the recommended guidelines for physical activity, highlighting a pervasive sedentary lifestyle among youth (80).

Large-scale initiatives, like the IDEFICS project, have shown that physical activity is essential in safeguarding young children against the accumulation of cardiovascular disease risk factors, with more consistent benefits noted in those over 6 years old. Healthcare professionals should advise 60 to 85 minutes of moderate to vigorous physical activity daily, incorporating at least 20 minutes of vigorous exercise (81). Longitudinal studies, such as the European Youth Heart Study, indicate that greater physical activity levels in childhood correlate with lower adiposity and a decreased risk of obesity-related comorbidities in adulthood (82). Similarly, research from the Avon Longitudinal Study of Parents and Children (ALSPAC) reveals that physically active children exhibit better cardiovascular health markers, including reduced blood pressure and cholesterol levels, which lower the risk of obesity-related diseases later in life (83). Likewise, a study by Jiménez-Pavón, Ortega, Artero et al. demonstrated that vigorous physical activity and fitness moderate the levels of leptin concentrations in a sample of European adolescents, independent of relevant confounding factors, including total body fat (84).

Encouraging children to engage in a variety of physical activities, including aerobic exercise, strength training, and flexibility exercises, is essential for promoting optimal growth and development and preventing obesity-related health complications.

- **Sedentary behaviours**

Excessive sedentary behaviour is a significant contributor to the global obesity epidemic, as evidenced by epidemiological studies linking prolonged screen time and sedentary activities to increased adiposity and weight gain in children. Data from the International Study of Childhood Obesity, Lifestyle, and the Environment (ISCOLE) reveal that children who spend more than two hours per day engaging in screen-based sedentary activities have a higher likelihood of being overweight or obese compared to those with limited screen time (85). Moreover, longitudinal studies, such as the Growing Up Today Study (GUTS), demonstrate that reducing sedentary behaviours, such as television viewing and computer use, can lead to improvements in body composition and metabolic health parameters among children and adolescents (86). Implementing strategies to limit screen time, such as establishing screen-free zones in the home and promoting alternative leisure activities, is essential for mitigating the detrimental effects of sedentary behaviour on childhood obesity risk.

- **Eating habits**

Healthy eating habits are fundamental for preventing childhood obesity and promoting overall health and well-being. Data from the NHANES indicate that dietary factors play a significant role in obesity prevalence among children, with high intake of sugary beverages, fast food, and processed snacks contributing to excess calorie consumption and weight gain (87).

For example, a study from the HELENA project found that insulin resistance and the score of clustered metabolic risk factors were associated with dietary behaviours and preferences among European adolescents, even after adjusting for various factors, including body fat. Skipping breakfast, as well as preferences for certain foods such as nuts, chocolate, burgers, and pizzas, and beverages like soft drinks or juices, partly explained the variance in insulin resistance. Additionally, regular snacking during the school day was linked to a higher metabolic risk score in females (88).

For example, a systematic review found that children who frequently consume sugar-sweetened beverages have a higher risk of obesity compared to those with lower intake (89). In addition, longitudinal studies, such as the Early Childhood Longitudinal Study (ECLS), demonstrate that adherence to a healthy dietary pattern, characterised by high intake of fruits, vegetables, whole grains, and lean proteins, is associated with a reduced risk of obesity and improved metabolic health outcomes in children and adolescents (90).

Promoting nutrition education, encouraging healthy food choices, and creating supportive environments that facilitate access to nutritious foods are essential strategies for preventing childhood obesity and fostering healthy eating habits from an early age (91).

- **Sleep habits**

Adequate sleep is crucial for children's growth, development, and overall health, with mounting evidence linking insufficient sleep duration and poor sleep quality to an increased risk of childhood obesity. Longitudinal studies, such as the Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC), reveal that children who consistently sleep less than the recommended amount have a higher likelihood of being overweight or obese compared to those with sufficient sleep duration (92). Additionally, meta-analytic studies, such as the National Sleep Foundation's Sleep in America Poll, demonstrate that short sleep duration and irregular sleep patterns are associated with dysregulated appetite hormones, increased food intake, and disrupted metabolism, which contribute to weight gain and obesity development in children and adolescents (93). Promoting healthy sleep habits, such as establishing consistent bedtime routines, creating a conducive

sleep environment, and limiting electronic device use before bedtime, is essential for supporting optimal sleep duration and quality in children and reducing the risk of obesity-related health complications.

- **At community level**

- **Social environment**

The social environment plays a crucial role in shaping childhood obesity risk, encompassing social norms, cultural influences, peer relationships, and family dynamics. A systematic review highlights the impact of social factors on childhood obesity, with findings indicating that children from socially disadvantaged backgrounds are more likely to experience higher rates of obesity due to limited access to healthy food options, fewer opportunities for physical activity, and increased exposure to unhealthy lifestyle behaviours (94). Moreover, social determinants such as parental education, household income, and neighbourhood characteristics significantly influence children's dietary patterns, physical activity levels, and weight status (60,95,96). Addressing social inequalities and promoting supportive social environments that foster healthy behaviours are essential for reducing childhood obesity prevalence and improving overall health outcomes in communities.

- **Physical environment**

The physical environment plays a pivotal role in shaping lifestyle behaviours and obesity risk among children. Built environment factors, such as access to parks, playgrounds, recreational facilities, and active transportation options, influence children's opportunities for physical activity and active play (97). Several studies highlight the importance of neighbourhood walkability and access to green spaces in promoting physical activity and reducing obesity risk among children (98,99). Additionally, environmental factors such as food availability, affordability, and marketing practices influence children's dietary choices and food preferences (100,101). Addressing environmental determinants of childhood obesity requires comprehensive strategies that enhance access to healthy food options, create safe and supportive spaces for physical activity, and regulate food advertising targeted at children.

- **Macro level environment**

The macro-level environment encompasses broader social, economic, and policy factors that influence childhood obesity prevalence at the population level. Economic policies, such as taxation on unhealthy foods and subsidies for healthy foods, can impact food prices and consumption patterns, thereby influencing dietary behaviours and obesity risk among children. Research from the Food-PRICE (Policy Review and Intervention Cost-Effectiveness) Project highlights the potential

impact of fiscal policies on reducing childhood obesity rates through improvements in dietary quality and reduced consumption of high-calorie, low-nutrient foods (102). Furthermore, policy initiatives aimed at promoting physical activity in schools, communities, and public spaces can create environments that support active lifestyles and contribute to obesity prevention efforts. Addressing macro-level determinants of childhood obesity requires coordinated action across multiple sectors, including healthcare, education, urban planning, and government policy, to create environments that facilitate healthy choices and promote optimal growth and development in children.

AIMS / OBJETIVOS

AIMS

General aim

The general aim of this International Doctoral Thesis was to study the efficacy of a comprehensive intervention encompassing individual, school, and community-based approaches aimed at promoting physical activity, reducing sedentary behaviour, enhancing physical fitness, and fostering healthy eating habits to prevent overweight and obesity among 8 to 9-year-old schoolchildren of the province of Cadiz.

This general aim was addressed in three studies with the following specific objectives:

Study I: A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ”

To design a viable and feasible multimodal intervention that involves various relevant dimensions, including sociocultural, behavioural, and environmental factors, with the purpose of preventing childhood obesity among third-grade primary school students in the province of Cádiz.

Study II: Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. Previene-Cádiz.

To analyse the independent and combined association of lifestyle behaviours and self-reported physical fitness with body weight status in schoolchildren.

Study III: Effectiveness of a School-Based Multimodal Intervention on Promoting Healthy Lifestyle Behaviours Among Schoolchildren. Previene-Cádiz Study.

To evaluate the effectiveness of an intervention aimed at promoting healthy lifestyle habits among schoolchildren in the province of Cádiz.

OBJETIVOS

Objetivo general

El objetivo general de esta Tesis Doctoral Internacional fue estudiar la eficacia de una intervención integral que engloba enfoques individuales, escolares y comunitarios encaminados a promover la actividad física, reducir el sedentarismo, mejorar la condición física y promover hábitos alimentarios saludables para prevenir el sobrepeso y la obesidad de escolares de 8 a 9 años de la provincia de Cádiz.

Este objetivo general se desglosa en tres estudios con los siguientes objetivos específicos:

Estudio 1: Una intervención multimodal para la prevención del sobrepeso y la obesidad en escolares. Protocolo del estudio “PREVIENE-CÁDIZ”

Diseñar una intervención multimodal viable y factible, que involucre diversas dimensiones relevantes, incluidos factores socioculturales, conductuales y ambientales, con el propósito de prevenir la obesidad infantil en los escolares de tercer curso de primaria de la provincia de Cádiz.

Estudio 2: Asociación independiente y combinada de estilos de vida y condición física con el estado de peso corporal en escolares. Previene-Cádiz.

Analizar la asociación independiente y combinada de los estilos de vida y la condición física auto-informada con el estado de peso corporal en escolares.

Estudio 3: Efectividad de una intervención multimodal escolar en la promoción de hábitos de vida saludables en escolares de la provincia de Cádiz. Estudio Previene-Cádiz.

Evaluar la efectividad de una intervención dirigida a promover hábitos de vida saludables entre los escolares de la provincia de Cádiz.

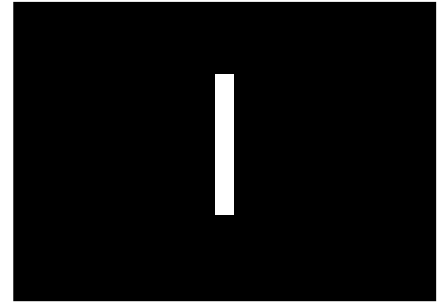
MATERIAL AND METHODS

MATERIAL AND METHODS

This International Doctoral Thesis comprises three studies derived from the PREVIENE-CÁDIZ project (Prevention of Overweight and Obesity in Schoolchildren in the Province of Cádiz. Quasi-Experimental Study on the Effectiveness of a Multicomponent Intervention, PI-0007-2017, 2018-2020). As such, it focuses on the data gathered within the framework of this project, which was 80% co-financed by the European Union, within the framework of the Andalusia FEDER Operational Programme 2014-2020, Regional Ministry of Health and Families, Regional Government of Andalusia.

Data collection took place both before the intervention (between November 2018 and January 2019) and after it (May and June 2019). The project was evaluated and approved by the Andalusian Biomedical Research Ethics Committee, along with approval from the Delegation of Education and Science of the province of Cádiz (PI-0007-2017, 21 March 2018), and was conducted following the principles of the Declaration of Helsinki and in accordance with Organic Law 3/2018, of December 5, on the Protection of Personal Data, and Regulation (EU) 2016/679 of the European Parliament and of the Council, of 27 April 2016 (General Data Protection Regulation).

The material and methods of each individual study (I to III) comprising the present International Doctoral Thesis are presented below.



**STUDY I: A Multimodal Intervention for Prevention of
Overweight and Obesity in Schoolchildren. A
Protocol Study “PREVIENE-CÁDIZ”**

Study I: A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ”

Study I is the protocol study, where the methodology of the PREVIENE-CÁDIZ project is described in detail.

Study Design and Participants

The project proposed a quasi-experimental design with an intervention group and a control group. An educational intervention was carried out in the experimental group, and it is intended to evaluate the effectiveness of the intervention to prevent childhood overweight and obesity in schoolchildren of the province of Cádiz. The study sample consisted of 833 schoolchildren between 8 and 9 years old, enrolled in the third grade of primary education from 25 schools of the province of Cádiz. The parents of each schoolchild were part of that same study subject (father, mother or caregivers and child were the same subject of study). The inclusion criteria were: children belonging to the selected school, who were in the third grade of primary school, regardless of their age, who had the informed consent signed by their parents or legal guardians, who responded to the questionnaires and who submitted to the anthropometric measurements. The exclusion criteria were that some of these requirements were not met.

The sample was divided into two, the intervention and the control groups. The intervention group contained 469 schoolchildren and consisted of 12 of the 25 school centres which participated in the study. Initially, 26 schools agreed to participate, however, due to one school in the experimental group failing to implement the intervention as expected, the final count of schools was reduced to 25. While, the control group contained 364 schoolchildren and consisted of the others 13 school centres participating in the study. Both groups underwent pre- and post-intervention measurements, and only the experimental group underwent the intervention, to compare the results with the control group and find out if an effect was emerged or not.

The province of Cádiz was divided into four areas: Campo de Gibraltar (six schools), Jerez-Costa Noroeste (five schools), Sierra de Cádiz (nine schools), and Bahía de Cádiz-La Janda (six schools) (**Figure 3**). The Campo de Gibraltar area, as previously indicated, ultimately consisted of five schools. To ensure a sample as representative as possible of the entire province of Cádiz, each area included both educational centres from the intervention group and the control group.



Figure 3. Geographical representation of the 4 study areas in the province of Cádiz. Taken from Aragón-Martín, R. et al (2021) (1).

Both the selection of schools participating in the study and the assignment of them to the experimental group or control group were made randomly from the list of public schools of the Cádiz Education Delegation (CED). These randomizations were carried out taking into account the schools belonging to each of the geographical areas in which the province of Cádiz was divided, the socioeconomic condition of the population served, which was determined from the Material Deprivation Index (MDI) of the section of the census in which the school was located (103), and the number of classes or corresponding lines of each centre belonging to that age group. Randomization was carried out in groups by schools, not individually (**Figure 4**).

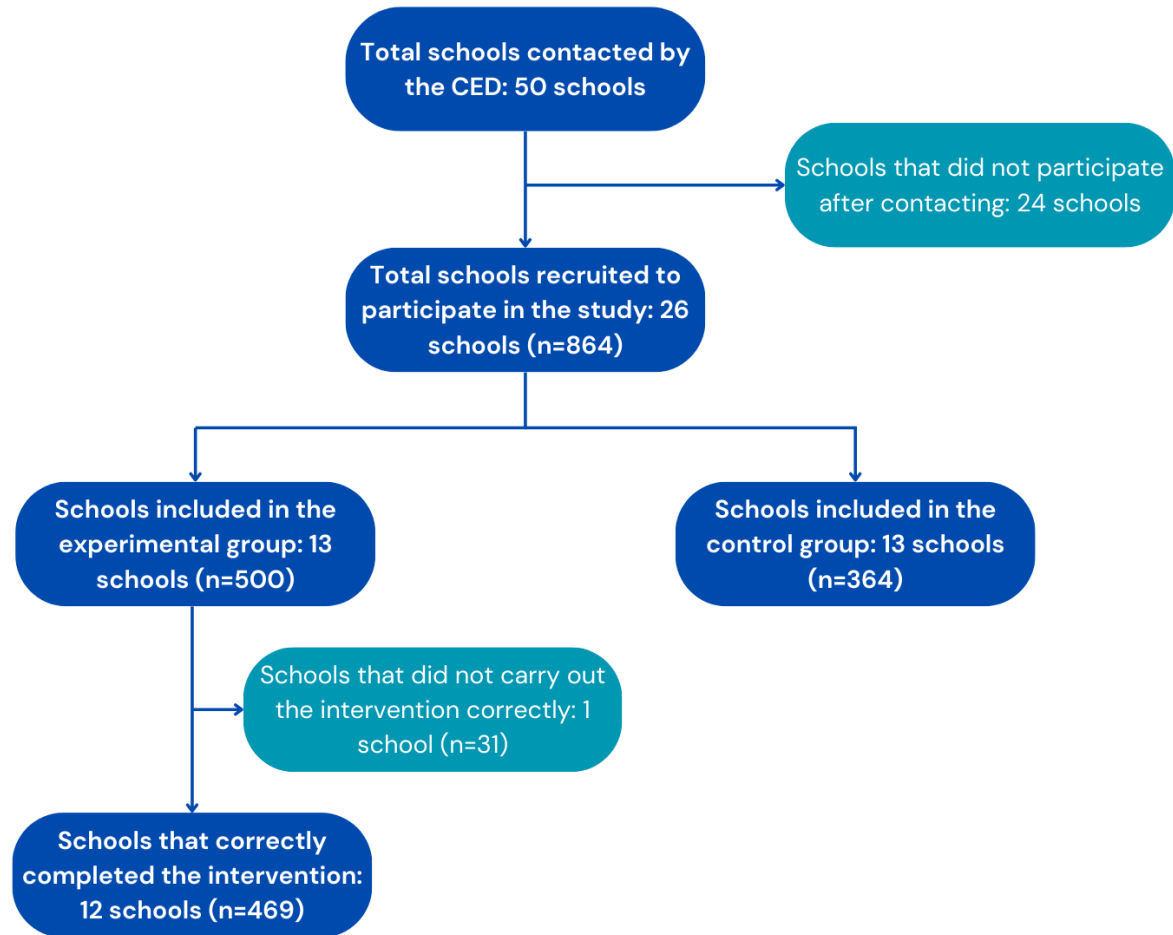


Figure 4. Flow diagram of schools, groups and participants of the PREVIENE-CÁDIZ study.

Sample Size Calculation

The sample size was calculated to determine the effectiveness of the intervention on the prevalence of overweight and obesity in the study population. After reviewing the results obtained by different studies carried out in our environment, an estimated prevalence of overweight and obesity of 35% was assumed, which was previously found (40) in a population from Cádiz similar to our study. The sample size necessary to test hypotheses was calculated by comparison of two proportions. The percentage of over-weight and obesity of schoolchildren was compared before and after the intervention in both groups (intervention and control; paired data) and inter-group (independent data). In our case, for an estimated difference of proportions of 9% (35% vs 26%) with a confidence level of 95% and a power of 80%, the minimum sample size required was 410 participants in each group (intervention and control), which makes a total of 820 children.

PREVIENE-CÁDIZ Intervention

The intervention adopted a multimodal approach, targeting students, their families, and educational institutions. The activities and sessions of the intervention programme, which can be seen in **Table 1**, were carried out by the teachers from the participating schools, after receiving training from the research team in a 10-hour in-person course. The students from the intervention group took part in the 10 sessions of the healthy educational programme, delivered by the teachers in the classroom, and were provided with two workbooks to use at home: one exclusively designed to delve into the programme's content, directed at the students, and another aimed at both students and their families to encourage family involvement in the addressed participants. Additionally, the parents received training in an in-person session held one afternoon in each of the intervention schools, where three training courses focused on improving their children's lifestyles were delivered: healthy nutrition, physical activity, and the resources available in their environment to enhance nutrition and increase levels of physical activity. **Table 2** shows the development of workshops and the corresponding content included in each.

Table 1. “PREVIENE-CÁDIZ” intervention sessions aimed at schoolchildren.

Sessions	Objectives
Session 1 <i>Our development</i>	To recognize weight and height as signs of development.
Session 2 <i>Let's assess</i>	To recognize and accept one's own physical appearance and that of others.
Session 3 <i>Our digestion</i>	To get to know the digestive tract and its functions; to practice dietary hygiene habits.
Session 4 <i>Food groups</i>	To get to know the food groups and how to differentiate them according to their origin.
Session 5 <i>Nutrients and their functions</i>	To get to know nutrients and their functions.
Session 6 <i>The food pyramid and exercise</i>	To get to know the primary recommendations for eating and exercising; to show skills associated with these recommendations.
Session 7 <i>The best breakfast</i>	To identify content and quantities of a health breakfast; to experiment how breakfast can be attractive and desirable.
Session 8 <i>Physical activity and sleep</i>	To Improve health habits of physical activity, sleep and eating.
Session 9 <i>Review and synthesis</i>	To integrate physical activity, sleep and healthy eating into habits.
Session 10 <i>Photovoice</i>	To identify, to become aware and to use the health resources readily available.

Table taken from Aragón-Martín, R. et al (2021) (1).

Table 2. Development of workshops aimed at parents or caregivers.

Workshops	Length	Content	Materials
Healthy eating workshop	45 minutes	Macronutrients (carbohydrates, fats and proteins) Micronutrients (minerals and vitamins) Nutrition labelling	Graphic and audiovisual media
Healthy cooking workshop	45 minutes	Developing a healthy monthly menu Making healthy bread: the recipe for healthy bread will be given to parents and the bread will be made in front of them so they can see how it is made. They will take a previously prepared bread so they can taste it. Making healthy cookies: parents will be given the recipe for healthy cookies and cookies will be made in front of them so they can see how they are made. Pre-made cookies will be taken so they can try them.	Two glass bowls A whisk
Healthy lifestyles workshop	45 minutes	What is physical activity? Benefits of healthy physical activity Tricks to increase the time of healthy physical activity Harms of sedentary lifestyle Tricks to reduce sedentary lifestyle Planning of free or leisure time	Graphic and audiovisual media
Workshop on assets / resources available to improve health	45 minutes	Current health concept What are assets for health? What resources / assets for health exist? Resources / assets for health that we have at our disposal Motivation to improve our health status	Graphic and audiovisual media

Table taken from Aragón-Martín, R. et al (2021) (1).

Timeline of the Study

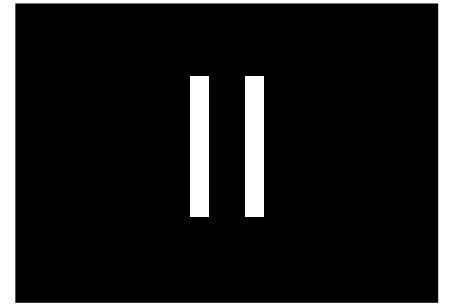
With the intention of covering the proposed objectives, the intervention was conceived as a gradual process in which three phases were distinguished fundamentally: (I) preparation phase, (II) implementation phase, and (III) evaluation and dissemination phase.

During **Phase I**, which primarily spanned the inaugural year of the project (2017), various activities were undertaken. These included conducting thorough reviews and updates of the scientific literature, preparing essential materials for evaluations and for the intervention (such as questionnaires, educational programs, and booklets), consensus meetings among the research team, recruiting and meetings with management teams and/or teachers from participating centres, recruiting participating teachers, establishing protocols for monitoring throughout the

intervention, implementing teacher training initiatives, and crafting workshops tailored for families.

Phase II, the implementation phase, spanned the second year and part of the third year of the study (2018-2019). This phase encompassed a range of activities, including conducting pre- and post-intervention evaluations, executing the multimodal intervention, organizing and delivering workshops for families, establishing databases and data entry procedures. Furthermore, it entailed identifying health-related resources and assets pertaining to healthy eating and physical activity within the school environment using the Photovoice technique. Additionally, the implementation of the World Cafe technique, which allowed for the articulation of the perceptions of intervention participants, including schoolchildren, teachers, and parents. Lastly, this phase involved assessing the prevalence of childhood overweight and obesity at that time in the province of Cádiz.

Phase III, corresponding to the evaluation and dissemination phase, spans from the third year of the study to the present day (2019-2024). This phase includes activities such as statistical analysis of the data and dissemination of the results. The findings have been disseminated both to the scientific community through scientific papers, conferences, workshops, etc., and to participating educational institutions through a report specifying the main study results. Additionally, there is an intention to disseminate the results to society at large, so that relevant authorities become aware of the issue and, if possible, implement the intervention, with necessary modifications, in as many schools as possible.



**STUDY II: Independent and Combined Association
of Lifestyle Behaviours and Physical Fitness with
Body Weight Status in Schoolchildren. Previene-
Cádiz.**

Study II: Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. Previene-Cádiz.

Study Design and Participants

The present study followed a descriptive and cross-sectional design using reference data from the PREVIENE-CÁDIZ project. The data analysed were those collected prior to the intervention. The study comprised a sample of 864 schoolchildren aged between 8 and 9 years, all enrolled in the third grade of primary education across 26 educational institutions in the province of Cádiz. Each student's parents or caregivers were also included as study subjects. Inclusion criteria encompassed children enrolled in the third year of Primary Education of the selected schools, regardless of their age, who provided signed consent from their parents or legal guardians, completed the questionnaires, and underwent to the anthropometric measurements. Exclusion criteria were applied if any of these requirements were not met. Parents or legal guardians were provided with an information sheet about the project and asked to provide written informed consent. Participation was voluntary, and schoolchildren had the option to withdraw from the study at any point.

Sample Size Calculation

While this study adopts a cross-sectional design, as explained in the Sample Size Calculation section of Study I, the original sample size calculation was performed for the longitudinal study, aiming to assess the intervention's impact on the prevalence of overweight and obesity in the study population.

Procedures and Assessments

Sociodemographic and Socioeconomic Information

Sociodemographic and socioeconomic information was collected from both the schoolchildren and family members. For the schoolchildren, data included the number of individuals residing in the household, household composition (father, mother, siblings, grandparents, among others), shared or individual bedrooms, number of computers and vehicles in the household, and frequency of family vacations. For the parents, data encompassed the number of household members, parents' birthplace, educational level, employment status and occupation, income level, and the family's financial ease or difficulty at the end of each month.

Anthropometric Measurements

Measurements were conducted by proficient members of the research team in accordance with the standardized protocol outlined by the International Society for

the Advancement of Kinanthropometry (ISAK) (104). Body weight was assessed using a precise mechanical scale sensitive to 100 g (SECA Colorata 760, Hamburg, Germany), while height was determined utilizing a portable stadiometer with an accuracy of 0.1 cm (SECA 213, Hamburg, Germany). Body mass index (BMI) was computed by dividing weight in kilograms by the square of height in meters and served as an indicator of overweight or obesity. Based on Cole's established thresholds (105), individuals with a BMI falling between 18.44 and 19.84 were classified as overweight, while those with a BMI between 21.60 and 24.00 were classified as obese. Furthermore, BMI categories were stratified based on age-specific percentiles recommended by the WHO, categorizing schoolchildren between the 50th and 80th percentile as overweight and those above the 85th percentile as obese.

Physical Fitness

Physical fitness of both children and parents was assessed by self-report using the International Physical Fitness Scale (IFIS) (106,107). The IFIS scale is a questionnaire designed to subjectively evaluate the physical fitness of individuals, which replaces the need to use a battery of objective tests. It has been translated into nine languages and evaluates both overall physical condition as well as each one of its primary components specifically: cardiorespiratory fitness, muscular strength, speed-agility and flexibility. Validation studies with both children and adults have demonstrated its reliability (106,107). Although there are separate versions for adults and children, they measure the same constructs.

Physical Activity

Physical activity was recorded by the students through a self-reported questionnaire (108,109). They were asked about the weekly frequency of engaging in physical activity with their parents, as well as the mode of transportation used to go to school, distinguishing between active modes (such as walking, cycling, skateboarding, or non-electric scootering, among others) and passive modes (such as travelling by car, motorcycle, bus, electric scooter, or other passive means of transportation). Other topics related to physical activity were also addressed, including the weekly frequency of participating in extracurricular physical activities, the type of activity, and the time spent in active play with friends. Additionally, to complement the information provided by the students, parents also provided information through a questionnaire (108,109) and by direct observation regarding their children's levels of physical activity. Additional information was gathered on weekly family physical activity, the mode of transportation used to go to school, as well as details about the quantity and type of extracurricular activities in which the children participated, the time spent in active play with friends, among other aspects.

Eating behaviours

The daily/weekly consumption of processed baked products, fried foods, snacks, sugary soft drinks, fruits, vegetables, packaged juices, sandwiches, dairy products, carbohydrates, meats, cold cuts, fish, and vegetables, among others, was recorded through two questionnaires administered to both students (who provided self-reports) and their families (who reported on their children) (108–110). Additionally, the frequency of breakfast consumption before school and the frequency of eating meals outside the home (at fast food outlets or restaurants) were documented using the same questionnaires (108–110).

Screen Time

Screen time was recorded through two questionnaires administered to schoolchildren and their parents (108,109), in order to have the information of the schoolchildren about themselves and that of the parents about their children. Both were asked about the average daily time spent on television (TV), computer, mobile, tablet and video games during the weekdays and on weekends.

Hours of Sleep

Hours of sleep were recorded through a questionnaire administered to parents (108,109), who provided information about their children's daily sleep hours, both from Monday to Friday and on weekends. To assess compliance with the recommendation for healthy behaviours, the cut-off points recommended by the Canadian 24-Hour Movement Guidelines (111) were established.

Lifestyle Behaviours Score

Lifestyle behaviours were assessed based on various variables impacting the behaviours of schoolchildren, encompassing levels of physical activity, sedentary behaviour, dietary patterns, and sleep routines. These factors, combined with self-reported physical fitness, contributed to a composite score reflecting overall lifestyle behaviours. In essence, one variable was selected from each category (eating behaviour, sedentary behaviour, sleep duration, and self-reported physical fitness), followed by summation and recategorization into three lifestyle behaviour categories (good/regular/bad). Thus, schoolchildren with respective scores exhibited healthier/more regular/less healthy lifestyle behaviours and corresponding levels of self-reported physical fitness.

Statistical Analysis

Descriptive statistics were employed to analyse outcome variables, encompassing measures of central tendency, dispersion, and 95% Confidence Intervals (CI), alongside frequency analysis to determine percentages and prevalence of categorical variables. Data were presented as mean \pm standard deviation, unless

otherwise specified. Log-transformation was applied to outcome variables to achieve normal distribution. Association between self-reported physical fitness, breakfast consumption, screen time, and sleep duration with body weight status was assessed using ANOVA. To explore the impact of lifestyle behaviours and self-reported physical fitness on schoolchildren's body weight status, lifestyle behaviours score was computed. ANOVA was conducted to evaluate the association between the composite score and body weight status. Logistic regression was then employed to analyse the influence of the composite score on body weight status. Statistical analyses were conducted using IBM SPSS Statistics (version 24.0) with a significance level set at 0.05.



**Study III: Effectiveness of a School-Based
Multimodal Intervention on Promoting Healthy
Lifestyle Behaviours Among Schoolchildren.
Previene-Cádiz Study.**

Study III: Effectiveness of a School-Based Multimodal Intervention on Promoting Healthy Lifestyle Behaviours Among Schoolchildren. Previene-Cádiz Study.

Although the Study Design and Participants, Sample Size Calculation, and the PREVIENE-CÁDIZ intervention have been previously detailed in the Materials and Methods section of Study I, they are also summarised graphically in **Figure 5**.

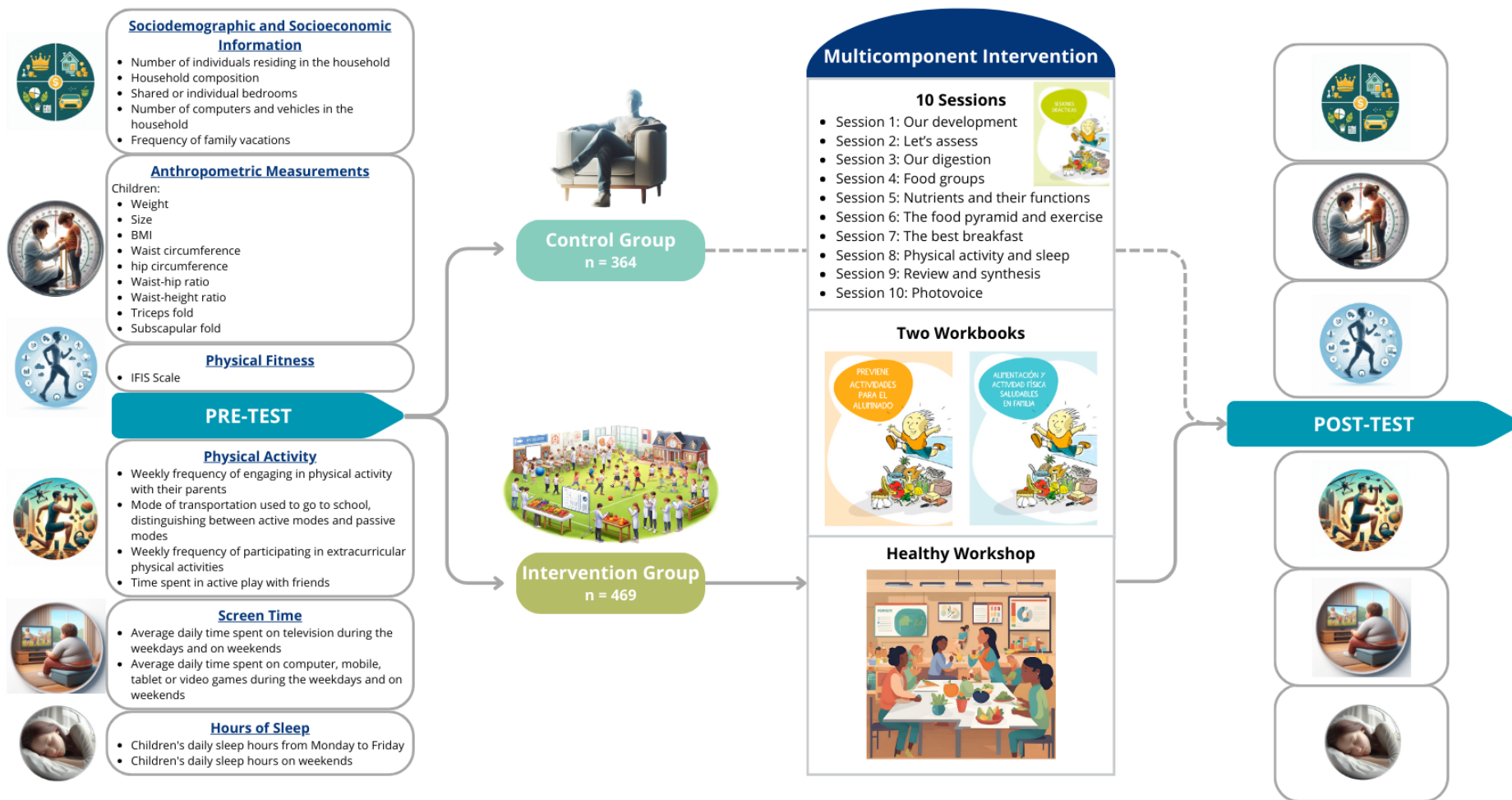


Figure 5. Methodological framework of the PREVIENE-CÁDIZ study.

Procedures and Assessments

The procedure for collecting sociodemographic and socioeconomic information, anthropometric measurements, physical fitness, physical activity, eating behaviours, screen time, hours of sleep, and lifestyle behaviours score was previously described in the Procedures and Assessments section of Study II. It's important to highlight that, as a longitudinal study comparing pre- and post-intervention data, analyses were performed on both datasets collected before and after the intervention. Additionally, it's noteworthy that the procedure for collecting information remained consistent both before and after the intervention. In terms of eating behaviours assessment, as a novel aspect regarding cross-sectional analysis, a comparative analysis between groups was conducted by creating an index comprising five questions related to knowledge and beliefs about food. This resulted in a scale ranging from 0 to 6, where 0 represents no knowledge and 6 represents excellent knowledge.

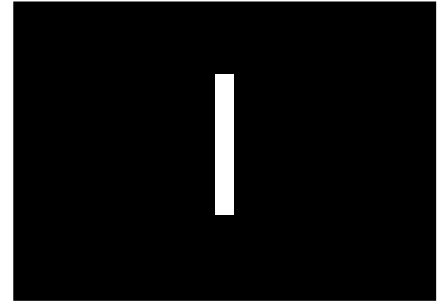
Statistical Analysis

A descriptive analysis of outcome variables was conducted, including measures of central tendency, dispersion, and 95% CI. Frequency analysis was performed to obtain percentages and prevalence of categorical variables. Data are presented as mean \pm standard deviation unless otherwise specified. Normality of study variables was assessed, and as none met the normality criterion, non-parametric analyses were conducted. Two analyses were conducted to compare groups before and after the intervention. Firstly, the Mann-Whitney U test was used for numerical variables, and secondly, the delta of study variables was calculated, and a differences-in-differences analysis was performed. Numerical delta variables were analysed using the Mann-Whitney U test, and categorical delta variables were analysed using the chi-square test. Statistical analyses were conducted using IBM SPSS Statistics software (version 24.0), with a significance level set at 0.05.

RESULTS

RESULTS

The results of the individual studies included in this International Doctoral Thesis are presented underneath.

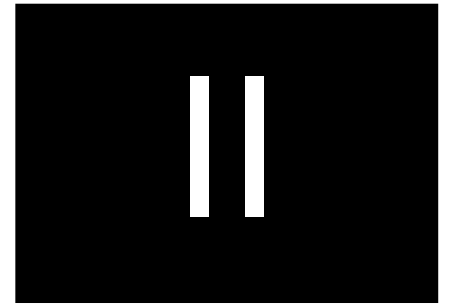


**STUDY I: A Multimodal Intervention for Prevention of
Overweight and Obesity in Schoolchildren. A
Protocol Study “PREVIENE-CÁDIZ”**

Study I: A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ”

The methodology, procedures, and tools used in the design of a viable and feasible multimodal intervention were described, encompassing various relevant dimensions including sociocultural, behavioural, and environmental factors. The objective of the intervention was to improve the lifestyle of 8 to 9-year-old third-grade primary school students in the province of Cádiz, thereby preventing the development of childhood obesity.

Annex I includes the full manuscript of Study I as published, detailing an exhaustive description of the methodology.



**STUDY II: Independent and Combined Association
of Lifestyle Behaviours and Physical Fitness with
Body Weight Status in Schoolchildren. Previene-
Cádiz.**

Study II: Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. Previene-Cádiz.

Baseline characteristics

Among the 864 participants, detailed in **Table 3**, 47.7% were girls. Regarding weight status, 35.2% were classified as overweight, with 12.9% classified as obese and 3.9% as severely obese. Additionally, 25% had a BMI equal to or greater than the 97th percentile for their age and sex. The mean age of the participants was 8.42 ± 0.34 years.

Table 3. Descriptive characteristics of schoolchildren by sex.

Variable	Total sample n=864	Male n=452	Female n=412
Physical characteristics			
	Mean (SD) or Percentage		
Age (years)	8.42 ± 0.34	8.43 ± 0.35	8.42 ± 0.33
Weight (kg)	31.33 ± 7.62	31.92 ± 8.13	30.77 ± 7.07
Height (cm)	130.68 ± 5.99	131.53 ± 6.12	129.88 ± 5.75 **
BMI (kg/m ²)	18.17 ± 3.44	18.27 ± 3.55	18.08 ± 3.44
BMI Status (%) (UW/NW/OW/Ob)	5 / 60 / 22 / 13	4 / 62 / 20 / 14	7 / 56 / 24 / 13
Self-reported physical fitness			
General physical fitness (%) (B/A/G/VG)	2 / 15 / 37 / 46	2 / 16 / 33 / 49	2 / 14 / 41 / 43
Cardiorespiratory fitness (%) (B/A/G/VG)	7 / 21 / 33 / 39	6 / 20 / 30 / 44	7 / 22 / 37 / 34 *
Muscular strength (%) (B/A/G/VG)	3 / 19 / 33 / 45	4 / 20 / 25 / 51	3 / 17 / 41 / 39 †
Speed/Agility (%) (B/A/G/VG)	4 / 15 / 30 / 51	3 / 12 / 31 / 54	5 / 18 / 29 / 48
Flexibility (%) (B/A/G/VG)	14 / 24 / 25 / 37	20 / 28 / 25 / 27	7 / 20 / 25 / 48 †
Feeding (children reported)			
Breakfast (%) (Yes/No)	91 / 9	89 / 11	92 / 8
To eat in a restaurant (%) (A/MT/S/N)	2 / 28 / 64 / 6	3 / 30 / 61 / 6	2 / 25 / 67 / 6
Feeding (parents reported)			
Breakfast (%) (A/MT/S/N)	86 / 6 / 5 / 3	87 / 6 / 5 / 2	85 / 6 / 6 / 3
To eat in a restaurant (%) (N/S/MT/AI)	30 / 67 / 2 / 1	29 / 69 / 2 / 0	30 / 67 / 2 / 1
Screen time (children reported)			
TV and VGs weekdays (%) (<2h/2-4h/>4h)	61 / 23 / 16	55 / 25 / 20	67 / 21 / 12 **
TV and VGs weekends (%) (<2h/2-4h/>4h)	46 / 28 / 26	38 / 30 / 32	54 / 26 / 20 †
PC and MP weekdays (%) (<2h/2-4h/>4h)	72 / 17 / 11	68 / 18 / 14	76 / 17 / 7 **
PC and MP weekends (%) (<2h/2-4h/>4h)	60 / 21 / 19	54 / 23 / 23	67 / 19 / 14 †
Screen time (parents reported)			
TV weekdays (%) (<2h/2-4h/>4h)	89 / 10 / 1	87 / 11 / 2	91 / 8 / 1
TV weekends (%) (<2h/2-4h/>4h)	64 / 33 / 3	63 / 34 / 3	64 / 33 / 3
VGs weekdays (%) (<2h/2-4h/>4h)	97 / 2 / 1	95 / 4 / 1	98 / 1 / 1 **
VGs weekends (%) (<2h/2-4h/>4h)	85 / 13 / 2	78 / 17 / 5	90 / 8 / 2 †
PC and MP weekdays (%) (<2h/2-4h/>4h)	97 / 2 / 1	98 / 1 / 1	96 / 3 / 1
PC and MP weekends (%) (<2h/2-4h/>4h)	86 / 12 / 2	85 / 13 / 2	87 / 11 / 2

Hours of sleep

Weekdays (h/day)	10.00 ± 0.55	10.05 ± 0.52	9.96 ± 0.58 *
Weekends (h/day)	10.38 ± 0.89	10.33 ± 0.95	10.43 ± 0.83
Weekdays (%) (<9h/9-12h/>12h)	2 / 98 / 0	1 / 99 / 0	2 / 98 / 0
Weekends (%) (<9h/9-12h/>12h)	2 / 96 / 2	2 / 96 / 2	2 / 96 / 2

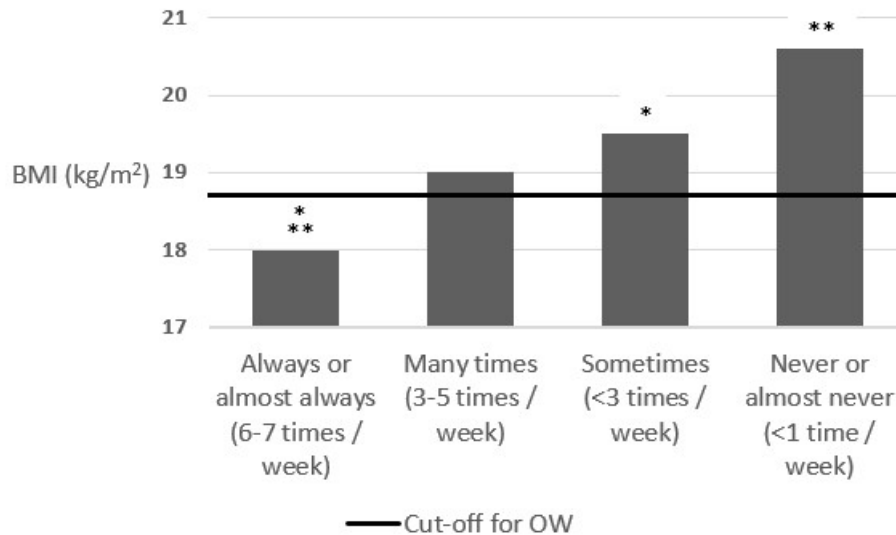
Parent 's educational level

Father 's educational level (%) (PE/SE/HS)	9 / 65 / 26	7 / 68 / 25	10 / 63 / 27
Mother 's educational level (%) (PE/SE/HS)	7 / 61 / 32	6 / 61 / 33	9 / 60 / 31

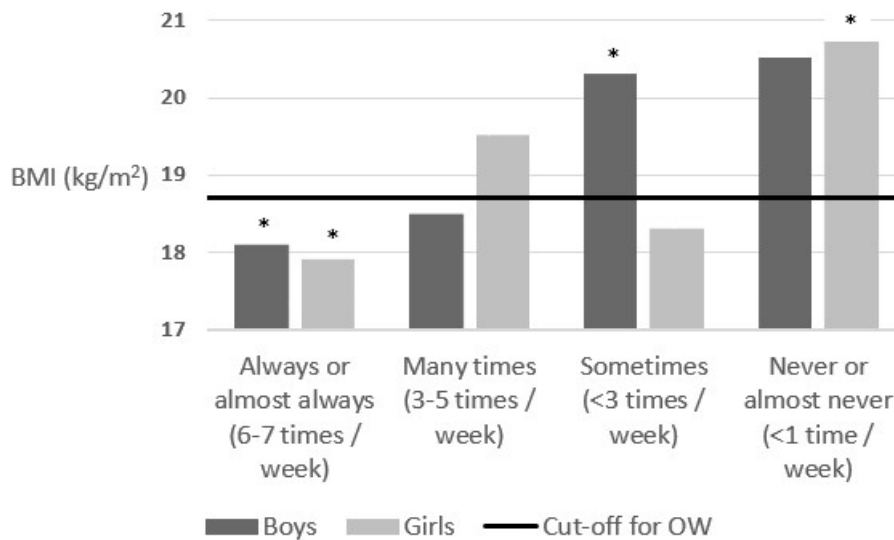
Values are presented as mean ± standard deviation or percentages. T-test and χ^2 square statistics was applied. Abbreviations: A, acceptable; Al, always; B, bad; BMI, body mass index; G, good; HS, higher studies; MP, mobile phone; MT, many times; N, never; NW, normal weight; Ob, obesity; OW, overweight; PC, personal computer; PE, primary education; SE, secondary education; S, sometimes; UN, underweight; VG, very good; VGs, video games. * p-value < 0.05, ** p-value < 0.01 and † p-value < 0.001.

Independent associations of lifestyle behaviours

A positive association was found between breakfast frequency and body weight status. As can be seen in the **Figure 6**, schoolchildren who had breakfast more regularly had a better body weight status than those who skip breakfast or had breakfast less frequently. The schoolchildren who had breakfast always or almost always (6 or 7 days a week)/many times (3 to 5 times a week)/sometimes (less than 3 times a week)/never or almost never (once a week or less), had a mean BMI of 18, 19, 19.5 and 20.6 respectively $F = 7.5$ (3) $p < 0.001$. The same happened when separating by sex. Boys who had breakfast always or almost always (6 or 7 days a week)/many times (3 to 5 times a week)/sometimes (less than 3 times a week)/never or almost never (once a week or less), had a mean BMI of 18.1, 18.5, 20.3 and 20.5 respectively $F = 4.1$ (3) $p = 0.007$. Same for girls: those who had breakfast always or almost always (6 or 7 days a week)/many times (3 to 5 times a week)/sometimes (less than 3 times a week)/never or almost never (once a week or less), had a mean BMI of 17.9, 19.5, 18.3 and 20.7 respectively $F = 4.4$ (3) $p = 0.004$.



(a)



(b)

Figure 6. (a) Association between breakfast frequency and body weight status (parent´s reported); (b) Association between breakfast frequency and body weight status (parent´s reported) segmenting by sex. The cut-off for Overweight (OW) line indicates the beginning of the OW category according to Cole´s cut-off points (105). * p-value < 0.05 and ** p-value < 0.01.

There was also an association between screen time and body weight status. As shown in **Figure 7**, schoolchildren who spent less than 2 hours/between 2 and 4 hours/more than 4 hours a day in front of TV on weekends, had a mean BMI of 17.8, 18.7 and 19.3 respectively $F = 6.7$ (2) $p = 0.001$. When separated by sex, in the case of boys, the differences were statistically significant $F = 7.1$ (2) $p = 0.001$. Boys who spent less than 2 hours/between 2 and 4 hours/more than 4 hours a day in front of TV on weekends, had a mean BMI of 17.8, 18.9 and 20.5 respectively. However, the results were not statistically significant for the girls. Those who spent less than 2

hours/between 2 and 4 hours/more than 4 hours a day in front of TV on weekends, had a mean BMI of 17.8, 18.4 and 18.2 respectively $F = 1.2 (2) p = 0.296$.

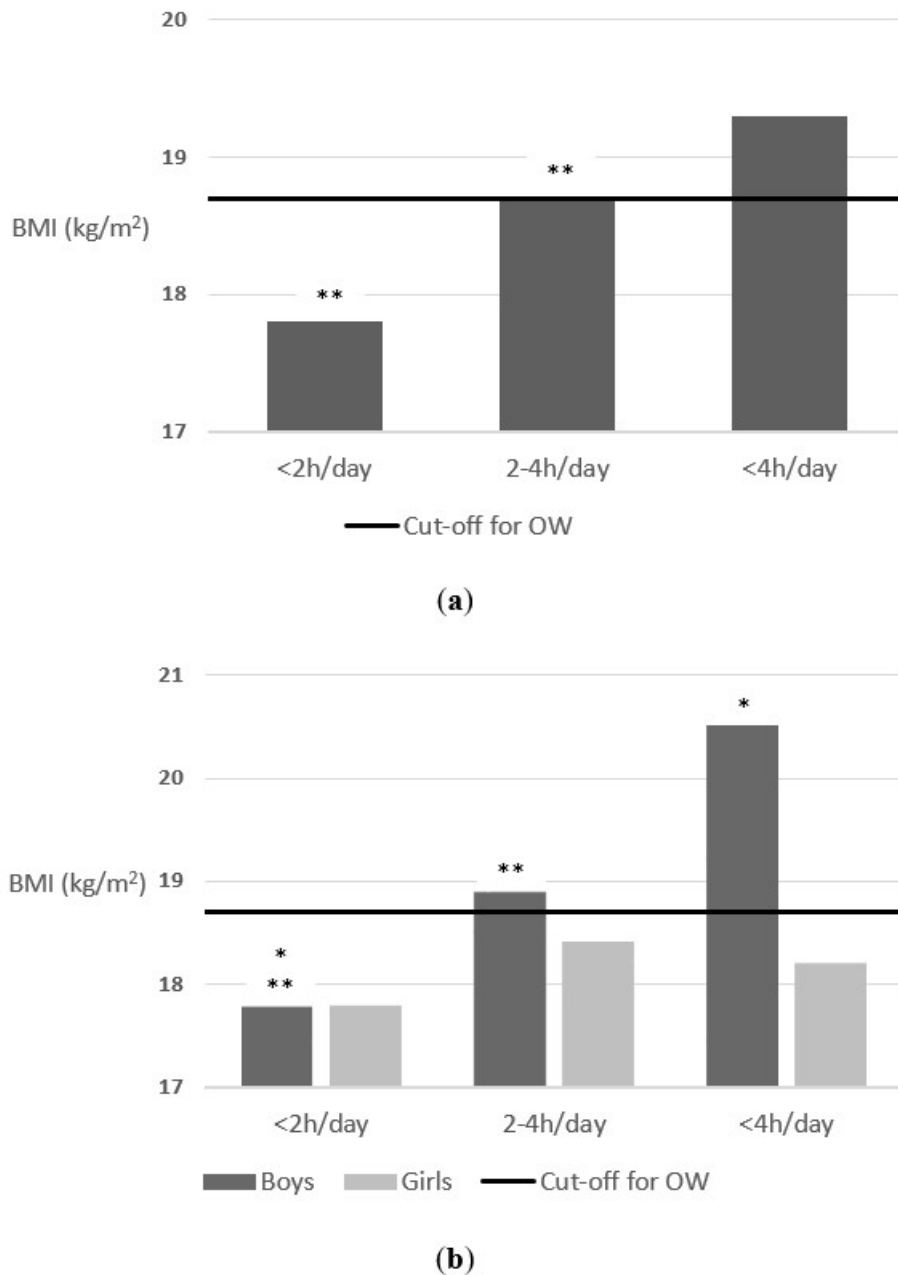


Figure 7. (a) Association between time in front of TV on weekends a day and body weight status (parents reported); (b) Association between time in front of TV on weekends a day and body weight status (parents reported) segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole’s cut-off points (105). * p-value < 0.05 and ** p-value < 0.01.

Finally, a positive association was also found between sleep time and body weight status. As can be seen in **Figure 8**, schoolchildren who slept less than 9 hours/between 9 and 11/more than 11 hours a day on weekends, had a mean BMI of 20.4, 18.2 and 18.1 respectively $F = 3.2 (2) p = 0.041$. However, although the

results followed the same trend, no significant results were found when segmented by sex. Boys who slept less than 9 hours/between 9 and 11/more than 11 hours a day on weekends, had a mean BMI of 21, 18.3 and 17.7 respectively $F = 2.9 (2) p = 0.054$. And girls who slept less than 9 hours/between 9 and 11/more than 11 hours a day on weekends, had a mean BMI of 19.8, 18 and 18.3 respectively $F = 1.2 (2) p = 0.300$.

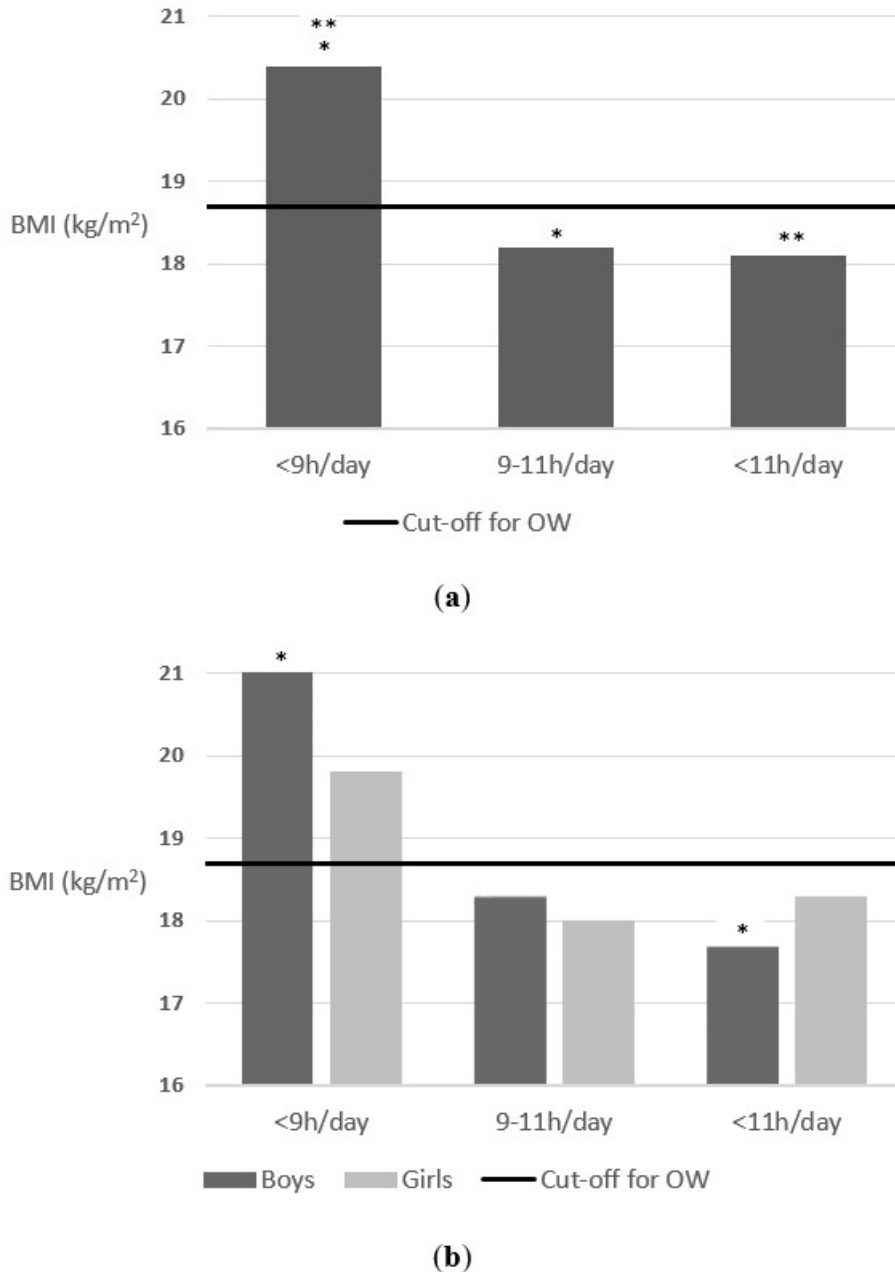
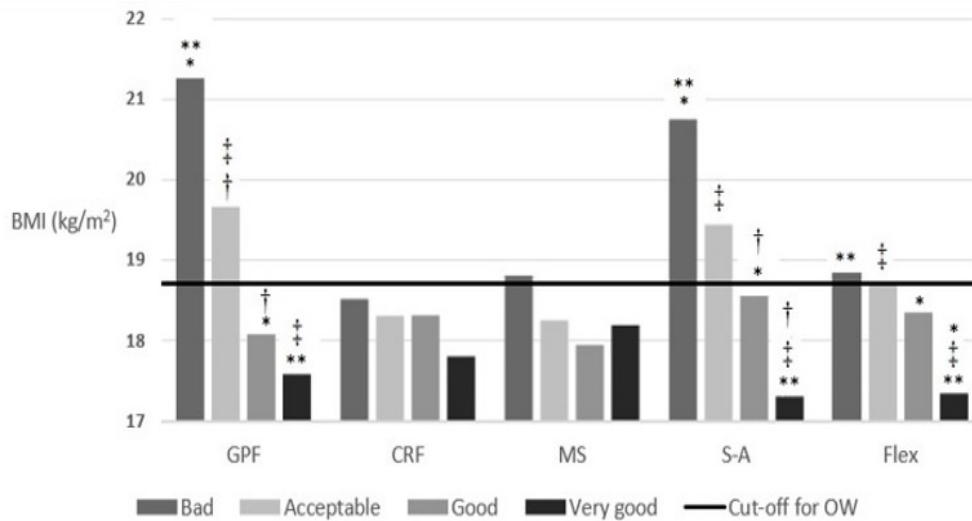


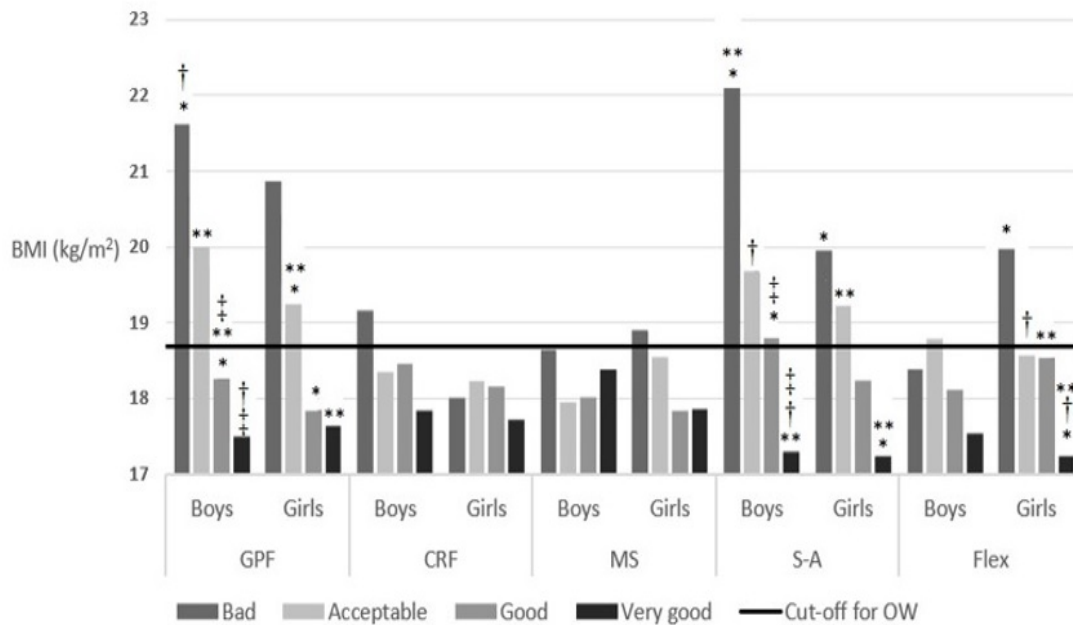
Figure 8. (a) Association between hours of sleep a day on weekends and body weight status (parent´s reported); (b) Association between hours of sleep a day on weekends and body weight status (parent´s reported) segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole´s cut-off points (105). * p-value < 0.05 and ** p-value < 0.05.

Independent associations of self-reported physical fitness

There was a positive association between several of the self-reported physical fitness and body weight status. As shown in **Figure 9**, the higher the self-reported physical fitness, the better the body weight status of schoolchildren. In the case of general physical fitness, it was observed that the schoolchildren who answered that they had a very good/good/acceptable/bad general physical fitness had a mean BMI of 17.5, 18.04, 19.6 and 21.2, respectively $F = 15.2 (3) p < 0.001$. The answers regarding cardiorespiratory fitness and muscular strength followed the same trend, although the difference was not significant $F = 1.5 (3) p = 0.21$ and $F = 0.6 (3) p = 0.61$, respectively. However, the difference in the mean BMI across the answer categories of speed-agility were significant $F = 22.5 (3) p < 0.001$ ranging from 17.3 to 20.8. The schoolchildren who answered that they had a very good/good/acceptable/bad speed-agility had a mean BMI of 17.3, 18.5, 19.4 and 20.8, respectively. Regarding flexibility, significant differences were also found with respect to BMI. The schoolchildren who answered that they had a very good/good/acceptable/bad flexibility had a mean BMI of 17.4, 18.3, 18.7 and 18.8, respectively $F = 8.2 (3) p < 0.001$. The same happened when it was segmented by sex (general physical fitness, $F = 10.7 (3) p < 0.001$; cardiorespiratory fitness, $F = 1.3 (3) p = 0.26$; muscular strength, $F = 0.4 (3) p = 0.71$; speed-agility, $F = 14.7 (3) p < 0.001$; flexibility, $F = 2.4 (3) p = 0.07$ for boys, and general physical fitness, $F = 5.03 (3) p = 0.002$; cardiorespiratory fitness, $F = 0.5 (3) p = 0.69$; muscular strength, $F = 1.04 (3) p = 0.37$; speed-agility, $F = 8.8 (3) p < 0.001$; flexibility, $F = 8.1 (3) p < 0.001$ for girls).



(a)



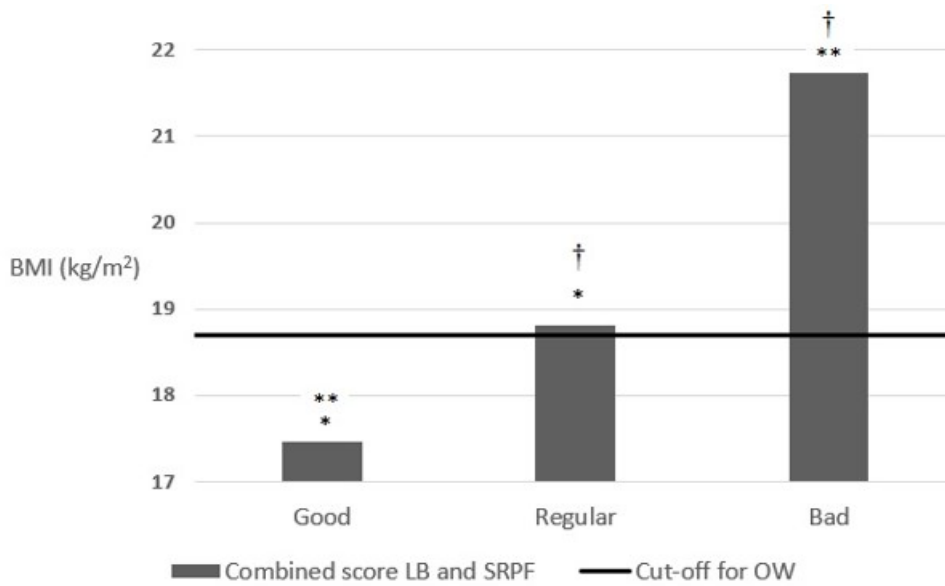
(b)

Figure 9. (a) Association between self-reported physical fitness and body weight status (children reported); (b) Association between self-reported physical fitness and body weight status (children reported) segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole's cut-off points (105). * p-value < 0.05, ** p-value < 0.05, † p-value < 0.05 and ‡ p-value < 0.05. Abbreviations: CRF, cardiorespiratory fitness; Flex, flexibility; GPF, general physical fitness; MS, muscular strength; S-A, speed-agility.

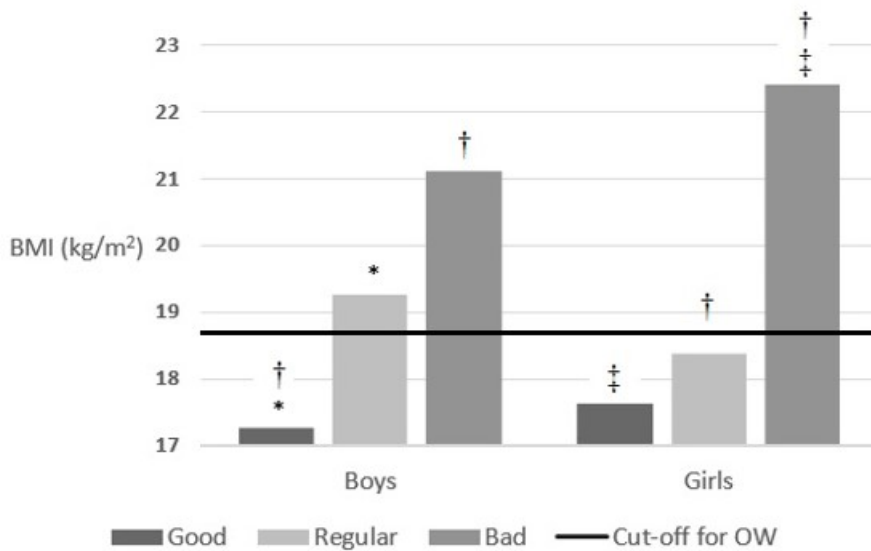
Combined associations of lifestyle behaviours and self-reported physical fitness

Once these results were obtained, in order to verify the influence of lifestyles behaviours and physical fitness on body weight status of schoolchildren, a combined score of lifestyle behaviours and self-reported physical fitness was calculated. For this, a variable was selected from each category (feeding, sedentary behaviour, sleep time and self-reported physical fitness). Then a summation of variables was performed, and finally, the outcome variable was re-categorized into three categories according to the lifestyles behaviours that the schoolchildren follow (good/regular/bad lifestyle behaviours). This means that the schoolchildren who had a good/regular/bad score, had healthier/regular health/less healthy lifestyle behaviours and good/regular/bad self-reported physical fitness.

Effectively, as shown in **Figure 10**, schoolchildren who followed healthier lifestyle behaviours and presented good values of physical fitness had a better body weight status. Schoolchildren who presented a good/regular/bad score in the combined score of lifestyle behaviours and physical fitness had a mean BMI of 17.4, 18.8 and 21.7 respectively $F = 18.1 (2) p < 0.001$. The same happened when it was segmented by sex. Boys who presented a good/regular/bad score in the combined score of lifestyle behaviours and physical fitness had a mean BMI of 17.2, 19.2 and 21.1 respectively $F = 14.5 (2) p < 0.001$. And girls who presented a good/regular/bad score in the combined score of lifestyle behaviours and physical fitness had a mean BMI of 17.6, 18.3 and 22.4 respectively $F = 6.3 (2) p = 0.002$.



(a)

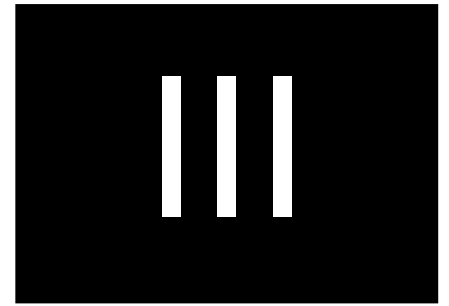


(b)

Figure 10. (a) Association between the combined score of lifestyle behaviours and self-reported physical fitness on body weight status; (b) Association between the combined score of lifestyle behaviours and self-reported physical fitness on body weight status segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole’s cut-off points (105). * p-value < 0.001, ** p-value < 0.001, ‡ p-value < 0.01 and † p-value < 0.05. Abbreviations: LB, lifestyles behaviours; SRPF, self-reported physical fitness.

After realising the logistic regression, it was observed that the schoolchildren who had a regular lifestyle behaviours and regular physical fitness (a regular punctuation on the combined score) had a 2.015 times higher risk of being overweight or obese than those who followed a healthy lifestyle behaviour and had a good physical fitness (had a good punctuation on the combined score) ($p < 0.001$). And

schoolchildren who had a bad lifestyle behaviours and bad physical fitness (a bad punctuation on the combined score) had a 10.34 times higher risk of being overweight or obese than those who followed a healthy lifestyle behaviour and had a good physical fitness (had a good punctuation on the combined score) ($p = 0.004$).



**Study III: Effectiveness of a School-Based
Multimodal Intervention on Promoting Healthy
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Previene-Cádiz Study.**

Study III: Effectiveness of a School-Based Multimodal Intervention on Promoting Healthy Lifestyle Behaviours Among Schoolchildren. Previene-Cádiz Study.

Overview of Descriptive Characteristics in Pre- and Post-Intervention Analysis

A comprehensive overview of the descriptive characteristics of the schoolchildren before and after the intervention, differentiating by control and experimental groups, is provided in **Table 4**. Additionally, the table includes the delta variables, showing the results of the difference-in-differences analysis. This table encapsulates an overview of study results.

Table 4. Descriptive characteristics of the schoolchildren pre-intervention, post-intervention and delta by groups.

Variable	Total Sample			Control Group			Intervention Group			p-value*		
	Pre n=864	Post n=833	Delta n=833	Pre n=364	Post n=364	Delta n=364	Pre n=469	Post n=469	Delta n=469	Pre	Post	Delta
Physical characteristics												
	Mean (SD) or Percentage											
Age (years)	8.43 ± 0.35	8.85 ± 0.35	0.42 ± 0.06	8.43 ± 0.36	8.81 ± 0.36	0.38 ± 0.05	8.43 ± 0.34	8.88 ± 0.34	0.45 ± 0.04	0.570	<0.001	<0.001
Weight (kg)	31.48 ± 7.72	32.92 ± 8.39	1.49 ± 1.72	31.44 ± 7.49	32.97 ± 8.00	1.51 ± 1.68	31.51 ± 7.89	32.88 ± 8.69	1.47 ± 1.75	0.790	0.474	0.454
Height (cm)	130.68 ± 6.03	132.73 ± 6.38	2.07 ± 1.81	131.06 ± 5.82	132.97 ± 6.09	1.92 ± 2.13	130.38 ± 6.19	132.54 ± 6.60	2.18 ± 1.51	0.094	0.307	<0.001
Body mass index (kg/m ²)	18.28 ± 3.40	18.51 ± 3.56	0.26 ± 0.95	18.16 ± 3.31	18.48 ± 3.42	0.32 ± 0.92	18.37 ± 3.47	18.52 ± 3.67	0.21 ± 0.98	0.476	0.941	0.048
Body mass index status (%) (UW/NW/OW/Ob) ^y	5 / 60 / 22 / 13	6 / 56 / 24 / 14	NA	5 / 57 / 24 / 14	6 / 56 / 24 / 15	NA	5 / 58 / 23 / 14	6 / 56 / 24 / 13	NA	0.994	0.969	NA
Triceps skinfold (mm)	14.67 ± 6.20	14.96 ± 6.30	0.37 ± 2.35	14.65 ± 6.21	14.92 ± 6.27	0.28 ± 2.22	14.68 ± 6.20	14.98 ± 6.32	0.44 ± 2.45	0.934	0.948	0.314
Subscapular skinfold (mm)	10.40 ± 7.12	10.69 ± 7.74	0.42 ± 2.45	10.28 ± 6.64	10.52 ± 7.28	0.27 ± 2.39	10.50 ± 7.48	10.83 ± 8.09	0.54 ± 2.48	0.334	0.870	0.036
Waist circumference (cm)	63.32 ± 9.58	63.82 ± 10.17	0.62 ± 3.24	63.28 ± 9.52	64.44 ± 10.15	1.16 ± 3.29	63.36 ± 9.63	63.33 ± 10.16	0.20 ± 3.14	0.988	0.052	<0.001
Hip circumference (cm)	72.14 ± 8.09	73.68 ± 8.35	1.62 ± 2.44	72.42 ± 7.89	73.63 ± 8.12	1.21 ± 2.56	71.92 ± 8.24	73.72 ± 8.52	1.94 ± 2.29	0.216	0.865	<0.001
Waist to hip ratio	0.87 ± 0.05	0.86 ± 0.06	-0.01 ± 0.04	0.87 ± 0.06	0.87 ± 0.07	0.0007 ± 0.42	0.88 ± 0.05	0.86 ± 0.06	-0.02 ± 0.04	0.063	<0.001	<0.001
Waist to height ratio	0.48 ± 0.06	0.48 ± 0.07	-0.003 ± 0.02	0.48 ± 0.06	0.48 ± 0.07	0.002 ± 0.03	0.48 ± 0.06	0.48 ± 0.06	-0.006 ± 0.02	0.479	0.145	<0.001
Self reported physical fitness (children reported)												
General physical fitness (%) (B/A/G/VG)	2 / 15 / 37 / 46	3 / 13 / 32 / 53	NA	3 / 16 / 37 / 45	3 / 13 / 34 / 50	NA	1 / 15 / 38 / 46	3 / 12 / 30 / 55	NA	0.422	0.481	NA
Cardiorespiratory fitness (%) (B/A/G/VG)	7 / 21 / 33 / 39	9 / 18 / 28 / 46	NA	7 / 19 / 32 / 42	9 / 16 / 29 / 45	NA	6 / 23 / 33 / 37	8 / 19 / 26 / 47	NA	0.548	0.671	NA
Muscular strength (%) (B/A/G/VG)	3 / 19 / 33 / 45	4 / 16 / 31 / 49	NA	4 / 17 / 33 / 47	5 / 14 / 31 / 50	NA	3 / 21 / 32 / 44	4 / 17 / 30 / 49	NA	0.581	0.569	NA
Speed/Agility (%) (B/A/G/VG)	4 / 15 / 30 / 51	3 / 13 / 29 / 54	NA	3 / 18 / 30 / 49	3 / 12 / 32 / 53	NA	5 / 13 / 30 / 52	3 / 14 / 26 / 56	NA	0.175	0.328	NA
Flexibility (%) (B/A/G/VG)	14 / 24 / 25 / 37	19 / 24 / 23 / 34	NA	12 / 25 / 24 / 38	18 / 23 / 24 / 35	NA	14 / 24 / 26 / 36	19 / 24 / 22 / 34	NA	0.812	0.878	NA
Physical activity (children reported)												
Weekly family physical activity days	2.27 ± 2.05	2.37 ± 2.03	0.11 ± 2.37	2.32 ± 2.09	2.14 ± 1.93	-0.20 ± 2.26	2.23 ± 2.01	2.55 ± 2.09	0.35 ± 2.43	0.673	0.004	0.002
School transportation mode (%) (AD/PD)	40 / 60	42 / 58	NA	51 / 49	47 / 53	NA	37 / 63	41 / 59	NA	0.255	0.009	NA
Eating behaviours (children reported)												
Feeding beliefs and knowledge index (%) (Nk/Lk/Sk/Gk/VGk/Ek)	4 / 15 / 28 / 34 / 17 / 2	3 / 11 / 28 / 35 / 20 / 3	NA	4 / 10 / 27 / 36 / 21 / 2	4 / 11 / 27 / 36 / 18 / 3	NA	4 / 18 / 29 / 32 / 15 / 3	3 / 11 / 28 / 34 / 22 / 3	NA	0.023	0.843	NA
Breakfast (%) (Yes/No)	91 / 9	92 / 8	NA	91 / 9	93 / 7	NA	91 / 9	91 / 9	NA	0.878	0.269	NA
Fast food consumption (%) (Al/MT/S/N)	2 / 28 / 64 / 6	1 / 23 / 67 / 10	NA	2 / 26 / 65 / 7	1 / 22 / 67 / 9	NA	2 / 29 / 63 / 6	1 / 23 / 66 / 10	NA	0.266	0.044	NA
Screen time (children reported)												
TV and VG weekdays (%) (<2h/2-4h/>4h)	61 / 23 / 16	70 / 21 / 9	NA	61 / 22 / 17	69 / 22 / 9	NA	60 / 24 / 16	70 / 21 / 9	NA	0.891	0.842	NA
TV and VG weekends (%) (<2h/2-4h/>4h)	46 / 28 / 26	49 / 31 / 20	NA	46 / 29 / 25	52 / 29 / 19	NA	45 / 27 / 28	46 / 33 / 21	NA	0.727	0.238	NA
PC and MP weekdays (%) (<2h/2-4h/>4h)	72 / 17 / 11	75 / 16 / 9	NA	71 / 19 / 10	75 / 18 / 8	NA	71 / 16 / 12	76 / 14 / 10	NA	0.439	0.276	NA
PC and MP weekends (%) (<2h/2-4h/>4h)	60 / 21 / 19	60 / 25 / 15	NA	61 / 24 / 15	64 / 22 / 14	NA	59 / 20 / 21	57 / 27 / 15	NA	0.061	0.124	NA
Screen time (parents reported)												
TV weekdays (%) (<2h/2-4h/>4h)	89 / 10 / 1	89 / 10 / 1	NA	89 / 9 / 2	89 / 9 / 1	NA	88 / 11 / 1	88 / 11 / 1	NA	0.628	0.820	NA
TV weekends (%) (<2h/2-4h/>4h)	64 / 33 / 3	66 / 30 / 5	NA	65 / 31 / 4	62 / 33 / 5	NA	62 / 35 / 3	68 / 27 / 4	NA	0.436	0.228	NA
Vg weekdays (%) (<2h/2-4h/>4h)	97 / 2 / 1	96 / 3 / 0	NA	97 / 2 / 0	96 / 3 / 0	NA	97 / 2 / 1	96 / 3 / 0	NA	0.870	0.984	NA
Vg weekends (%) (<2h/2-4h/>4h)	85 / 13 / 2	85 / 14 / 1	NA	87 / 10 / 2	88 / 11 / 1	NA	83 / 14 / 2	83 / 16 / 1	NA	0.259	0.127	NA
PC and MP weekdays (%) (<2h/2-4h/>4h)	97 / 2 / 1	97 / 3 / 0	NA	96 / 3 / 1	97 / 2 / 1	NA	98 / 2 / 0	97 / 3 / 0	NA	0.364	0.254	NA
PC and MP weekends (%) (<2h/2-4h/>4h)	86 / 12 / 2	85 / 13 / 2	NA	86 / 12 / 2	85 / 14 / 2	NA	86 / 12 / 2	85 / 13 / 2	NA	0.910	0.782	NA
Hours of sleep												
Weekdays (h/day)	10.01 ± 0.57	10.01 ± 0.57	0.011 ± 0.71	10.04 ± 0.58	10.03 ± 0.56	0.002 ± 0.76	9.98 ± 0.57	10.00 ± 0.55	0.02 ± 0.67	0.273	0.495	0.682

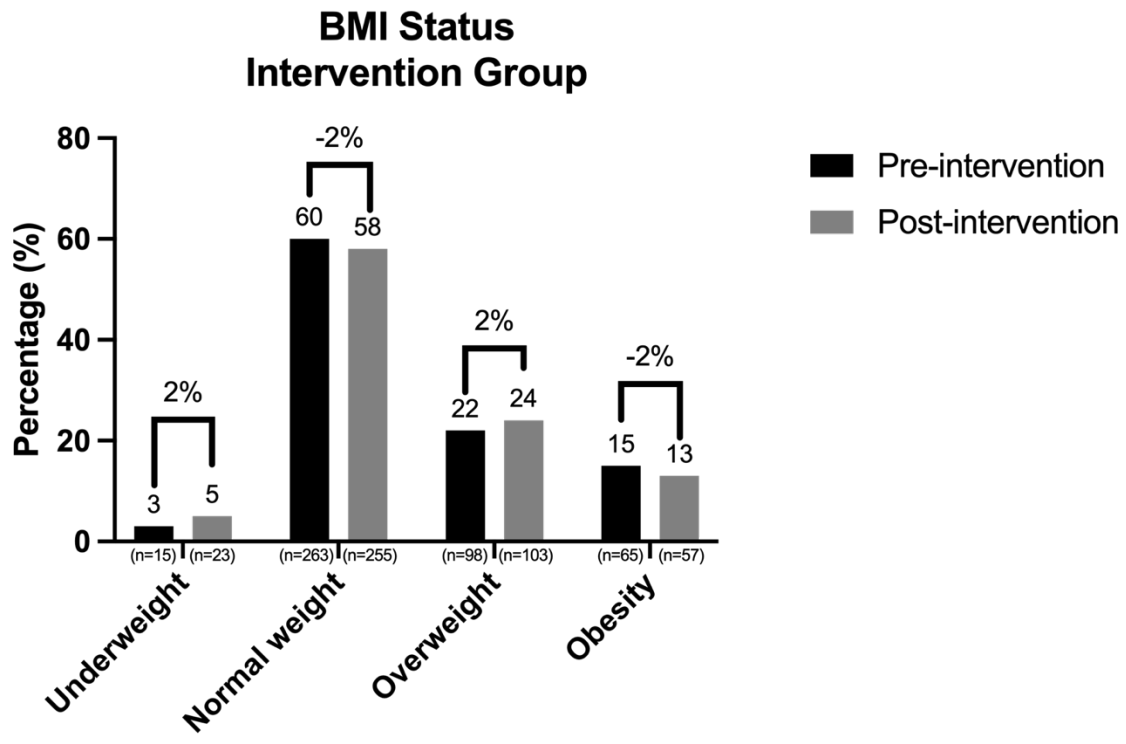
Weekends (h/day)	10.40 ± 0.91	10.40 ± 0.90	-0.008 ± 1.16	10.51 ± 0.97	10.47 ± 0.93	-0.05 ± 1.35	10.30 ± 0.85	10.32 ± 0.85	0.02 ± 0.98	0.055	0.147	0.377
Weekdays (%) (<9h/9–11h/>11h)	2 / 98 / 0	8 / 85 / 7	NA	8 / 90 / 2	8 / 85 / 7	NA	8 / 91 / 1	8 / 85 / 6	NA	0.158	0.932	NA
Weekends (%) (<9h/9–11h/>11h)	2 / 96 / 2	8 / 59 / 32	NA	7 / 76 / 17	7 / 58 / 35	NA	10 / 77 / 13	9 / 60 / 31	NA	0.277	0.369	NA
Parent 's educational level												
Father 's educational level (%) (PS/SS/HS)	9 / 65 / 26	9 / 65 / 26	NA	8 / 66 / 25	10 / 65 / 25	NA	8 / 64 / 28	8 / 64 / 28	NA	0.810	0.443	NA
Mother 's educational level (%) (PS/SS/HS)	7 / 61 / 32	7 / 60 / 33	NA	7 / 61 / 32	8 / 59 / 33	NA	7 / 60 / 33	7 / 60 / 33	NA	0.953	0.808	NA
Lifestyle behaviour score												
Lifestyle behaviours score (%) (G/R/B)	48 / 49 / 3	50 / 49 / 1	NA	50 / 49 / 1	47 / 51 / 2	NA	48 / 49 / 3	53 / 47 / 0	NA	0.345	0.368	NA

Values are presented as mean ± standard deviation or percentages. Mann Whitney U tests and χ^2 square statistics was applied. Statistically significant differences between groups are highlighted in bold. Abbreviations: A, acceptable; AD, active displacement; Al, always; B, bad; BMI, body mass index; Cm, centimetres; Ek, excellent knowledge; G, good; Gk, good knowledge; h/day, hours per day; HS, higher studies; Kg, kilograms; kg/m^2 , kilogram per square meter; Lk, little knowledge; Mm, millimetres; MP, mobile phone; MT, many times; N, never; NA, not applicable; Nk, no knowledge; NW, normal weight; Ob, obesity; OW, overweight; PC, personal computer; PD, passive displacement; PS, primary studies; R, regular; S, sometimes; SD, standard deviation; Sk, some knowledge; SS, secondary studies; ST, something; TV, television; UW, underweight; VG, very good; Vg, video games; VGk, very good knowledge; <2h, less than two hours; 2–4h, between two and four hours; >4h, more than four hours; <9h, less than nine hours; 9–11h, between nine and eleven hours; >11h, more than eleven hours). * p-value for differences between control and intervention.

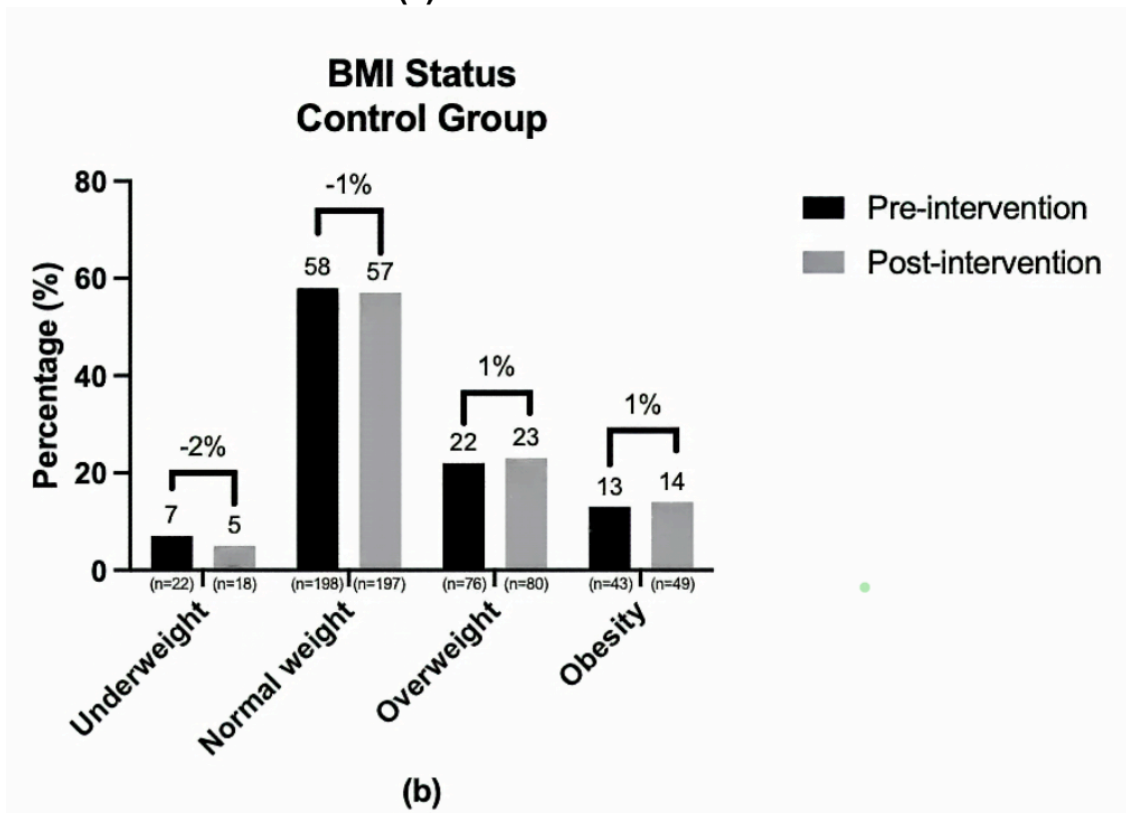
Changes in Body Composition

BMI Distribution Across Weight Categories

A chi-square analysis of the BMI delta variable (difference-in-differences study) revealed a significant difference in the distribution of BMI categories between the intervention and control groups before and after the intervention ($p=0.029$). As shown in **Figure 11**, the intervention group exhibited slight reductions in the normal weight and obesity categories post-intervention, alongside modest increases in the underweight and overweight categories. In contrast, the control group experienced a slight decrease in both the underweight and normal weight categories, coupled with a slight increase in the overweight and obesity categories.



(a)



(b)

Figure 11. (a) BMI distribution across weight categories of the experimental group before and after intervention. (b) BMI distribution across weight categories of the control group before and after intervention. A chi-square analysis of the delta variable reveals a significant difference in BMI distribution across weight categories between groups pre- and post-intervention ($p = 0.029$). The numbers above the boxes represent the delta.

Changes in Waist Circumference

Figure 12 illustrates the changes in waist circumference across both groups following the intervention. In the experimental group, waist circumference remained virtually unchanged post-intervention. Conversely, the control group exhibited a slight increase. A Mann-Whitney U analysis of the delta variable for waist circumference (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p < 0.001$).

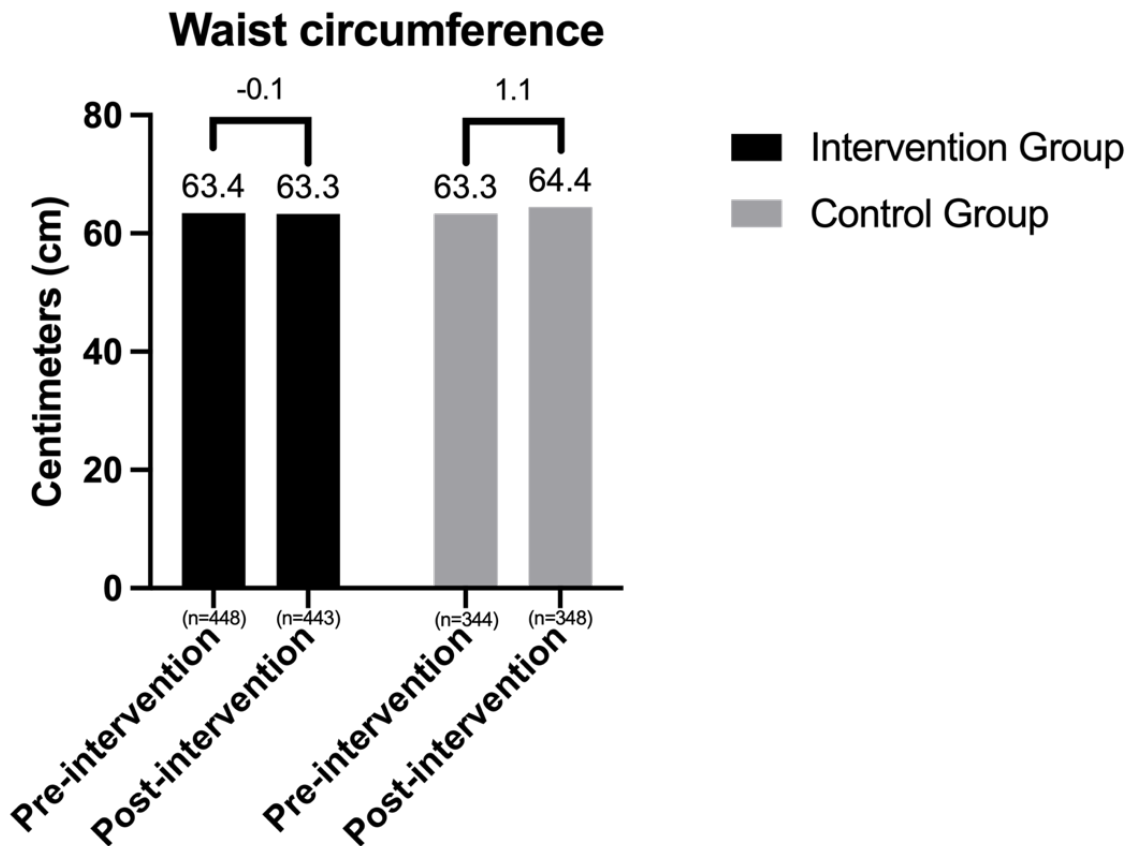


Figure 12. Changes in waist circumference before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in waist circumference changes between groups pre- and post-intervention ($p < 0.001$). The numbers above the boxes represent the delta.

Changes in Waist to Hip Ratio

A Mann-Whitney U analysis of the delta variable for the waist to hip ratio (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p < 0.001$). As shown in **Figure 13**, the intervention group experienced a slight decrease in the waist-to-hip ratio following the intervention, while the control group maintained consistent values.

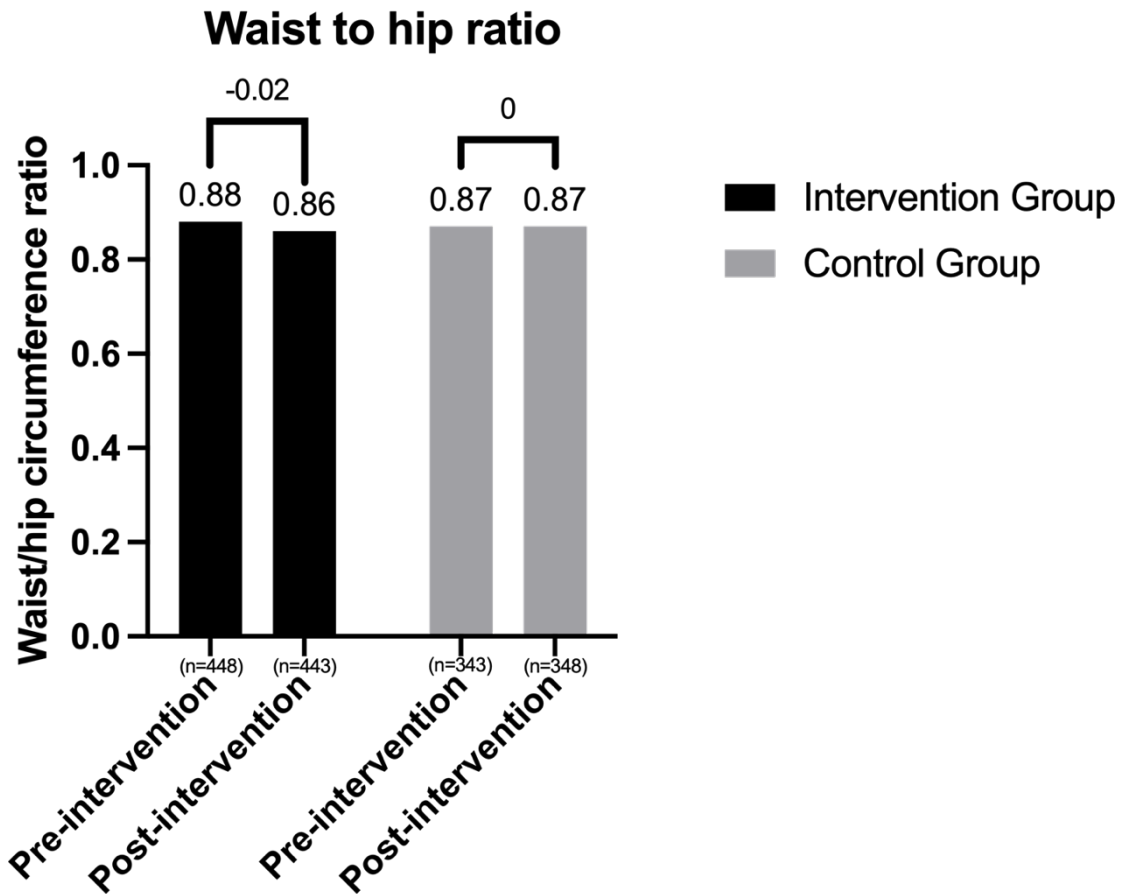


Figure 13. Changes in waist to hip ratio before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in waist to hip ratio changes between groups pre- and post-intervention ($p < 0.001$). The numbers above the boxes represent the delta.

Changes in Waist to Height Ratio

As depicted in **Figure 14**, the waist to height ratio slightly decreased in the experimental group following the intervention, whereas it slightly increased in the control group. A Mann-Whitney U analysis of the delta variable for the waist to height ratio (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p < 0.001$).

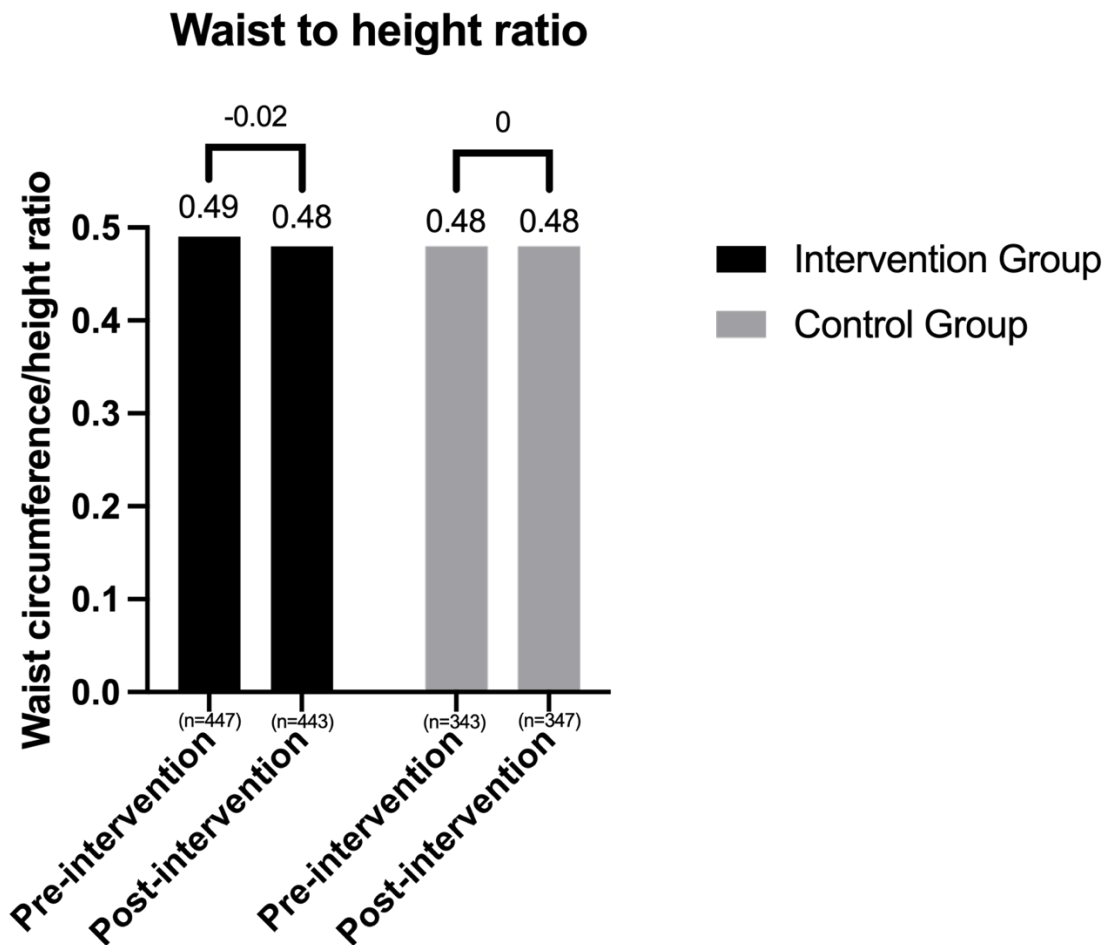


Figure 14. Changes in waist to height ratio before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in waist to height ratio changes between groups pre- and post-intervention ($p < 0.001$). The numbers above the boxes represent the delta.

Changes in Physical Activity Levels

Weekly Frequency of Family Physical Activity

A Mann-Whitney U analysis of the delta variable (difference-in-differences study) revealed a significant difference between the groups in the weekly frequency of family physical activity before and after the intervention ($p=0.004$). As illustrated in **Figure 15**, the average number of days per week that schoolchildren engaged in family physical activity slightly increased in the experimental group post-intervention. Conversely, the control group experienced a slight decrease.

Weely frequency of family physical activity

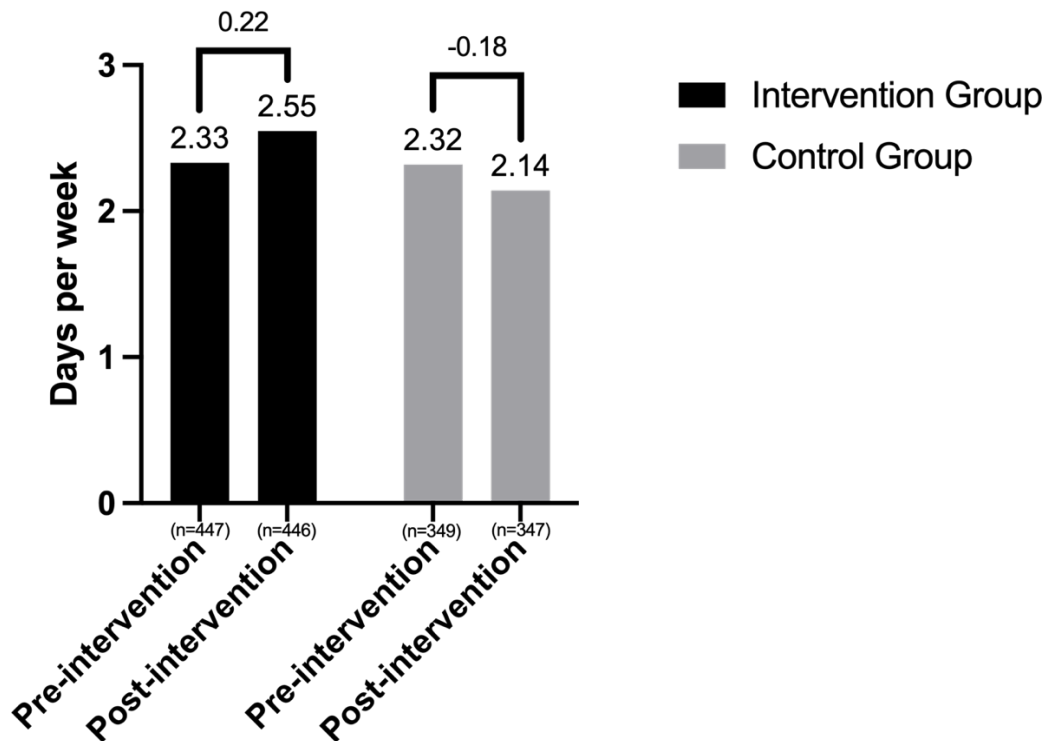
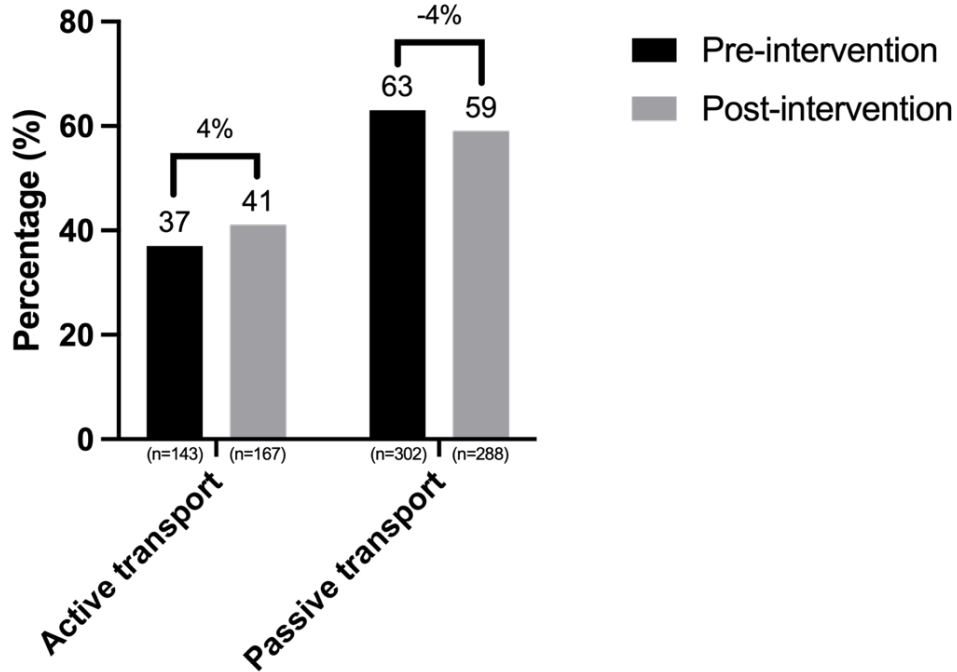


Figure 15. Weekly frequency of family physical activity before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in weekly frequency of family physical activity changes between groups pre- and post-intervention ($p=0.004$). The numbers above the boxes represent the delta.

School Transportation Mode

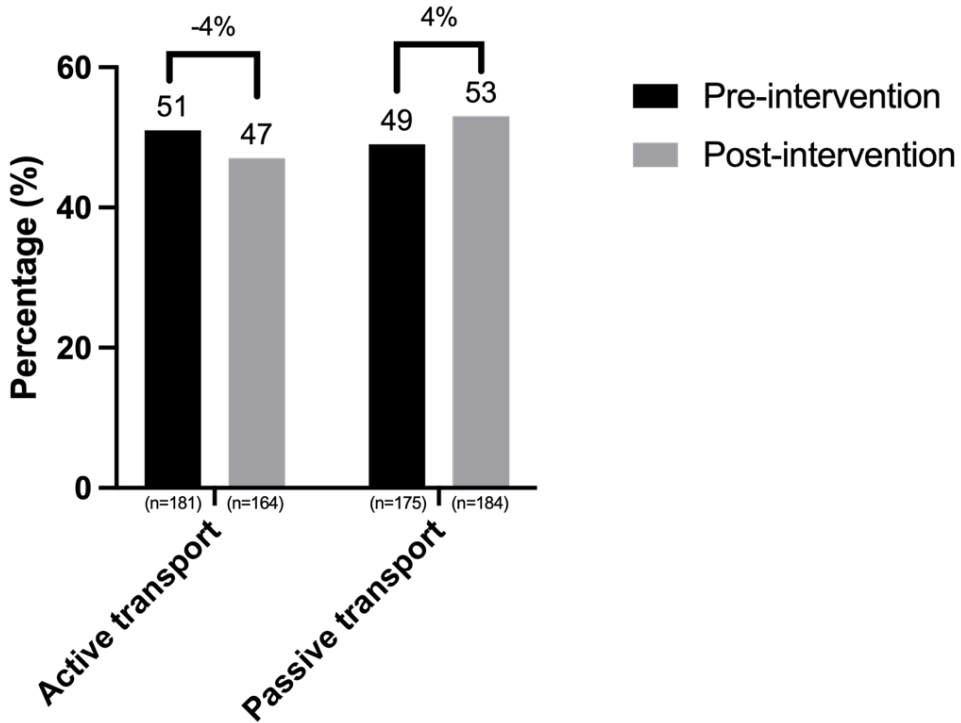
The mode of transportation to school before and after the intervention was analysed for both the experimental and control groups. A chi-square analysis of the delta variable for the mode of transportation to school (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p=0.009$). As shown in **Figure 16**, the experimental group experienced a slight increase in active travel to school and a corresponding decrease in passive travel after the intervention. Conversely, the control group saw a slight decrease in active transportation and a subtle increase in passive transportation.

School transportation mode Intervention Group



(a)

School transportation mode Control Group



(b)

Figure 16. (a) School transportation mode of the experimental group before and after intervention. (b) School transportation mode of the control group before and after intervention. Chi-square analysis indicates a significant difference in school transportation mode changes between groups pre- and post-intervention ($p=0.009$). The numbers above the boxes represent the delta.

Changes in Eating Behaviours

Feeding Beliefs and Knowledge Index

The eating beliefs and knowledge index was evaluated before and after the intervention for both the experimental and control groups. As depicted in **Figure 17**, the experimental group exhibited a slight increase in dietary knowledge after the intervention, whereas in the control group, this knowledge slightly decreased following the intervention. A chi-square analysis conducted on the delta variable of the eating beliefs and knowledge index (difference-in-differences study) revealed a significant difference between groups pre- and post-intervention ($p=0.042$).

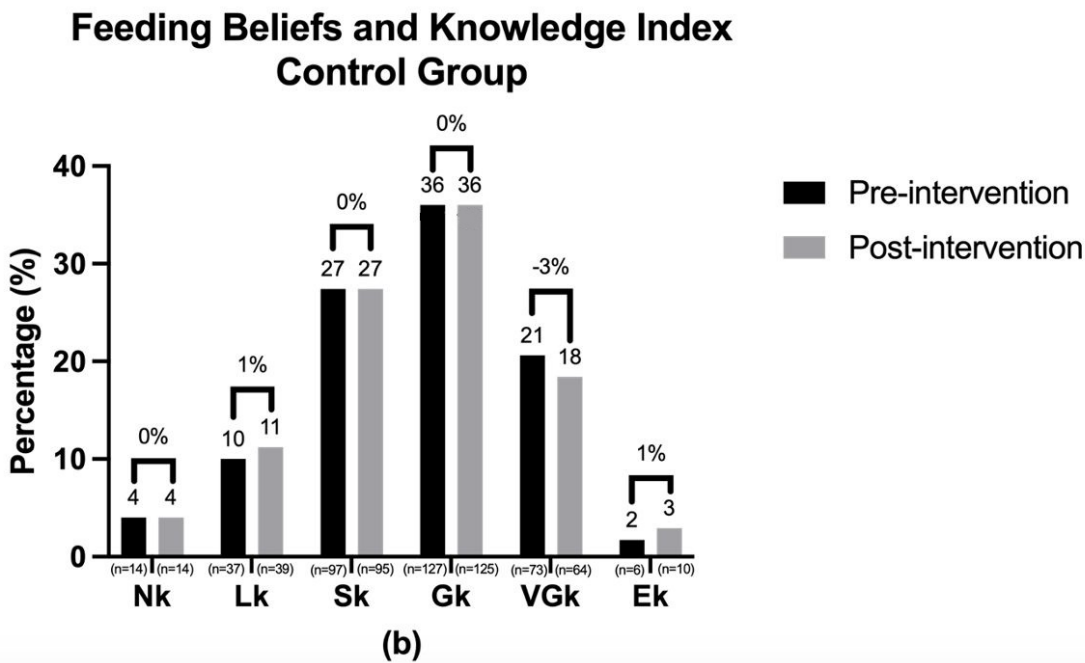
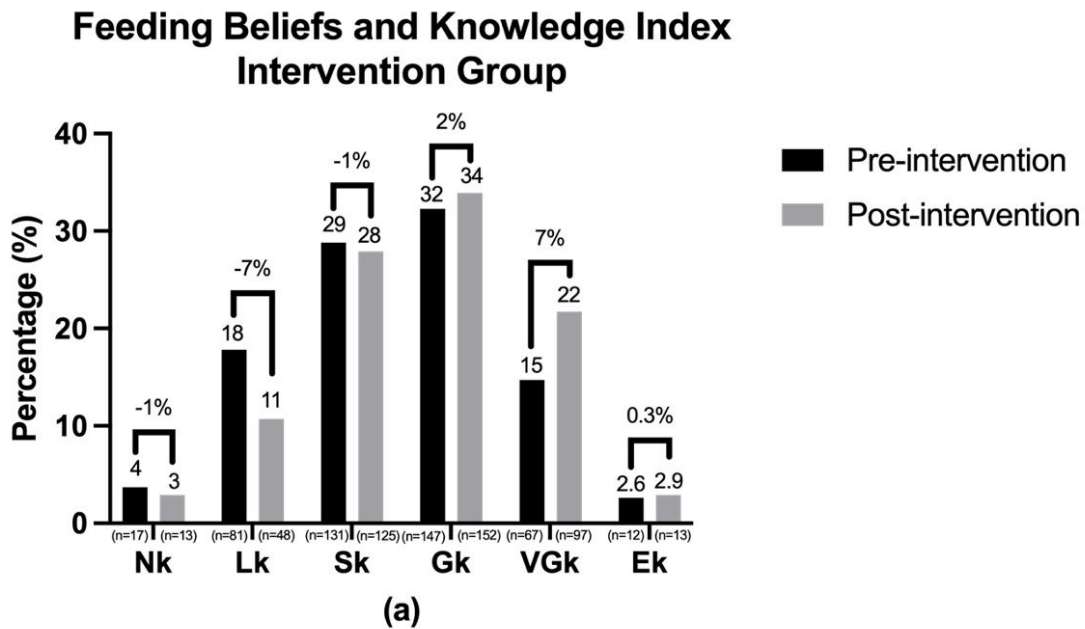


Figure 17. (a) Feeding beliefs and knowledge index of the experimental group before and after intervention. (b) Feeding beliefs and knowledge index of the control group before and after intervention. A chi-square analysis of the delta variable reveals a significant difference in feeding beliefs and knowledge index between groups pre- and post-intervention ($p = 0.049$). The numbers above the boxes represent the delta. Abbreviations: Ek, Excellent knowledge; Gk, good knowledge; Lk, little knowledge; Nk, no knowledge; Sk, some knowledge; VGk, very good knowledge.

It is noteworthy that all these variables displayed similar trends of subtle improvement. While the changes observed in each specific parameter may appear modest individually, collectively they indicate a positive shift in various aspects of health behaviour and outcomes following the intervention. These findings suggest that the intervention had a nuanced but overall beneficial impact on the studied variables for the experimental group.

Changes in Physical Fitness, Sedentary Behaviours and Sleep Behaviours

The analysis found that there were no statistically significant differences in physical fitness, sedentary behaviours, or sleep behaviours between the experimental and control groups following the intervention. Although both groups exhibited similar patterns and trends in these areas, the intervention did not lead to notable changes in these variables. This indicates the necessity for further refinement and enhancement of intervention strategies to more effectively target these specific aspects of children's health.

In summary, **Figure 18** graphically presents the methodological framework, key findings from Study II, and key findings from Study III.

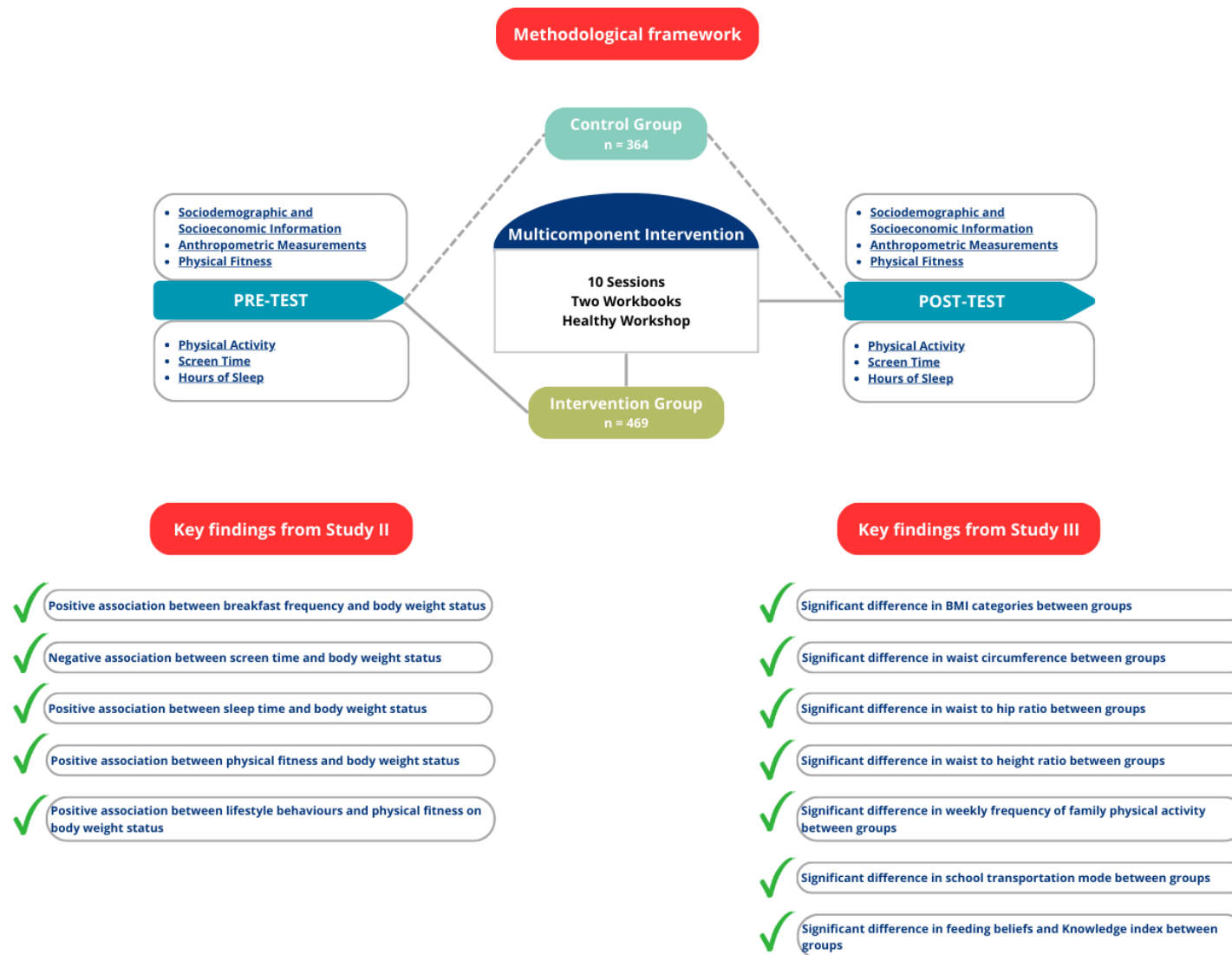
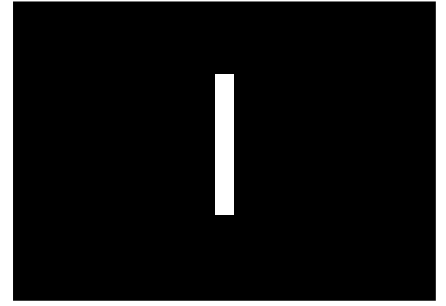


Figure 18. Summary of Methodological Framework and Key Findings from Study II and Study III

DISCUSSION

DISCUSSION

The discussion of this International Doctoral thesis is divided into three specific discussions for each study. The specific discussions for each study are shown below.



**STUDY I: A Multimodal Intervention for Prevention of
Overweight and Obesity in Schoolchildren. A
Protocol Study “PREVIENE-CÁDIZ”**

Study I: A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ”

“PREVIENE-CÁDIZ” intervention is based on the scientific literature regarding strategies to reduce childhood overweight and obesity. The design of the most effective interventions for the prevention of childhood obesity must include an education program carried out in the classroom and at home, where children and parents work aspects such as the practice of regular physical activity (112), recreational activities (113), extracurricular sports (114), reduced screen time, reduced fat consumption, increased fruit and vegetable servings and decreased consumption of carbonated beverages (113), in order to improve the behaviour of children and parents and get them to acquire healthier lifestyle habits (115).

According to a Cochrane Review (115), most interventions take place within the 6–12-year range. Solid evidence has been found regarding the benefits which can be obtained within those ages (115). This result is consistent with a later review (115) which concludes that those interventions combining physical activity and diet were those which yielded the best results both in their family settings and in school. Taking this into account, it could be very interesting to delve deeper into this age range, focusing on third grade of Spanish Primary Education due to the maturity of the students to be able to fill in questionnaires and to understand the intervention. Due to the fact that this intervention was planned to take place through sessions included in their ordinary curriculum, it was necessary to pick a subject to develop such material and to implement it on the same level in all schools, considering that such school year is the best one to do that. In addition, this age has been chosen by other authors for different interventions on health promotion (116,117).

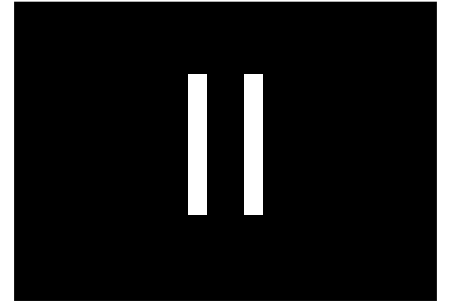
Among the strengths of this project, we highlight that a multimodal intervention carried out incorporating the main agents responsible for education (school and family) on a representative sample of boys and girls aged 8–9 years from the province of Cádiz. In addition, the multidisciplinary composition of the research team with more than 10 different disciplines and the continuous feedback and workshops (seminars) between the research team and the teachers were strengths of the PREVIENE-CÁDIZ project.

Regarding sustainability, it is worth mentioning that the initiative could be extended without the need for considerable additional resources. The fact that the educational sessions were implemented by the teachers enables an easier continuity of the intervention.

As a limitation, getting all the schools in the intervention group to carry out the ten sessions on the planned schedule was a challenge for the project. For this limitation, a contingency plan was contemplated whereby, through the teacher

training courses developed by the research team in the CEP of Cádiz, a section was included to organize the scholar calendar with the management teams and teachers. This ensured that all schools commit to implementing the intervention at the same time, and it was expected that this favoured the implementation of the sessions.

In another vein, not measuring the physical condition of schoolchildren and family members objectively but doing so subjectively using the self-report questionnaire of perceived physical condition (IFIS), could be a limitation. However, due to the complexity of bringing together schoolchildren, and especially their families to perform a series of physical tests, a decision was made to use the IFIS scale, which was previously been validated and used in this population group (106,107).



**STUDY II: Independent and Combined Association
of Lifestyle Behaviours and Physical Fitness with
Body Weight Status in Schoolchildren. Previene-
Cádiz.**

Study II: Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. Previene-Cádiz.

This study aimed to verify the association between lifestyle behaviours and self-reported physical fitness (individually and combined) with body weight status in schoolchildren from the province of Cádiz. Particularly, it was found that there were independent and combined associations of lifestyle behaviours and physical fitness with body weight status in schoolchildren.

Lifestyle behaviours are known to be key determinants in the developing of healthy/unhealthy body weight status. Some lifestyles have shown identify as independent and relevant association with body weight status in schoolchildren, however, no evidence has been reported about the combined role of lifestyle behaviours and physical fitness on body weight status.

One of these lifestyle behaviours is related with nutrition habits such as breakfast, which is one of the more controversial meals, considered a key meal of the day on some occasions and questioned in others. Most of the studies associated breakfast with better body weight control and healthy cardiometabolic risk indicators in children (118–120). However, other studies suggest inverse or controversial relationships (121–123). Several studies have shown a direct relationship between breakfast skipping and suffering overweight or obese (119,124). According to López-Sobaler et al. (118), the breakfast of the Spanish population can be improved, since a high percentage skip breakfast, make an insufficient breakfast or incorporate inadequate foods. Our findings concur with those reported by López-Sobaler et al., Szajewska et al. and Monzani et al. (118–120,124), who suggest breakfast is associated with better body weight control and skipping breakfast is directly related with suffering overweight or obese.

Screen-based sedentary behaviours (watching TV, playing video games, using mobile phones, tablets and computers) are common among young people, most children failing to meet guidelines of <2 hours of television per day (125). This is of concern given the positive associations between increased levels of screen time, sedentary behaviour, and adverse health outcomes (126). In this line are the results found in the present study, schoolchildren who spent more than 4 hours a day on screen time had a worse body weight status than those who spent between 2 and 4 hours and less than 2 hours respectively. Therefore, as supported by previous studies, a negative association was found in the present study between screen time and body weight status of the schoolchildren.

Short sleep-in childhood has been shown to significantly raise the risk of overweight and obesity (127,128). These observations suggest that short sleep affects food

intake via hedonic rather than homeostatic processes (129). Evidence to date points to food intake rather than activity as the primary pathway (130). Epidemiological studies in children have identified an inverse relationship between sleep duration and energy intake (131,132). Accordance with these studies, a positive association was found between hours of sleep and body weight status. Schoolchildren who slept more hours a day had a better body weight status than those who slept fewer hours.

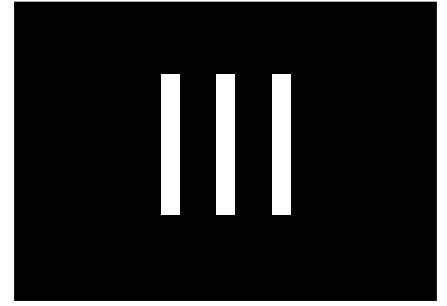
On the other hand, according to several studies (133–135), physical fitness is considered a powerful marker of health already in youth. This supports the results obtained in the present study, where it was observed a positive association between physical fitness and body weight status. It was found that the higher the physical fitness, the better the children's body weight status. Along the same lines are the results of the cross-sectional study carried out by Ruiz-Montero, J.P. et al. (136), where a positive association between self-reported physical fitness and body weight status was found in a group of adolescent secondary school students. According to this study, a higher BMI in adolescents was associated with a worse general physical fitness, cardiorespiratory fitness, muscle strength, speed-agility, and flexibility.

A recent systematic review (137) showed that lifestyle behaviours interventions were generally effective to reduce excess weight in children and adolescents. Absolute reductions in BMI z-score of 0.2 or more were observed in the intervention groups, compared with virtually no reduction in the control groups. In turn, a community intervention focused on improving the lifestyles behaviours of schoolchildren between 10 and 12 years old, carried out in Australia, showed a 6% reduction in the prevalence of overweight and obesity in a follow-up at 3 years after the intervention among schoolchildren in the intervention group (138). Furthermore, in a study carried out by Anna-Kaisa, K. et al. (139) a positive association was found between physical fitness and body weight status in 8-year-old children. Children who were overweight or obese had an impaired performance in tests requiring muscle endurance, balance, explosive power of lower extremities, upper body strength, endurance and speed and agility in both genders and exercise capacity in boys. These findings support the positive association found in the present study between the combined score created for lifestyle behaviours and physical fitness on body weight status of schoolchildren. Children who followed healthier lifestyle behaviours and had better physical fitness had better body weight status than those who followed unhealthy lifestyle behaviours and presented bad physical fitness.

As a possible limitation of the study, it should be noted that the physical fitness of schoolchildren and family members was not objectively assessed, but doing so subjectively using the self-report questionnaire of perceived physical condition IFIS.

It was decided to evaluate the physical fitness in this way due to the complexity of bringing together schoolchildren, and especially their families to perform a series of physical tests. As a positive aspect to support this decision, point out that the IFIS has been previously validated and used successfully in this population group (107). Another possible limitation of this study is that it is a cross-sectional study, where a single measurement is collected at a specific point in time, so it cannot be compared with a previous or subsequent measurement, but since what has been done is to check if there is association between the study variables and the body weight status of the schoolchildren by way of description, there should be no problem when using this design. In future studies, the pre and post intervention measurements will be compared to see if there have been changes with the performance of the intervention or not, and to verify its efficacy or not.

Among the strengths of this project, it should be noted that there is a large and representative sample of boys and girls aged 8 to 9 from all over the province of Cádiz, with schools spread throughout the geography of the province. In addition, it has had the response of the schoolchildren and their families, which has made it possible to counteract the information of children and parents, obtaining more complete and truthful information from the study sample.



**Study III: Effectiveness of a School-Based
Multimodal Intervention on Promoting Healthy
Lifestyle Behaviours Among Schoolchildren.
Previene-Cádiz Study.**

Study III: Effectiveness of a School-Based Multimodal Intervention on Promoting Healthy Lifestyle Behaviours Among Schoolchildren. Previene-Cádiz Study.

This study aimed to evaluate the effectiveness of an intervention designed to promote healthy lifestyle behaviours among schoolchildren in the province of Cádiz and to assess its impact on various outcomes including body composition, self-reported physical fitness, physical activity levels, sedentary behaviours, eating behaviours, and sleep behaviours among the participants. Overall, the intervention led to improvements in some key areas. Specifically, there were subtle enhancements in BMI distribution, waist circumference, waist-to-hip ratio, and waist-to-height ratio among participants in the experimental group. Additionally, the experimental group demonstrated modest increases in knowledge regarding dietary habits, as well as a slight rise in the frequency of family physical activity and active transportation to school.

The intervention had a slight effect on schoolchildren, albeit not to the extent expected in our hypothesis. In overall, obesity indicators slightly improved for those in the intervention group. Moreover, several physical activity indicators such as weekly family activity days and children active transport were increased after intervention. Finally, beliefs and knowledge on nutrition behaviours showed a slight but significant improvement. This modest change in pattern that the impact of the intervention was small on the various health and behavioural parameters that have been analysed so far.

Despite favourable changes observed in body composition parameters, such as reductions in BMI, waist circumference or wait to hip/height ratios, the magnitude of these changes was not relevant enough from the biological point of view. Consequently, the intervention seems to have initiated a certain positive effect on schoolchildren, the intensity of which should be improved in future studies with adjustments to the multimodal intervention. These findings align with previous studies that have reported modest effects of school-based interventions on body composition outcomes. In fact, there are several systematic reviews and meta-analyses (115,140–147), which analysed, among other parameters, the effectiveness of educational interventions on body composition of schoolchildren, showing efficacy in less than 50% of the interventions. Although others (148–150) showed efficacy in improving the body composition of students in more than 50% of the interventions. These findings highlight the variability in the effectiveness of school-based interventions on body composition outcomes and underscore the importance of identifying strategies that yield more consistent and impactful results.

It's noteworthy that the intervention consisted of only 10 sessions, a relatively limited exposure period, so the likelihood of significant changes in body composition is inherently low. Instead, the primary aim of the intervention was to instil healthier behaviours among the schoolchildren. By focusing on behaviour modification and promoting healthier lifestyle choices, the intervention sought to lay the groundwork for long-term improvements of body composition and obesity reduction. The rationale behind this approach lies in the understanding that sustained adoption of healthy behaviours over time is more likely to yield meaningful changes in body composition and overall health outcomes among the schoolchildren. Thus, even these modest changes in body composition should be explained by some behavioural changes as promoted by the current study.

The analysis of another relevant component of health, the physical fitness, revealed no significant changes after intervention between groups. This result is contradictory to the findings found by Seo, Y et al. (151), who showed how a specific 16-week physical exercise program obtains satisfactory results regarding the physical condition of a group of children and adolescents with obesity, which suggests that short-term interventions, such as the 10-session program in our study, may not be sufficient to produce noticeable changes in physical fitness. Moreover, it is possible that a specific exercise intervention would provide more intense and effective improvement of physical fitness, rather than multimodal approach. Thus, we believe that for meaningful improvements to occur, interventions should be integrated into the school curriculum and include a greater number of sessions, both within and outside of school, providing more time for students to engage in physical activity and aiming to achieve a moderate to high intensity. By prioritizing consistent physical activity participation in both school and extracurricular settings over time, we anticipate observing more significant improvements in physical fitness among schoolchildren.

Despite observing significant changes in physical activity levels, these changes were not as impactful as anticipated. While there were improvements, they did not fully align with the expected outcomes, suggesting that the increase in physical activity levels among schoolchildren was moderate. This is in line with findings from other studies (143,144,147,152), suggesting that short-term interventions may not effectively increase physical activity levels among school-aged children. It is thought that interventions should extend over at least one full school year to achieve meaningful and sustainable changes. Moreover, given the complexity of behaviour change and the specialized knowledge required, it is suggested that teachers should benefit from the support of external experts to effectively deliver these interventions. This need for external support has been underscored in previous research (153,154), where collaboration with health professionals and physical activity experts has been found to enhance the effectiveness of school-based

interventions aimed at increasing physical activity levels. Another potential factor to consider is the fat of intensity but not only volume or duration (155,156).

The analysis indicated that there were no substantial differences between groups regarding sedentary behaviours, suggesting that the intervention had a limited impact on this aspect. Sedentary behaviours are complex and deeply ingrained, requiring comprehensive and sustained efforts to modify effectively. Previous research, such as Neil-Sztramko and Dobbins's systematic review (152), supports this challenge. Neil-Sztramko and Dobbins analysed 16 studies of school-based physical activity interventions and highlighted that most interventions showed little or no decrease in sedentary time among children and adolescents, emphasizing the need for multifaceted approaches addressing various aspects of sedentary behaviours, including screen time, sitting time, and overall activity patterns. Thus, while our intervention aimed to promote healthier behaviours, especially regarding sedentary one, the results suggest that a greater number of sessions emphasizing this aspect may be necessary, as well as the assistance of qualified external personnel who work directly with students and families to achieve significant and lasting changes in this area.

Additionally, while some meaningful changes were observed between groups regarding dietary behaviours, these changes were not as extensive as anticipated. Similar to findings in previous research, interventions with a small number of sessions may not effectively address dietary behaviours among schoolchildren (143,144,147). Dietary behaviours are deeply ingrained and influenced by various factors, including cultural norms, family environment, and individual preferences. Therefore, interventions aimed at promoting healthier eating behaviours may require more extensive and targeted strategies, such as further extending the nutrition education program, increasing the number of cooking workshops for both children and parents, and further increasing the participation of parents and caregivers. Additionally, collaboration with nutritionists or dietitians may be beneficial in providing tailored guidance and support to parents.

Regarding sleep behaviours, no significant differences were noted between groups. However, it is encouraging that both groups reported a considerable number of hours of sleep on both weekdays and weekends. While further exploration into sleep quality may be beneficial, it is positive to note that, in terms of sleep quantity, both groups generally adhered to the sleep recommendations set by the Canadian 24-Hour Movement Guidelines (111).

As possible limitations of the study, the following can be mentioned: the duration of the intervention, consisting of only 10 sessions, may have limited its ability to achieve the anticipated outcomes. Extending the intervention period could potentially support more substantial and lasting changes in health behaviours

among schoolchildren. Additionally, the intervention could have benefited from a greater focus on the intensity of physical activity during physical education sessions, as both volume and intensity are important for achieving health benefits. Furthermore, the study faced challenges related to teacher engagement. Unlike collaborative projects such as POIBA in Barcelona (153,154), where external personnel assisted educators, our intervention relied solely on school staff. Incorporating external support could enhance motivation and improve program delivery. Finally, the lack of integration into the school curriculum posed a barrier, as the intervention competed for time with existing school activities, leading to varied levels of commitment among teachers. Embedding health education programs into the curriculum could help prioritize their importance and ensure consistent implementation across all participating schools.

Among the strengths of this study, it should be noted the comprehensive approach of the intervention, which addresses, albeit to a slightly lesser extent than initially anticipated, both school education and the involvement of parents and schoolchildren. This holistic approach allows for greater awareness and commitment to adopting healthy lifestyle behaviours at all levels: school, family, and community. Moreover, collaboration among these different stakeholders enhances the impact of the intervention by creating a supportive environment that facilitates the implementation and maintenance of positive lifestyle changes. Another strength of the study is the rigorous assessment of multiple outcome measures, including body composition, physical fitness, physical activity levels, sedentary, eating, and sleep behaviours. This comprehensive evaluation provides a nuanced understanding of the intervention's effects on various aspects of participants' health and lifestyle.

LIMITATIONS AND STRENGTHS

LIMITATIONS AND STRENGTHS

In this section, the limitations and strengths of this International Doctoral Thesis will be outlined, providing insights into the considerations to be taken into account when interpreting the results.

Limitations

- The reliance on self-reported data poses a significant limitation, as it opens the possibility of recall bias and may compromise the accuracy of the findings. Participants may not accurately remember or report their behaviours, leading to skewed results.
- Subjective assessment of physical fitness using the IFIS scale introduces potential bias. Participants' perceptions of their own fitness levels may not align with objective measurements, affecting the reliability of the data.
- Not all schools in the intervention group adhered to the prescribed ten-session schedule, indicating inconsistent implementation of the intervention. Variability in adherence levels across schools may affect the intervention's effectiveness and lead to skewed outcomes.
- The intervention's limited duration, comprising only 10 sessions, may have been insufficient to elicit significant changes in outcomes. Longer-term interventions may be necessary to observe meaningful effects on health-related behaviours and outcomes.
- Insufficient external support from experts may have impacted the consistency and quality of intervention implementation across schools. Variability in expertise and resources among schools could lead to disparities in intervention delivery and outcomes.
- Study II has a cross-sectional design, involving a single measurement at a specific moment, restricts the ability to track changes over time. Without longitudinal data, it is challenging to establish causal relationships or assess changes in outcomes over time.
- Limited family involvement highlights the need for additional parental workshops to raise awareness of healthier lifestyles. Increased parental engagement could enhance intervention effectiveness by fostering supportive home environments conducive to behaviour change.
- Insufficient sessions dedicated to improving physical activity and eating habits suggest the need for more comprehensive intervention plans. Addressing multiple aspects of lifestyle behaviours through targeted interventions may yield more significant and sustained improvements.
- Limited visibility of the intervention in many experimental group schools underscores the importance of active engagement for intervention success.

Increased visibility and engagement could foster a supportive school environment conducive to behaviour change and intervention effectiveness.

- Integration into the school curriculum presents a notable barrier, as it competes with existing activities and teacher commitment levels. Lack of integration may lead to limited time and resources allocated to the intervention, affecting its implementation and outcomes.

Strengths

- The comprehensive nature of the intervention, which encompassed individual, school, and community-based approaches, enhances the relevance and applicability of the findings. By targeting multiple levels of influence, including individual behaviours, school environments, and community resources, the intervention addresses the complex interplay of factors influencing health behaviours and outcomes.
- The project benefits from a large, representative sample of children aged 8 to 9 from across the province of Cadiz, enhancing the result's generalizability and ability to draw meaningful conclusions about the target population.
- Active participation of schoolchildren and their families facilitated comprehensive data collection, improving the validity and reliability of study findings. Engaging participants directly in data collection enhances data quality and ensures a more accurate representation of participants' behaviours and experiences.
- The studies comprehensive intervention approach, addressing both school education and parental and student involvement, is a significant strength. By targeting multiple levels of influence, the intervention may have a broader impact on participants' behaviours and outcomes.
- The longitudinal design of Study III allows for the evaluation of changes over time, providing valuable insights into the effectiveness of the intervention. This longitudinal perspective enables researchers to explore the trajectory of behaviour change and identify potential long-term benefits or challenges associated with the intervention.
- Rigorous evaluation of multiple outcome measures, including body composition, physical fitness, physical activity levels, sedentary habits, dietary patterns, and sleep habits, enhances the study's robustness and credibility. Assessing various aspects of lifestyle behaviours allows for a more comprehensive understanding of the intervention's effects and its potential to promote health and well-being.

CONCLUSIONS / CONCLUSIONES

CONCLUSIONS

The conclusions of this International Doctoral Thesis are shown below.

- 1) The design of a multimodal intervention, involving various relevant dimensions including sociocultural, behavioural, and environmental factors, as well as its execution, is viable and feasible, allowing for addressing gaps in the literature, despite its methodological challenges and implementation risks (Study I).
- 2) Lifestyle behaviours and physical fitness are associated with the weight status of third year Primary Education students in the province of Cádiz. It has been shown that improved lifestyle behaviours and physical fitness are independently and combined related to healthier body weight outcomes among schoolchildren (Study II).
- 3) The intervention was effective, although the strength or intensity of the effect was moderate and lower than expected. Further research is needed to enhance the intervention's impact and better understand the factors influencing its effectiveness (Study III).

CONCLUSIONES

A continuación, se muestran las conclusiones de la presente Tesis Doctoral Internacional:

- 1) El diseño de una intervención multimodal, que involucra diversas dimensiones relevantes, incluidos factores socioculturales, conductuales y ambientales, así como su ejecución, es viable y factible, permitiendo abordar las lagunas en la literatura, a pesar de sus desafíos metodológicos y riesgos de implementación (Estudio I).
- 2) Los comportamientos de estilo de vida y la condición física, se asocian con el estado de peso de los estudiantes de tercer curso de primaria en la provincia de Cádiz. Se ha demostrado que mejores comportamientos de estilo de vida y condición física están relacionados, de manera independiente y combinada, con resultados de peso corporal más saludables entre los escolares (Estudio II).
- 3) La intervención fue efectiva, aunque la fuerza o intensidad del efecto fue moderada y menor de lo esperado. Se requiere más investigación para mejorar el impacto de la intervención y comprender mejor los factores que influyen en su efectividad (Estudio III).

FUTURE RESEARCH DIRECTIONS

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Despite the insights gained from this International Doctoral Thesis, several avenues for future research warrant exploration to further advance our understanding of childhood obesity prevention and intervention strategies. Firstly, longitudinal studies with extended follow-up periods are needed to assess the long-term effectiveness and sustainability of interventions targeting lifestyle behaviours and physical fitness among schoolchildren. This would allow for the evaluation of intervention effects beyond immediate outcomes and provide valuable insights into the persistence of behavioural changes over time.

It would be convenient to enhance the current intervention and implement it anew once all identified shortcomings have been addressed and lessons learned from this International Doctoral Thesis. By rectifying the flaws detected in the present study and incorporating valuable insights gained through rigorous analysis, future iterations of the intervention can be optimised to maximise effectiveness and impact.

Furthermore, investigating the role of school policies and environmental factors in supporting healthy lifestyle behaviours and mitigating childhood obesity risk is crucial for informing the development of comprehensive and sustainable intervention approaches. Additionally, there is a need for research exploring innovative intervention modalities, such as digital health technologies and gamification, to enhance intervention reach, engagement, and effectiveness among school-aged children. By leveraging technology and interactive platforms, interventions can be tailored to individual needs and preferences, thereby increasing their appeal and potential impact.

In general, future research should adopt a multidisciplinary and multifaceted approach to childhood obesity prevention, integrating insights from public health, nutrition, physical activity, psychology, education, and policy domains. By addressing the complex and multifactorial nature of childhood obesity, future interventions can maximise their impact and contribute to the promotion of health and well-being among children worldwide. Moreover, this newfound knowledge can be transferred to our forthcoming research projects to enhance the quality of our research endeavours.

BIBLIOGRAPHIC REFERENCES

BIBLIOGRAPHIC REFERENCES

1. Aragón-Martín R, Gómez-Sánchez M del M, Jiménez-Pavón D, Martínez-Nieto JM, Schwarz-Rodríguez M, Segundo-Iglesias C, et al. A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ.” *Int J Environ Res Public Health* [Internet]. 2021;18(4). Available from: <https://www.mdpi.com/1660-4601/18/4/1622>
2. Kaur R, Kumar R, Gupta M. Predicting risk of obesity and meal planning to reduce the obese in adulthood using artificial intelligence. *Endocrine*. 2022 Oct 12;78:1–12.
3. The Heart Foundation. Childhood Obesity [Internet]. 2018 [cited 2024 Jul 11]. Available from: <https://theheartfoundation.org/2018/02/09/childhood-obesity/>
4. World Health Organization (WHO). Obesity and overweight [Internet]. 2024 [cited 2024 Jul 11]. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>
5. Murray CJL, Aravkin AY, Zheng P, Abbafati C, Abbas KM, Abbasi-Kangevari M, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet* [Internet]. 2020;396(10258):1223–49. Available from: <https://www.sciencedirect.com/science/article/pii/S0140673620307522>
6. Roth J, Qiang X, Marbán SL, Redelt H, Lowell BC. The Obesity Pandemic: Where Have We Been and Where Are We Going? *Obes Res* [Internet]. 2004;12(S11):88S-101S. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1038/oby.2004.273>
7. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. *Nutr Rev* [Internet]. 2012 Jan 1;70(1):3–21. Available from: <https://doi.org/10.1111/j.1753-4887.2011.00456.x>
8. Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, et al. The global obesity pandemic: shaped by global drivers and local environments. *The Lancet* [Internet]. 2011;378(9793):804–14. Available from: <https://www.sciencedirect.com/science/article/pii/S0140673611608131>
9. Bray GA, Kim KK, Wilding JPH, on behalf of the World Obesity Federation. Obesity: a chronic relapsing progressive disease process. A position statement of the World Obesity Federation. *Obesity Reviews* [Internet]. 2017;18(7):715–23. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/obr.12551>

10. Dhawan D, Sharma S. Abdominal Obesity, Adipokines and Non-communicable Diseases. *J Steroid Biochem Mol Biol* [Internet]. 2020;203:105737. Available from: <https://www.sciencedirect.com/science/article/pii/S0960076020302624>
11. Bremner JD, Moazzami K, Wittbrodt MT, Nye JA, Lima BB, Gillespie CF, et al. Diet, Stress and Mental Health. *Nutrients* [Internet]. 2020;12(8). Available from: <https://www.mdpi.com/2072-6643/12/8/2428>
12. Anekwe CV, Jarrell AR, Townsend MJ, Gaudier GI, Hiserodt JM, Stanford FC. Socioeconomics of Obesity. *Curr Obes Rep* [Internet]. 2020;9(3):272–9. Available from: <https://doi.org/10.1007/s13679-020-00398-7>
13. Dee A, Kearns K, O'Neill C, Sharp L, Staines A, O'Dwyer V, et al. The direct and indirect costs of both overweight and obesity: a systematic review. *BMC Res Notes* [Internet]. 2014;7(1):242. Available from: <https://doi.org/10.1186/1756-0500-7-242>
14. Kolotkin RL, Andersen JR. A systematic review of reviews: exploring the relationship between obesity, weight loss and health-related quality of life. *Clin Obes* [Internet]. 2017 Oct 1;7(5):273–89. Available from: <https://doi.org/10.1111/cob.12203>
15. Apovian CM. Obesity: Definition, Comorbidities, Causes, and Burden [Internet]. 2014. Available from: www.ajmc.com
16. Mirr M, Owecki M. An Update to the WISP-1/CCN4 Role in Obesity, Insulin Resistance and Diabetes. *Medicina (B Aires)* [Internet]. 2021;57(2). Available from: <https://www.mdpi.com/1648-9144/57/2/100>
17. Hany M, Demerdash HM, Agayby ASS, Ibrahim M, Torensma B. Can Leptin/Ghrelin Ratio and Retinol-Binding Protein 4 Predict Improved Insulin Resistance in Patients with Obesity Undergoing Sleeve Gastrectomy? *Obes Surg* [Internet]. 2022;32(12):3942–50. Available from: <https://doi.org/10.1007/s11695-022-06296-2>
18. Abenavoli L, Scarpellini E, Colica C, Boccuto L, Salehi B, Sharifi-Rad J, et al. Gut Microbiota and Obesity: A Role for Probiotics. *Nutrients* [Internet]. 2019;11(11). Available from: <https://www.mdpi.com/2072-6643/11/11/2690>
19. Zhou J, Tang R, Wang X, Li X, Heianza Y, Qi L. Improvement of Social Isolation and Loneliness and Excess Mortality Risk in People With Obesity. *JAMA Netw Open* [Internet]. 2024 Jan 22;7(1):e2352824–e2352824. Available from: <https://doi.org/10.1001/jamanetworkopen.2023.52824>

20. Yu H jie, Li F, Hu Y feng, Li C feng, Yuan S, Song Y, et al. Improving the Metabolic and Mental Health of Children with Obesity: A School-Based Nutrition Education and Physical Activity Intervention in Wuhan, China. *Nutrients* [Internet]. 2020;12(1). Available from: <https://www.mdpi.com/2072-6643/12/1/194>
21. Powell-Wiley TM, Poirier P, Burke LE, Després JP, Gordon-Larsen P, Lavie CJ, et al. Obesity and Cardiovascular Disease: A Scientific Statement From the American Heart Association. *Circulation* [Internet]. 2021;143(21):e984–1010. Available from: <https://www.ahajournals.org/doi/abs/10.1161/CIR.0000000000000973>
22. Pulgaron ER, Delamater AM. Obesity and Type 2 Diabetes in Children: Epidemiology and Treatment. *Curr Diab Rep* [Internet]. 2014;14(8):508. Available from: <https://doi.org/10.1007/s11892-014-0508-y>
23. Kolb R, Sutterwala FS, Zhang W. Obesity and cancer: inflammation bridges the two. *Curr Opin Pharmacol* [Internet]. 2016;29:77–89. Available from: <https://www.sciencedirect.com/science/article/pii/S1471489216300650>
24. Lin X, Li H. Obesity: Epidemiology, Pathophysiology, and Therapeutics. *Front Endocrinol (Lausanne)* [Internet]. 2021;12. Available from: <https://www.frontiersin.org/journals/endocrinology/articles/10.3389/fendo.2021.706978>
25. Okunogbe A, Nugent R, Spencer G, Ralston J, Wilding J. Economic impacts of overweight and obesity: current and future estimates for eight countries. *BMJ Glob Health* [Internet]. 2021;6(10). Available from: <https://gh.bmj.com/content/6/10/e006351>
26. on Obesity (1999: Geneva S, Organization WH. Obesity : preventing and managing the global epidemic : report of a WHO consultation. World Health Organization; 2000. p. 252 p. (WHO technical report series ; 894).
27. Drozd D, Alvarez-Pitti J, Wójcik M, Borghi C, Gabbianelli R, Mazur A, et al. Obesity and Cardiometabolic Risk Factors: From Childhood to Adulthood. *Nutrients* [Internet]. 2021;13(11). Available from: <https://www.mdpi.com/2072-6643/13/11/4176>
28. Hills AP, Andersen LB, Byrne NM. Physical activity and obesity in children. *Br J Sports Med* [Internet]. 2011;45(11):866–70. Available from: <https://bjsm.bmj.com/content/45/11/866>
29. Arévalo Avalos MR, Ayers SL, Patrick DL, Jager J, Castro FG, Konopken YP, et al. Familism, Self-Esteem, and Weight-Specific Quality of Life Among Latinx

- Adolescents With Obesity. *J Pediatr Psychol* [Internet]. 2020 Sep 1;45(8):848–57. Available from: <https://doi.org/10.1093/jpepsy/jsaa047>
30. Sutaria S, Devakumar D, Yasuda SS, Das S, Saxena S. Is obesity associated with depression in children? Systematic review and meta-analysis. *Arch Dis Child* [Internet]. 2019;104(1):64–74. Available from: <https://adc.bmj.com/content/104/1/64>
 31. Ogden CL, Fryar CD, Martin CB, Freedman DS, Carroll MD, Gu Q, et al. Trends in obesity prevalence by race and hispanic origin - 1999-2000 to 2017-2018. Vol. 324, *JAMA - Journal of the American Medical Association*. American Medical Association; 2020. p. 1208–10.
 32. Pérez-Herrera A, Cruz-López M. Childhood obesity: Current situation in Mexico. *Nutr Hosp*. 2019 Mar 1;36(2):463–9.
 33. Rimes-Dias KA, Costa JC, Canella DS. Obesity and health service utilization in Brazil: data from the National Health Survey. *BMC Public Health* [Internet]. 2022;22(1):1474. Available from: <https://doi.org/10.1186/s12889-022-13906-2>
 34. Liu D, Zhao LY, Yu DM, Ju LH, Zhang J, Wang JZ, et al. Dietary Patterns and Association with Obesity of Children Aged 6–17 Years in Medium and Small Cities in China: Findings from the CNHS 2010–2012. *Nutrients* [Internet]. 2019;11(1). Available from: <https://www.mdpi.com/2072-6643/11/1/3>
 35. Mathur P, Kulothungan V, Leburu S, Krishnan A, Chaturvedi HK, Salve HR, et al. Baseline risk factor prevalence among adolescents aged 15-17 years old: findings from National Non-communicable Disease Monitoring Survey (NNMS) of India. *BMJ Open*. 2021 Jun 29;11(6).
 36. Ahrens W, Pigeot I, Pohlabeln H, De Henauw S, Lissner L, Molnár D, et al. Prevalence of overweight and obesity in European children below the age of 10. *Int J Obes* [Internet]. 2014 Sep 15 [cited 2019 Oct 7];38(S2):S99–107. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25376223>
 37. Cadenas-Sanchez C, Nyström C, Sanchez-Delgado G, Martinez-Tellez B, Mora-Gonzalez J, Risinger AS, et al. Prevalence of overweight/obesity and fitness level in preschool children from the north compared with the south of Europe: an exploration with two countries. *Pediatr Obes* [Internet]. 2016 Oct [cited 2019 Oct 7];11(5):403–10. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26549795>
 38. British Royal Government Digital Service. National Child Measurement Programme, England, 2022_23 School Year - NHS England Digital. 2023;

39. Ministry of Health - Government of Spain. Spanish National Health Survey (ENSE) 2017. 2018.
40. Sergio VP, Novalbos-Ruiz JP, Rodríguez-Martín A, Martínez-Nieto JM, Lechuga-Sancho AM. Implicaciones del nivel socioeconómico familiar sobre las conductas de riesgo en la obesidad infantojuvenil. *Nutr Hosp* [Internet]. 2013 [cited 2019 Oct 8];28(6):1951–60. Available from: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S0212-16112013000600026
41. Littleton SH, Berkowitz RI, Grant SFA. Genetic Determinants of Childhood Obesity. *Mol Diagn Ther* [Internet]. 2020;24(6):653–63. Available from: <https://doi.org/10.1007/s40291-020-00496-1>
42. Marko Kostovski, Velibor Tasic, Nevena Laban, Momir Polenakovic, Dragan Danilovski, Zoran Gucev. Obesity in childhood and adolescence, genetic factors. *Pril (Makedon Akad Nauk Umet Odd Med Nauki)*. 2017;38(3):121–33.
43. Shi L, Jiang Z, Zhang L. Childhood obesity and central precocious puberty. Vol. 13, *Frontiers in Endocrinology*. Frontiers Media S.A.; 2022.
44. Liu S, Wang X, Zheng Q, Gao L, Sun Q. Sleep Deprivation and Central Appetite Regulation. *Nutrients* [Internet]. 2022;14(24). Available from: <https://www.mdpi.com/2072-6643/14/24/5196>
45. Deldin A, Kuk JL, Lee S. Influence of Sex on the Changes in Regional Fat and Skeletal Muscle Mass in Response to Exercise Training in Adolescents with Obesity. *Childhood Obesity* [Internet]. 2019 Jan 29;15(3):216–22. Available from: <https://doi.org/10.1089/chi.2018.0329>
46. Voerman E, Santos S, Golab BP, Amiano P, Ballester F, Barros H, et al. Maternal body mass index, gestational weight gain, and the risk of overweight and obesity across childhood: An individual participant data meta-analysis. *PLoS Med*. 2019 Feb 1;16(2).
47. Moreno-Fernandez J, Ochoa JJ, Lopez-Frias M, Diaz-Castro J. Impact of Early Nutrition, Physical Activity and Sleep on the Fetal Programming of Disease in the Pregnancy: A Narrative Review. *Nutrients* [Internet]. 2020;12(12). Available from: <https://www.mdpi.com/2072-6643/12/12/3900>
48. Reichetzeder C. Overweight and obesity in pregnancy: their impact on epigenetics. *Eur J Clin Nutr* [Internet]. 2021;75(12):1710–22. Available from: <https://doi.org/10.1038/s41430-021-00905-6>
49. Desai M, Ross MG. Maternal-infant nutrition and development programming of offspring appetite and obesity. *Nutr Rev* [Internet]. 2020 Nov

- 15;78(Supplement_2):25–31. Available from:
<https://doi.org/10.1093/nutrit/nuaa121>
50. Desoye G, Herrera E. Adipose tissue development and lipid metabolism in the human fetus: The 2020 perspective focusing on maternal diabetes and obesity. *Prog Lipid Res* [Internet]. 2021;81:101082. Available from: <https://www.sciencedirect.com/science/article/pii/S016378272030062X>
 51. Fernandez-Twinn DS, Hjort L, Novakovic B, Ozanne SE, Saffery R. Intrauterine programming of obesity and type 2 diabetes. *Diabetologia* [Internet]. 2019;62(10):1789–801. Available from: <https://doi.org/10.1007/s00125-019-4951-9>
 52. Victora CG, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The Lancet* [Internet]. 2016 Jan 30;387(10017):475–90. Available from: [https://doi.org/10.1016/S0140-6736\(15\)01024-7](https://doi.org/10.1016/S0140-6736(15)01024-7)
 53. Ma J, Qiao Y, Zhao P, Li W, Katzmarzyk PT, Chaput JP, et al. Breastfeeding and childhood obesity: A 12-country study. *Matern Child Nutr* [Internet]. 2020 Jul 1;16(3):e12984. Available from: <https://doi.org/10.1111/mcn.12984>
 54. Zheng M, D’Souza NJ, Atkins L, Ghobadi S, Laws R, Szymlek-Gay EA, et al. Breastfeeding and the Longitudinal Changes of Body Mass Index in Childhood and Adulthood: A Systematic Review. *Advances in Nutrition* [Internet]. 2024;15(1):100152. Available from: <https://www.sciencedirect.com/science/article/pii/S2161831323014369>
 55. González-Domínguez Á, Jurado-Sumariva L, Domínguez-Riscart J, Saez-Benito A, González-Domínguez R. Parental obesity predisposes to exacerbated metabolic and inflammatory disturbances in childhood obesity within the framework of an altered profile of trace elements. *Nutr Diabetes* [Internet]. 2024;14(1):2. Available from: <https://doi.org/10.1038/s41387-024-00258-6>
 56. Xu H, Wen LM, Rissel C. Associations of Parental Influences with Physical Activity and Screen Time among Young Children: A Systematic Review. He G, editor. *J Obes* [Internet]. 2015;2015:546925. Available from: <https://doi.org/10.1155/2015/546925>
 57. Mahmood L, Flores-Barrantes P, Moreno LA, Manios Y, Gonzalez-Gil EM. The Influence of Parental Dietary Behaviors and Practices on Children’s Eating Habits. *Nutrients* [Internet]. 2021;13(4). Available from: <https://www.mdpi.com/2072-6643/13/4/1138>

58. Godfrey KM, Reynolds RM, Prescott SL, Nyirenda M, Jaddoe VW V, Eriksson JG, et al. Influence of maternal obesity on the long-term health of offspring. *Lancet Diabetes Endocrinol* [Internet]. 2017 Jan 1;5(1):53–64. Available from: [https://doi.org/10.1016/S2213-8587\(16\)30107-3](https://doi.org/10.1016/S2213-8587(16)30107-3)
59. Sares-Jäske L, Grönqvist A, Mäki P, Tolonen H, Laatikainen T. Family socioeconomic status and childhood adiposity in Europe - A scoping review. *Prev Med (Baltim)* [Internet]. 2022;160:107095. Available from: <https://www.sciencedirect.com/science/article/pii/S0091743522001438>
60. An R, Yang Y, Hoschke A, Xue H, Wang Y. Influence of neighbourhood safety on childhood obesity: a systematic review and meta-analysis of longitudinal studies. *Obesity Reviews* [Internet]. 2017 Nov 1;18(11):1289–309. Available from: <https://doi.org/10.1111/obr.12585>
61. Karimi E, Haghighatdoost F, Mohammadifard N, Najafi F, Farshidi H, Kazemi T, et al. The influential role of parents' socioeconomic status and diet quality on their children's dietary behavior: results from the LIPOKAP study among the Iranian population. *BMC Pediatr* [Internet]. 2023;23(1):188. Available from: <https://doi.org/10.1186/s12887-023-04000-6>
62. McInnis N. Long-term health effects of childhood parental income. *Soc Sci Med* [Internet]. 2023;317:115607. Available from: <https://www.sciencedirect.com/science/article/pii/S0277953622009133>
63. Yang D, Hu S, Li M. The Influence of Family Socioeconomic Status on Adolescents' Mental Health in China. *Int J Environ Res Public Health* [Internet]. 2022;19(13). Available from: <https://www.mdpi.com/1660-4601/19/13/7824>
64. Gutiérrez-González E, Sánchez Arenas F, López-Sobaler AM, Andreu Ivorra B, Rollán Gordo A, García-Solano M. Socioeconomic and gender inequalities in childhood obesity in Spain. *Anales de Pediatría (English Edition)* [Internet]. 2023;99(2):111–21. Available from: <https://www.sciencedirect.com/science/article/pii/S2341287923001631>
65. Dondi A, Piccinno V, Morigi F, Sureshkumar S, Gori D, Lanari M. Food Insecurity and Major Diet-Related Morbidities in Migrating Children: A Systematic Review. *Nutrients* [Internet]. 2020;12(2). Available from: <https://www.mdpi.com/2072-6643/12/2/379>
66. Lim YM, Song S, Song WO. Prevalence and Determinants of Overweight and Obesity in Children and Adolescents from Migrant and Seasonal Farmworker Families in the United States—A Systematic Review and Qualitative

- Assessment. *Nutrients* [Internet]. 2017;9(3). Available from: <https://www.mdpi.com/2072-6643/9/3/188>
67. Skinner AC, Ravanbakht SN, Skelton JA, Perrin EM, Armstrong SC. Prevalence of Obesity and Severe Obesity in US Children, 1999–2016. *Pediatrics* [Internet]. 2018 Mar 1;141(3):e20173459. Available from: <https://doi.org/10.1542/peds.2017-3459>
 68. Stearns JC, Zulyniak MA, de Souza RJ, Campbell NC, Fontes M, Shaikh M, et al. Ethnic and diet-related differences in the healthy infant microbiome. *Genome Med* [Internet]. 2017;9(1):32. Available from: <https://doi.org/10.1186/s13073-017-0421-5>
 69. Formisano A, Hunsberger M, Bammann K, Vanaelst B, Molnar D, Moreno LA, et al. Family structure and childhood obesity: results of the IDEFICS Project. *Public Health Nutr* [Internet]. 2013/09/20. 2014;17(10):2307–15. Available from: <https://www.cambridge.org/core/product/BE6D0655300D5C16CD2F36E2810C11FC>
 70. Stahlmann K, Lissner L, Bogl LH, Mehlig K, Kaprio J, Klosowska JC, et al. Family structure in relation to body mass index and metabolic score in European children and adolescents. *Pediatr Obes* [Internet]. 2022 Dec 1;17(12):e12963. Available from: <https://doi.org/10.1111/ijpo.12963>
 71. Santaliestra-Pasías AM, Moreno LA, Gracia-Marco L, Buck C, Ahrens W, De Henauw S, et al. Prospective physical fitness status and development of cardiometabolic risk in children according to body fat and lifestyle behaviours: The IDEFICS study. *Pediatr Obes* [Internet]. 2021;16(11):e12819. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/ijpo.12819>
 72. Zaqout M, Michels N, Bammann K, Ahrens W, Sprengeler O, Molnar D, et al. Influence of physical fitness on cardio-metabolic risk factors in European children. The IDEFICS study. *Int J Obes* [Internet]. 2016;40(7):1119–25. Available from: <https://doi.org/10.1038/ijo.2016.22>
 73. González-Gil EM, Santaliestra-Pasías AM, Buck C, Gracia-Marco L, Lauria F, Pala V, et al. Improving cardiorespiratory fitness protects against inflammation in children: the IDEFICS study. *Pediatr Res* [Internet]. 2022;91(3):681–9. Available from: <https://doi.org/10.1038/s41390-021-01471-0>
 74. Martinez-Gomez D, Gomez-Martinez S, Ruiz JR, Diaz LE, Ortega FB, Widhalm K, et al. Objectively-measured and self-reported physical activity and fitness in relation to inflammatory markers in European adolescents: The HELENA

- Study. *Atherosclerosis* [Internet]. 2012;221(1):260–7. Available from: <https://www.sciencedirect.com/science/article/pii/S0021915011011798>
75. Mintjens S, Menting MD, Daams JG, van Poppel MNM, Roseboom TJ, Gemke RJJ. Cardiorespiratory Fitness in Childhood and Adolescence Affects Future Cardiovascular Risk Factors: A Systematic Review of Longitudinal Studies. *Sports Medicine* [Internet]. 2018;48(11):2577–605. Available from: <https://doi.org/10.1007/s40279-018-0974-5>
 76. Mpofo JJ, Underwood ; J Michael, Thornton JE, Brener ND, Rico A, Kilmer G, et al. Overview and Methods for the Youth Risk Behavior Surveillance System — United States, 2021 [Internet]. 2021. Available from: <https://www.>
 77. Wu J, Yang Y, Yu H, Li L, Chen Y, Sun Y. Comparative effectiveness of school-based exercise interventions on physical fitness in children and adolescents: a systematic review and network meta-analysis. Vol. 11, *Frontiers in Public Health*. Frontiers Media S.A.; 2023.
 78. Parker N, Atrooshi D, Lévesque L, Jauregui E, Barquera S, Taylor JL y, et al. Physical Activity and Anthropometric Characteristics Among Urban Youth in Mexico: A Cross-Sectional Study. *J Phys Act Health* [Internet]. 2016;13(10):1063–9. Available from: <https://journals.humankinetics.com/view/journals/jpah/13/10/article-p1063.xml>
 79. Piercy KL, Troiano RP, Ballard RM, Carlson SA, Fulton JE, Galuska DA, et al. The Physical Activity Guidelines for Americans. *JAMA* [Internet]. 2018 Nov 20;320(19):2020–8. Available from: <https://doi.org/10.1001/jama.2018.14854>
 80. Global Observatory for Physical Activity (GoPA). 2nd Physical Activity Almanac [Internet]. 2021 [cited 2024 Apr 21]. Available from: <https://ediciones.uniandes.edu.co/reader/2nd-physical-activity-almanac-global-observatory-for-physical-activity-gopa?location=1>
 81. Jiménez-Pavón D, Konstabel K, Bergman P, Ahrens W, Pohlman H, Hadjigeorgiou C, et al. Physical activity and clustered cardiovascular disease risk factors in young children: a cross-sectional study (the IDEFICS study). *BMC Med* [Internet]. 2013;11(1):172. Available from: <https://doi.org/10.1186/1741-7015-11-172>
 82. Andersen LB, Froberg K. Advancing the understanding of physical activity and cardiovascular risk factors in children: the European Youth Heart Study (EYHS). *Br J Sports Med* [Internet]. 2015 Jan 1;49(2):67. Available from: <http://bjsm.bmj.com/content/49/2/67.abstract>

83. Dangardt F, Charakida M, Georgiopoulos G, Chiesa ST, Rapala A, Wade KH, et al. Association between fat mass through adolescence and arterial stiffness: a population-based study from The Avon Longitudinal Study of Parents and Children. *Lancet Child Adolesc Health* [Internet]. 2019 Jul 1;3(7):474–81. Available from: [https://doi.org/10.1016/S2352-4642\(19\)30105-1](https://doi.org/10.1016/S2352-4642(19)30105-1)
84. Jiménez-Pavón D, Ortega FB, Artero EG, Labayen I, Vicente-Rodriguez G, Huybrechts I, et al. Physical Activity, Fitness, and Serum Leptin Concentrations in Adolescents. *J Pediatr* [Internet]. 2012 Apr 1;160(4):598-603.e2. Available from: <https://doi.org/10.1016/j.jpeds.2011.09.058>
85. Katzmarzyk PT, Chaput JP, Fogelholm M, Hu G, Maher C, Maia J, et al. International study of childhood obesity, lifestyle and the environment (ISCOLE): Contributions to understanding the global obesity epidemic. Vol. 11, *Nutrients*. MDPI AG; 2019.
86. Falbe J, Rosner B, Willett WC, Sonnevile KR, Hu FB, Field AE. Adiposity and Different Types of Screen Time. *Pediatrics* [Internet]. 2013 Dec 1;132(6):e1497–505. Available from: <https://doi.org/10.1542/peds.2013-0887>
87. Center for Health Statistics N. Vital and Health Statistics Series 2, Number 184 April 2020: Sample Design and Estimation Procedures Data Evaluation and Methods Research [Internet]. 2015. Available from: <https://www.cdc.gov/nchs/products/index.htm>.
88. Sesé MA, Jiménez-Pavón D, Gilbert CC, González-Gross M, Gottrand F, de Henauw S, et al. Eating behaviour, insulin resistance and cluster of metabolic risk factors in European adolescents. The HELENA Study. *Appetite* [Internet]. 2012;59(1):140–7. Available from: <https://www.sciencedirect.com/science/article/pii/S0195666312001456>
89. Calcaterra V, Cena H, Magenes VC, Vincenti A, Comola G, Beretta A, et al. Sugar-Sweetened Beverages and Metabolic Risk in Children and Adolescents with Obesity: A Narrative Review. *Nutrients* [Internet]. 2023;15(3). Available from: <https://www.mdpi.com/2072-6643/15/3/702>
90. Asigbee FM, Whitney SD, Peterson CE. The Link Between Nutrition and Physical Activity in Increasing Academic Achievement. *Journal of School Health* [Internet]. 2018 Jun 1;88(6):407–15. Available from: <https://doi.org/10.1111/josh.12625>
91. Pereira AR, Oliveira A. Dietary Interventions to Prevent Childhood Obesity: A Literature Review. *Nutrients* [Internet]. 2021;13(10). Available from: <https://www.mdpi.com/2072-6643/13/10/3447>

92. Dumuid D, Wake M, Burgner D, Tremblay MS, Okely AD, Edwards B, et al. Balancing time use for children's fitness and adiposity: Evidence to inform 24-hour guidelines for sleep, sedentary time and physical activity. *PLoS One* [Internet]. 2021 Jan 19;16(1):e0245501-. Available from: <https://doi.org/10.1371/journal.pone.0245501>
93. Wams EJ, Woelders T, Marring I, Van Rosmalen L, Beersma DGM, Gordijn MCM, et al. Linking light exposure and subsequent sleep: A field polysomnography study in humans. *Sleep*. 2017 Dec 1;40(12).
94. Hemmingsson E. Early Childhood Obesity Risk Factors: Socioeconomic Adversity, Family Dysfunction, Offspring Distress, and Junk Food Self-Medication. *Curr Obes Rep* [Internet]. 2018;7(2):204–9. Available from: <https://doi.org/10.1007/s13679-018-0310-2>
95. Zhang Y, Mei H, Xu K, Li C, Xia Z, Tan Y, et al. Association and potential mediators between socioeconomic status and childhood overweight/obesity. *Prev Med (Baltim)* [Internet]. 2021;146:106451. Available from: <https://www.sciencedirect.com/science/article/pii/S0091743521000359>
96. Jo Y. What money can buy: Family income and childhood obesity. *Econ Hum Biol* [Internet]. 2014;15:1–12. Available from: <https://www.sciencedirect.com/science/article/pii/S1570677X14000495>
97. Lee AM, Cardel MI, Donahoo WT. Social and Environmental Factors Influencing Obesity. In 2019. Available from: <https://api.semanticscholar.org/CorpusID:216572055>
98. Smith M, Hosking J, Woodward A, Witten K, MacMillan A, Field A, et al. Systematic literature review of built environment effects on physical activity and active transport – an update and new findings on health equity. *International Journal of Behavioral Nutrition and Physical Activity* [Internet]. 2017;14(1):158. Available from: <https://doi.org/10.1186/s12966-017-0613-9>
99. Chalikavada R, Broder JC, O'Hara RL, Xue W, Gasevic D. The association between neighbourhood walkability and after-school physical activity in Australian schoolchildren. *Health Promotion Journal of Australia* [Internet]. 2021 Apr 1;32(2):182–8. Available from: <https://doi.org/10.1002/hpja.356>
100. Lianbiakl S, Rehman V. Revisiting 42 Years of literature on food marketing to children: A morphological analysis. *Appetite* [Internet]. 2023;190:106989. Available from: <https://www.sciencedirect.com/science/article/pii/S0195666323024510>
101. Davó-Blanes MC, Ortiz-Moncada R, Gil-González D, Álvarez-Dardet C, Lobstein T. The impact of marketing practices and its regulation policies on

- childhood obesity. Opinions of stakeholders in Spain. *Appetite* [Internet]. 2013;62:216–24. Available from: <https://www.sciencedirect.com/science/article/pii/S0195666312004825>
102. POMERANZ JL, CASH SB, MOZAFFARIAN D. US Policies That Define Foods for Junk Food Taxes, 1991–2021. *Milbank Q* [Internet]. 2023 Jun 1;101(2):560–600. Available from: <https://doi.org/10.1111/1468-0009.12652>
 103. Ocaña-Riola R, Saez M, Sánchez-Cantalejo C, Barceló MA, Fernández A, Saurina C. Protocolo de investigación del atlas de mortalidad de las capitales de provincia de Andalucía y Cataluña (proyecto AMCAC). *Rev Esp Salud Publica*. 2005;79(6):613–20.
 104. Tim Olds AS and LELCMMJ. ISAK manual, International standards for Anthropometric Assessment. In 2012.
 105. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: International survey. *Br Med J*. 2000 May 6;320(7244):1240–3.
 106. Ortega FB, Sánchez-López M, Solera-Martínez M, Fernández-Sánchez A, Sjöström M, Martínez-Vizcaino V. Self-reported and measured cardiorespiratory fitness similarly predict cardiovascular disease risk in young adults. *Scand J Med Sci Sports* [Internet]. 2013 Dec [cited 2020 Mar 16];23(6):749–57. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22417235>
 107. Sánchez-López M, Martínez-Vizcaíno V, García-Hermoso A, Jiménez-Pavón D, Ortega FB. Construct validity and test-retest reliability of the International Fitness Scale (IFIS) in Spanish children aged 9-12 years. *Scand J Med Sci Sports* [Internet]. 2015 Aug 1 [cited 2020 Mar 16];25(4):543–51. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24942050>
 108. Lineros-González C, Marcos-Marcos J, Ariza C, Hernán-García M. Importancia del proceso en la evaluación de la efectividad de una intervención sobre obesidad infantil. *Gac Sanit* [Internet]. 2017 May [cited 2019 Oct 8];31(3):238–41. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0213911117300080>
 109. Carles A, Teresa A, Sara V, Gemma S, Albert M, Luis R, et al. Validation of ‘POIBA-How do we eat?’ questionnaire in 9-10 years old schoolchildren. *Food & Nutrition Research* [Internet]. 2017 Oct;61. Available from: <https://foodandnutritionresearch.net/index.php/fnr/article/view/1215>
 110. Sánchez-Martínez F, Torres Capcha P, Serral Cano G, Valmayor Safont S, Castell Abat C ACC y, POIBA G de E del P. Factors Associated with Overweight

- and Obesity in Schoolchildren from 8 to 9 Years Old. Barcelona, Spain. Rev Esp Salud Publica [Internet]. 2016 [cited 2019 Oct 8];90:1–11. Available from: <http://scielo.isciii.es/pdf/resp/v90/1135-5727-resp-90-e40027.pdf>
111. Canadian Society for Exercise Physiology. Canadian 24-Hour Movement Guidelines for Children and Youth 5-17 years. Canadian Society for Exercise Physiology [Internet]. 2018;(December 2014):1–2. Available from: [http://csepguidelines.ca/children-and-youth-5-17/%0Afile:///V:/HALO/HALO Staff/Longmuir/New Literature B/Canadian24HourMovementGuidelines2016.pdf](http://csepguidelines.ca/children-and-youth-5-17/%0Afile:///V:/HALO/HALO%20Staff/Longmuir/New%20Literature%20B/Canadian24HourMovementGuidelines2016.pdf)
 112. Lazaar N, Aucouturier J, Ratel S, Rance M, Meyer M, Duché P. Effect of physical activity intervention on body composition in young children: influence of body mass index status and gender. Acta Paediatr [Internet]. 2007 Sep [cited 2019 Nov 14];96(9):1321–5. Available from: <http://doi.wiley.com/10.1111/j.1651-2227.2007.00426.x>
 113. Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. Arch Pediatr Adolesc Med. 1999;153(4):409–18.
 114. Martínez Vizcaíno V, Salcedo Aguilar F, Franquelo Gutiérrez R, Solera Martínez M, Sánchez López M, Serrano Martínez S, et al. Assessment of an after-school physical activity program to prevent obesity among 9- to 10-year-old children: A cluster randomized trial. Int J Obes. 2008 Jan 12;32(1):12–22.
 115. Waters E, de Silva-Sanigorski A, Burford BJ, Brown T, Campbell KJ, Gao Y, et al. Interventions for preventing obesity in children. Vol. 2011, Cochrane Database of Systematic Reviews. John Wiley and Sons Ltd; 2011.
 116. Spinelli A, Buoncristiano M, Kovacs VA, Yngve A, Spiroski I, Obreja G, et al. Prevalence of severe obesity among primary school children in 21 European countries. Obes Facts [Internet]. 2019 [cited 2020 Sep 7];12(2):244–58. Available from: <https://pubmed.ncbi.nlm.nih.gov/31030201/>
 117. Lombardo FL, Spinelli A, Lazzeri G, Lamberti A, Mazzarella G, Nardone P, et al. Severe obesity prevalence in 8-to 9-year-old Italian children: A large population-based study. Eur J Clin Nutr [Internet]. 2015 May 9 [cited 2020 Sep 8];69(5):603–8. Available from: www.nature.com/ejcn
 118. López-Sobaler AM^a, Cuadrado-Soto E, Peral-Suárez Á, Aparicio A, Ortega RM^a. Importancia del desayuno en la mejora nutricional y sanitaria de la población [Internet]. Vol. 35, Nutricion hospitalaria. NLM (Medline); 2018 [cited 2021 Feb 18]. p. 3–6. Available from: <https://pubmed.ncbi.nlm.nih.gov/30351152/>

119. Szajewska H, Ruszczyński M. Systematic review demonstrating that breakfast consumption influences body weight outcomes in children and adolescents in Europe. *Crit Rev Food Sci Nutr* [Internet]. 2010 Feb [cited 2021 Feb 18];50(2):113–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/20112153/>
120. Monzani A, Ricotti R, Caputo M, Solito A, Archero F, Bellone S, et al. A systematic review of the association of skipping breakfast with weight and cardiometabolic risk factors in children and adolescents. What should we better investigate in the future? [Internet]. Vol. 11, *Nutrients*. MDPI AG; 2019 [cited 2021 Feb 18]. Available from: <https://pubmed.ncbi.nlm.nih.gov/30781797/>
121. Andersen LF, Lillegaard ITL, Øverby N, Klepp KI, Lytle L, Johansson L. Overweight and obesity among Norwegian schoolchildren: Changes from 1993 to 2000. *Scand J Public Health* [Internet]. 2005 [cited 2021 Feb 22];33(2):99–106. Available from: <https://pubmed.ncbi.nlm.nih.gov/15823970/>
122. Kim JH, So WY. Association between frequency of breakfast eating and obesity in Korean adolescents. *Iran J Public Health* [Internet]. 2012 [cited 2021 Feb 22];41(6):50–7. Available from: <http://ijph.tums.ac.ir>
123. Küpers LK, De Pijper JJ, Sauer PJJ, Stolk RP, Corpeleijn E. Skipping breakfast and overweight in 2- and 5-year-old Dutch children—the GECKO Drenthe cohort. *Int J Obes* [Internet]. 2014 [cited 2021 Feb 22];38(4):569–71. Available from: <https://pubmed.ncbi.nlm.nih.gov/24158122/>
124. Ardeshirlarijani E, Namazi N, Jabbari M, Zeinali M, Gerami H, Jalili RB, et al. The link between breakfast skipping and overweight/obesity in children and adolescents: a meta-analysis of observational studies [Internet]. Vol. 18, *Journal of Diabetes and Metabolic Disorders*. Springer; 2019 [cited 2021 Feb 22]. p. 657–64. Available from: <https://pubmed.ncbi.nlm.nih.gov/31890690/>
125. Ministry of Health. The Health of New Zealand Children 2011/12. [cited 2021 Sep 13]; Available from: www.health.govt.nz
126. Nelson M, Neumark-Stzainer D, Hannan P, Sirard J, Story M. Longitudinal and secular trends in physical activity and sedentary behavior during adolescence. *Pediatrics* [Internet]. 2006 Dec [cited 2021 Sep 13];118(6). Available from: <https://pubmed.ncbi.nlm.nih.gov/17142492/>
127. Cappuccio FP, Taggart FM, Kandala NB, Currie A, Peile E, Stranges S, et al. Meta-Analysis of Short Sleep Duration and Obesity in Children and Adults.

- Sleep [Internet]. 2008 May 1 [cited 2021 Sep 13];31(5):619–26. Available from: <https://academic.oup.com/sleep/article/31/5/619/2454190>
128. Chen X, Beydoun MA, Wang Y. Is sleep duration associated with childhood obesity? A systematic review and meta-analysis [Internet]. Vol. 16, Obesity. 2008 [cited 2021 Sep 13]. p. 265–74. Available from: www.obesityjournal.org
 129. Chaput JP, St-Onge MP. Increased Food Intake by Insufficient Sleep in Humans: Are We Jumping the Gun on the Hormonal Explanation? *Front Endocrinol (Lausanne)*. 2014;0(JUL):116.
 130. McDonald L, Wardle J, Llewellyn CH, Fisher A. Nighttime sleep duration and hedonic eating in childhood. *International Journal of Obesity* 2015 39:10 [Internet]. 2015 Jul 20 [cited 2021 Sep 13];39(10):1463–6. Available from: <https://www.nature.com/articles/ijo2015132>
 131. Golley RK, Maher CA, Matricciani L, Olds TS. Sleep duration or bedtime? Exploring the association between sleep timing behaviour, diet and BMI in children and adolescents. *International Journal of Obesity* 2013 37:4 [Internet]. 2013 Jan 8 [cited 2021 Sep 13];37(4):546–51. Available from: <https://www.nature.com/articles/ijo2012212>
 132. Fisher A, McDonald L, van Jaarsveld CHM, Llewellyn C, Fildes A, Schrempft S, et al. Sleep and energy intake in early childhood. *International Journal of Obesity* 2014 38:7 [Internet]. 2014 Mar 26 [cited 2021 Sep 13];38(7):926–9. Available from: <https://www.nature.com/articles/ijo201450>
 133. Ortega FB, Silventoinen K, Tynelius P, Rasmussen F. Muscular strength in male adolescents and premature death: Cohort study of one million participants. *BMJ (Online)* [Internet]. 2012 [cited 2021 Sep 13];345(7884). Available from: <http://www.bmj.com/>
 134. Ortega FB, Ruiz JR, Castillo MJ, Sjöström M. Physical fitness in childhood and adolescence: a powerful marker of health. *International Journal of Obesity* 2008 32:1 [Internet]. 2007 Dec 4 [cited 2021 Sep 13];32(1):1–11. Available from: <https://www.nature.com/articles/0803774>
 135. Ruiz JR, Castro-Piñero J, Artero EG, Ortega FB, Sjöström M, Suni J, et al. Predictive validity of health-related fitness in youth: a systematic review. *Br J Sports Med* [Internet]. 2009 Nov 1 [cited 2021 Sep 13];43(12):909–23. Available from: <https://bjsm.bmj.com/content/43/12/909>
 136. Ruiz-Montero PJ, Chiva-Bartoll O, Baena-Extremuera A, Hortigüela-Alcalá D. Gender, Physical Self-Perception and Overall Physical Fitness in Secondary School Students: A Multiple Mediation Model. *International Journal of Environmental Research and Public Health* 2020, Vol 17, Page 6871 [Internet].

- 2020 Sep 20 [cited 2021 Oct 21];17(18):6871. Available from: <https://www.mdpi.com/1660-4601/17/18/6871/htm>
137. O'Connor EA, Evans C V, Burda BU, Walsh ES, Eder M, Lozano P. Screening for Obesity and Intervention for Weight Management in Children and Adolescents: Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA* [Internet]. 2017 Jun 20;317(23):2427–44. Available from: <https://doi.org/10.1001/jama.2017.0332>
 138. Swinburn B, Malakellis M, Moodie M, Waters E, Gibbs L, Millar L, et al. Large reductions in child overweight and obesity in intervention and comparison communities 3 years after a community project. *Pediatr Obes* [Internet]. 2014 Dec 1 [cited 2021 Sep 13];9(6):455–62. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1111/j.2047-6310.2013.00201.x>
 139. Karppanen AK, Ahonen SM, Tammelin T, Vanhala M, Korpelainen R. Physical activity and fitness in 8-year-old overweight and normal weight children and their parents. <https://doi.org/103402/ijch.v71i017621> [Internet]. 2012 [cited 2021 Oct 21];71(1). Available from: <https://www.tandfonline.com/doi/abs/10.3402/ijch.v71i0.17621>
 140. Doak CM, Visscher TLS, Renders CM, Seidell JC. The prevention of overweight and obesity in children and adolescents: A review of interventions and programmes. Vol. 7, *Obesity Reviews*. 2006. p. 111–36.
 141. Kamath CC, Vickers KS, Ehrlich A, McGovern L, Johnson J, Singhal V, et al. Behavioral interventions to prevent childhood obesity: A systematic review and metaanalyses of randomized trials. Vol. 93, *Journal of Clinical Endocrinology and Metabolism*. Endocrine Society; 2008. p. 4606–15.
 142. Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: An update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. Vol. 10, *Obesity Reviews*. 2009. p. 110–41.
 143. Spruijt-Metz D. Etiology, treatment, and prevention of obesity in childhood and adolescence: A decade in review. *Journal of Research on Adolescence*. 2011 Mar;21(1):129–52.
 144. Atlantis E, Barnes EH, Singh MAF. Efficacy of exercise for treating overweight in children and adolescents: A systematic review. Vol. 30, *International Journal of Obesity*. 2006. p. 1027–40.
 145. McGovern L, Johnson JN, Paulo R, Hettinger A, Singhal V, Kamath C, et al. Treatment of pediatric obesity: A systematic review and meta-analysis of

- randomized trials. Vol. 93, Journal of Clinical Endocrinology and Metabolism. Endocrine Society; 2008. p. 4600–5.
146. Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O'Malley C, Stolk RP, et al. Cochrane review: Interventions for treating obesity in children. *Evid Based Child Health*. 2009 Dec;4(4):1571–729.
 147. Sargent GM, Pilotto LS, Baur LA. Components of primary care interventions to treat childhood overweight and obesity: A systematic review of effect. *Obesity Reviews*. 2011;12(5).
 148. Flynn MAT, McNeil DA, Maloff B, Mutasingwa D, Wu M, Ford C, et al. Reducing obesity and related chronic disease risk in children and youth: A synthesis of evidence with “best practice” recommendations. Vol. 7, *Obesity Reviews*. 2006. p. 7–66.
 149. Whitlock EP, O'Conner EA, Williams SB, Beil TL, Lutz KW. Effectiveness of Primary Care Interventions for Weight Management in Children and Adolescents: An Updated, Targeted Systematic Review for the USPSTF [Internet]. Agency for Healthcare Research and Quality (US), Rockville (MD); 2010. (U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews). Available from: <http://europepmc.org/books/NBK36416>
 150. Lavelle H V., MacKay DF, Pell JP. Systematic review and meta-analysis of school-based interventions to reduce body mass index. *Journal of Public Health (United Kingdom)*. 2012 Aug;34(3):360–9.
 151. Seo YG, Lim H, Kim Y, Ju YS, Lee HJ, Jang HB, et al. The Effect of a Multidisciplinary Lifestyle Intervention on Obesity Status, Body Composition, Physical Fitness, and Cardiometabolic Risk Markers in Children and Adolescents with Obesity. *Nutrients* [Internet]. 2019;11(1). Available from: <https://www.mdpi.com/2072-6643/11/1/137>
 152. Neil-Sztramko SE CH, Dobbins M. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. *Cochrane Database of Systematic Reviews* [Internet]. 2021;(9). Available from: <https://doi.org/10.1002/14651858.CD007651.pub3>
 153. Ariza C, Sánchez-Martínez F, Serral G, Valmayor S, Juárez O, Pasarín MI, et al. The Incidence of Obesity, Assessed as Adiposity, Is Reduced After 1 Year in Primary Schoolchildren by the POIBA Intervention. *J Nutr* [Internet]. 2019;149(2):258–69. Available from: <https://www.sciencedirect.com/science/article/pii/S0022316622165363>

154. Sánchez-Martínez F, Brugueras S, Serral G, Valmayor S, Juárez O, López MJ, et al. Three-Year Follow-Up of the POIBA Intervention on Childhood Obesity: A Quasi-Experimental Study. *Nutrients* [Internet]. 2021;13(2). Available from: <https://www.mdpi.com/2072-6643/13/2/453>
155. Ardoy DN, Fernández-Rodríguez JM, Jiménez-Pavón D, Castillo R, Ruiz JR, Ortega FB. A Physical Education trial improves adolescents' cognitive performance and academic achievement: the EDUFIT study. *Scand J Med Sci Sports* [Internet]. 2014 Feb 1;24(1):e52–61. Available from: <https://doi.org/10.1111/sms.12093>
156. Daniel N. Ardoy, Juan M. Fernández-Rodríguez, Palma Chillón, Enrique G. Artero, Vanesa España-Romero, David Jiménez-Pavón, et al. Physical fitness enhancement through education, EDUFIT study: background, design, methodology and dropout analysis. *Rev Esp Salud Publica* [Internet]. 2010 May;84:151–68. Available from: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1135-57272010000200004&nrm=iso

ANNEXES

ANNEX I: Manuscript of Study I: A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ”










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Study Protocol

A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ”

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Abstract: This paper describes the protocol for a study designed to address the high prevalence (40%) of childhood overweight and obesity in the province of Cádiz, Spain, as a reflection of what is happening worldwide. It is widely known that children who suffer from childhood obesity have a higher risk of developing chronic diseases in adulthood. This causes a decrease in the quality of life and an increase in health spending. In this context, it is necessary to intervene promoting healthy lifestyle habits from an early stage. The objective of this project will be to evaluate the effectiveness of a multimodal intervention (individual, school and family) called “PREVIENE-CÁDIZ” [CADIZ-PREVENT]. The intervention will be focused mainly on diet, physical activity, sedentary lifestyle and sleep, to prevent overweight and obesity in schoolchildren from 8 to 9 years old in the province of Cádiz. It will consist of a 10-session education program carried out in the classroom by the teachers. In addition, children will be assigned two workbooks, one to work on in class and the other at home with parents. A workshop aimed at parents will be included to help teach them how to obtain healthier lifestyle habits. The proposed study will involve a quasi-experimental design with a control group.

Keywords: pediatric obesity; primary prevention; health behavior; eating behavior; physical activity; sedentary behavior; sleep; multimodal intervention

1. Introduction

The World Health Organization (WHO) considers obesity to be a problem or main issue of concern for public health today in the developed world, due to the high prevalence

of this disease in these countries and all the problems it causes. Together with the International Obesity Task Force (IOTF), obesity has been classified as the epidemic of the 21st century [1,2]. The prevalence of this epidemic has increased in Spain by three to four times in the last 20 years and has not only caused a strong impact on chronic diseases, but also on health spending and the quality of life of the population [3]. Moreover, estimates have been made [4] that by 2050, obesity rates in countries of the Organization for Economic Co-operation and Development (OECD) may affect 60% of men, 50% of women and 25% of children.

In a recent study that evaluated the levels of severe obesity in child populations (6–10 years) of 21 European countries, a conclusion was made that it presented a major public health problem for a large number of countries, especially relevant in Bulgaria, Greece, Italy and Spain. This higher prevalence of obesity in southern European countries has been demonstrated in previous research [4,5], estimated at more than 40%. When the prevalence of obesity in these countries is studied specifically (Italy [6], Greece [7] or Spain), the data are confirmed. Particularly in Spain, the Aladdin study [8], which was carried out between November 2015 and March 2016, found for this age group a percentage of 39.3% with overweight or obesity. Of this percentage, 23.2% suffered overweight and 16.1% obese. The obesity was more frequent in boys than girls.

Within Spain, the province of Cádiz (Southwest) has the highest prevalence of overweight and obesity (35% children aged 6–12 years) compared to the rest of Spain, which constitutes a serious health problem in the province that has been increasing in recent years [9]. Researchers from the Andalusian School of Public Health [10] reported a similar prevalence of overweight and obesity (37%) in children aged 8–9 years in Granada (Southeast Spain). This data confirms the need to develop and reinforce public health policies that reduce these numbers.

In the general population, obesity increases the risk of numerous diseases such as diabetes, high blood pressure, dyslipidemia, cardiovascular diseases, some types of cancer, musculoskeletal disease, obstructive sleep apnea, and fatty liver disease [11–14]. Life expectancy for 40 year old people who suffer obesity is seven years less than that of one without excess weight [15]. Similarly, obesity in children and adolescents is associated with a higher prevalence of various disease risk factors, such as pre-diabetes, increased blood pressure, accumulation of cholesterol in the arteries, increased oxidative vulnerability and sleep disorders [16–20], increased risk of excess body weight and related diseases in adulthood [21,22]. Excess body weight is also associated with lower self-esteem and higher levels of anxiety and depression, thus reducing well-being and quality of life [20]. Similarly, a study carried out in a sample of children aged 2–9 years in eight European countries found that children who were overweight had an increased risk of poor health-related quality of life.

Due to all the problems associated with obesity that have been described in the previous paragraph, it is urgent to detect and solve this disease in the early stages of life, both to protect the general health of the population as well as to promote lifelong engagement of healthy lifestyle behaviors [23]. Children mostly depend on their family, school, health services or social institutions to acquire relevant knowledge and skills to grow into healthy adults [24]. The important influence of the environment that surrounds the child (socioeconomic, educational level, etc. of the parents) on the healthy habits of the child has been shown in numerous studies [25–27]. The study conducted by Spinelli et al. [25], shows that children with parents with low and medium levels of education constitute a significant risk to suffer overweight or obesity. Children whose mothers had only primary or secondary levels of education, had a higher prevalence of severe obesity than children whose mothers had high levels of education. In the province of Cádiz, the sociocultural level is low for 25% of the adult population, as reflected in a study carried out by this research group, where the educational, employment and socioeconomic level of the adult population from the province of Cádiz was analyzed [28]. Due to this, an educational

intervention based on health promotion is proposed, since this type of interventions allows individuals to overcome these inequalities, reaching children of all socioeconomic levels.

A Cochrane review [29] analyzed 37 studies focused on boys and girls between the ages of 6 and 12 years old. They evaluated interventions focused on behavior change in school settings. They concluded that the impact of the interventions translated into a reduction in BMI of 0.15 kg/m² in the aforementioned age group. The authors recommended that the school curriculum was reinforced, including content on healthy eating, nutritional balance, a higher level of physical activity and personal self-image. In addition, they claimed greater support from educational personnel to achieve the goals.

It has been concluded in previous studies that the school environment is the most appropriate place for the development of strategies aimed at reducing childhood overweight/obesity, especially when the family is involved [30]. Interventions in school settings have been suggested to represent a marked improvement in terms of public health, and future interventions involving children and parents jointly are recommended [31].

Also, the duration and design of the study have also been considered in various studies, suggesting a minimum duration of six months to assess changes in lifestyle habits [31], thus our intervention will last six months. In addition, performing the intervention in a school year will allow the sample to be obtained and minimize the possibility of abandonment, as previously described [32,33]. Similarly, quasi-experimental designs or clinical trials have been suggested as the most appropriate approaches for this type of study [34].

Martínez-Vizcaíno et al. [35] have shown changes in the proportion of body fat in nine-year-old schoolchildren by means of the implementation of an extracurricular program of non-competitive physical activity. Ávila-García et al. [36] analyzed interventions for the promotion of eating habits and physical education in Spanish primary school students, identifying only seven publications that met the inclusion criteria, which shows the scarcity of research in this area. In this review, it was concluded that half of the studies showed positive changes in the improvement of body composition, and all had a positive effect regarding eating habits and on an increase in physical activity. Greater family involvement was suggested as a potential factor to improve these results, as family involvement was low in all studies.

In order to shed light and evidence on possible strategies to tackle this global health problem, with special interest in young people, the project entitled "Prevention of overweight and obesity among school children in the province of Cádiz: a quasi-experimental study of the effectiveness of a multimodal intervention "PREVIENE-CÁDIZ" [CADIZ-PREVENT] is proposed. The general objective of the study will be to evaluate the effectiveness of the multimodal intervention (individual, family and school) focused on food-related lifestyle habits, physical activity, sedentarism and sleep time, to prevent overweight and obesity in school-aged children (8–9 years) in the province of Cádiz. The main hypothesis of the study is that the intervention will improve eating habits, increase levels of physical activity, reduce screen time and increase sleeping hours of parents and children, as well as reduce the prevalence of overweight and obesity of schoolchildren aged eight to nine years in the province of Cádiz in the long term.

2. Materials and Methods

2.1. Study Design and Participants

The current study will have a quasi-experimental design with a control group, which will be target children enrolled in third grade of primary education from 26 schools of the province of Cádiz. The inclusion criteria that will be used will be: children belonging to the selected school, who are in the third grade of primary school, regardless of their age, who have the informed consent signed by their parents or legal guardians, who respond to the questionnaires and who undergo to the anthropometric measurements. The exclusion criteria will be that these requirements are not met.

The total number of study participants will be between 850 and 900 children. The parents of each schoolchild will be part of that same subject (father, mother and child are the

same subject of study). The sample will be divided into two groups, the intervention group and the control group. The intervention group will contain around 450 schoolchildren and will be made up of 13 of the 26 school centers which will participate in the study. In this group, pre-intervention measurements will be performed, which will be explained later. A multimodal intervention will be developed, which will also be explained in detail later. Finally, post-intervention measurements will be made, which will be the same as the pre-intervention measurements. The control group will also contain around 450 schoolchildren and will be made up of the others 13 school centers which will participate in the study. It will be made up of the same number of schoolchildren. The difference with respect to the intervention group will be that the control group will not receive any educational intervention. Only the pre- and post-intervention measurements will be taken, to later compare the results with the intervention group and find out if an effect has emerged or not.

The province of Cádiz will be divided into four areas: Campo de Gibraltar (six schools), Jerez-Costa Noroeste (five schools), Sierra de Cádiz (nine schools) and Bahía de Cádiz-La Janda (six schools) (Figure 1). In each area, there will be between 200 and 300 participants and school centers belonging to both the intervention group and the control group. This division will be made to have a sample that is as representative as possible of the entire province of Cádiz.



Figure 1. Geographical representation of the 4 study areas in the province of Cádiz.

Both the selection of schools participating in the study and the assignment of them to the experimental group or control group will be made randomly from the list of public schools of the Cádiz Education Delegation. These randomizations will be carried out taking into account the schools belonging to each of the geographical areas in which the province of Cádiz will be divided, the socioeconomic condition of the population served, which will be determined from the Material Deprivation Index (MDI) of the section of the census in which the school is located [37], and the number of classes or corresponding lines of

each center belonging to that age group. Randomization will be carried out in groups by schools, not individually.

The group of schoolchildren will constitute the first level of analysis, and the schools will be the second level. This target population (children 8–9 years) has been selected due to the need to detect and solve the problem of childhood obesity in early stages to promote healthier lifestyle habits, and thus achieve health benefits that allow correct weight management from childhood until adulthood, and because, at this age, children are very receptive to receiving information that implies changes in habits [23].

The project, which is 80% co-financed by funds from the Andalusian Operational Program FEDER (European Regional Development Fund) 2014–2020, will conduct in accordance with the Declaration of Helsinki. The protocol has been approved by the Andalusian Biomedical Research Ethics Committee, along with approval from the Delegation of Education and Science of the province of Cádiz (PI-0007-2017, 21 March 2018). In order to guarantee this right, the guarantees of confidentiality of the data will be specified in writing to each family, by means of a letter explaining the objectives of the study, requesting their collaboration and the signed consent of participation, as well as the anonymization of the data. Participation will be voluntary and the collection of information from children will be done by the research team at the school. The questionnaires will be answered in the classroom, and a more intimate space available to the school will be used to carry out the anthropometric measurements, such as a support room, the morning classroom, the library or the gym. Schoolchildren who do not have the informed consent signed by their parents or legal guardians will not participate in the study. These schoolchildren who do not participate in the study and belong to the schools of the intervention group will receive the educational component of the intervention but will not undergo to the pre and post intervention evaluations. And the schoolchildren who do not participate in the study and belong to schools of the control group will not undergo to the pre and post intervention evaluations and of course no intervention. The data obtained in this study will be confidential and will be treated in accordance with Organic Law 3/2018, of December 5, on the Protection of Personal Data, Regulation (EU) 2016/679 of the European Parliament and of the Council, of 27 of April 2016 (General Data Protection Regulation), and in accordance with the official document of the Andalusian School of Public Health on the protection of personal data.

2.2. Calculation of the Sample Size

To determine the effectiveness of the intervention on the prevalence of overweight and obesity, the sample size necessary to test hypotheses has been calculated, comparing two proportions. We will compare the percentage of overweight and obesity of schoolchildren before and after the intervention in both groups (intervention and control) (paired data) and inter-group (independent data). In our case, for an estimated difference of proportions of 9% (35% vs. 26%) with a confidence level of 95% and a power of 80%, the minimum sample size required is 410 subjects in each group (intervention and control), which makes a total of 820 subjects. For the calculation of the sample, after reviewing the results obtained by different studies carried out in our environment, it has been assumed an estimated prevalence of overweight and obesity of a 35%, which was found by Villagrán et al. (2013) [9] in a population of Cádiz similar to that of this study.

2.3. “PREVIENE-CÁDIZ” [CADIZ-PREVENT] Intervention Protocol

The “PREVIENE-CÁDIZ” [CADIZ-PREVENT] intervention (S1) will have a multi-modal nature and will be aimed at schoolchildren, their families and schools. The intervention activities/sessions will be implemented by the teachers at the school centers. The research team will train those teachers to implement the program, and parents in a face-to-face session, but not schoolchildren. To achieve this, before implementing the intervention, the management teams and teachers of the intervention group will receive training sessions managed by the CEP (Center for Teacher Education) of Cádiz from the research team.

These sessions will last 10 classroom hours and will be aimed at updating knowledge on promoting healthy lifestyle habits (healthy eating, promoting physical activity, reducing sedentary lifestyle, the importance of sleep and promoting health based on resources). Moreover, the sessions will be addressed for the teaching context, and they will show how to use the tools available to implement the intervention. All the information covered will be made available to the teaching staff through the “Moodle” virtual tool that will allow the research team and teaching staff to be in permanent contact to resolve any possible doubts. There will also be chat tools for management teams and research teams.

The intervention will be implemented in three settings: classroom, family and school. See the description of each setting below.

2.3.1. In the Classroom (Implemented on the Children and Conducted by the Teachers)

It will be a unit of ten health education sessions which will be carried out in the classroom for six months. The teachers in charge of imparting these ten sessions to schoolchildren during the six months will be free to organize the periodicity with which each session is taught, to make it easier for them to combine it with the rest of the content they have to teach. The unit will encompass healthy eating, physical activity habits, reducing sedentary lifestyle and increased sleep, with content based on the healthy eating and physical activity strategies. This content will include (a) nutrition and healthy components of diet and physical activity and the damages of sedentary lifestyle; (b) promotion of the importance of physical activity and participation in sports and recreational activities; (c) review and reduction of the number of weekly hours of sedentary habits; (d) reinforcement of self-concept and body image; (e) importance of sleep and benefits of proper rest; (f) awareness and use of available resources that promote the acquisition of healthy lifestyle habits (Photovoice). Ten sessions will be conducted (Table 1), led by teachers and physical education teachers.

Table 1. “PREVIENE-CÁDIZ” [CADIZ-PREVENT] intervention sessions aimed at schoolchildren.

Sessions	Objectives
Session 1 Our development	To recognize weight and height as signs of development.
Session 2 Let’s assess	To recognize and accept one’s own physical appearance and that of others.
Session 3 Our digestion	To get to know the digestive tract and its functions; to practice dietary hygiene habits.
Session 4 Food groups	To get to know the food groups and how to differentiate them according to their origin.
Session 5 Nutrients and their functions	To get to know nutrients and their functions.
Session 6 The food pyramid and exercise	To get to know the primary recommendations for eating and exercising; to show skills associated with these recommendations.
Session 7 The best breakfast	To identify content and quantities of a health breakfast; to experiment how breakfast can be attractive and desirable.
Session 8 Physical activity and sleep	To Improve health habits of physical activity, sleep and eating.
Session 9 Review and synthesis	To integrate physical activity, sleep and healthy eating into habits.
Session 10 Photovoice	To identify, to become aware and to use the health resources readily available.

Table adapted from the “Previene” [Prevent] study carried out in Granada [10].

The teachers' role during the intervention will be planning the timing and distribution of the sessions to be given, as well as conducting these sessions and promoting positive attitudes and opinions regarding food, healthy physical activity, reduction of sedentary lifestyle, and the importance of sleep and use of resources/assets for health available to students. In addition, the Physical Education teachers will promote an activity to improve adherence to physical activity during "Active Recess" breaks.

2.3.2. At the Family Level (with Parents or Caregivers)

The intervention in families will be carried out in three ways: through workshops aimed at parents or caregivers in schools, which will be led by members of the research team based on everyday situations with graphic and audiovisual material. Through a workbook, which will be given by the teachers to the school children, with which parents and children will work together at home to deepen the content of the intervention that the schoolchildren will be seeing in class with the teachers. And through the Photovoice activity, which will consist of taking two photos (jointly at home or outdoors by parents/caregivers and children) one of a resource that encourages healthy eating and another resource that encourages healthy physical activity. Once each child has taken the two photos, they will take them to school and share it, so that all children become aware of the resources they have around them to improve their diet and to promote practice of physical activity. This activity will be explained in detail later.

The workshops aimed at parents given by the research team will take place during one afternoon per school. They will consist of providing parents with skills and strategies to obtain improvements in eating habits, promote healthy meals through cooking workshops, promote the use of health assets available to families, improve the organization and distribution of their children's free time and improve their children's sleep habits. This will help children to reduce sedentary habits at home, to increase the practice of sports, recreational and active leisure activities, to improve their eating habits at home and to achieve adequate sleep habits. Table 2 shows how the workshops will be developed and what content each of them will include.

Table 2. Development of workshops aimed at parents or caregivers.

Workshops	Length	Content	Materials
Healthy eating workshop	45 min	Macronutrients (carbohydrates, fats and proteins) Micronutrients (minerals and vitamins) Nutrition labeling Developing a healthy monthly menu	Graphic and audiovisual media
Healthy cooking workshop	45 min	Making healthy bread: the recipe for healthy bread will be given to parents and the bread will be made in front of them so they can see how it is made. They will take a previously prepared bread so they can taste it. Making healthy cookies: parents will be given the recipe for healthy cookies and cookies will be made in front of them so they can see how they are made. Pre-made cookies will be taken so they can try them.	Two glass bowls A whisk
Healthy lifestyles workshop	45 min	What is physical activity? Benefits of healthy physical activity Tricks to increase the time of healthy physical activity Harms of sedentary lifestyle Tricks to reduce sedentary lifestyle Planning of free or leisure time	Graphic and audiovisual media
Workshop on assets/resources available to improve health	45 min	Current health concept What are assets for health? What resources/assets for health exist? Resources/assets for health that we have at our disposal Motivation to improve our health status	Graphic and audiovisual media

The decision has been made to concentrate all the information in a single afternoon due to the difficulty that parents/caregivers will have to attend school for 3 h in a row, since most of them will work or have obligations and cannot be attending school frequently. In this way, as it is only one day, we will ensure that many more parents attend, that they pay more attention and successfully understand the material. In addition, the information that we intend to give them is not too extensive, so we believe that it can be covered in a single afternoon (3 h). Above all, our intention is to explain what the intervention will consist of, give them basic information on healthy eating, activity physical activity, reduction of sedentary lifestyle and sleep habits, and explain what the exercise booklet and the Photovoice activity consist of, so that they can later spend more time working at home or outdoors with their children.

The role of parents/caregivers during the implementation of the intervention will be to attend the workshops proposed by the research team, to acquire the knowledge that they will later have to share with their children, complete the workbook with them and complete the Photovoice activity. In addition, they will have to encourage healthy eating at home, healthy physical activity, the reduction of sedentary lifestyle and the importance of sleep.

In the case that a family cannot attend the workshop given by the research team, the audiovisual material exhibited in the workshop will be shared with that family. All the information that will be given to the families in the workshop will be summarized in the audiovisual material. Moreover, if any family wants to remember a concept that has been worked on in the workshop, the school will have this material available and will share it to all participating families digitally. In addition, they will be provided with a document through the school in which the nutrition part and the healthy recipes that will be worked on in the healthy cooking workshop will be summarized. This document will be the same that will be provided to families in the workshop. With all this material, families who cannot attend the workshop will be able to acquire sufficient knowledge to successfully exercise their role within the intervention.

2.3.3. At the School Level (with Teachers and the Management Team of the Schools)

In addition to the implementation of the health education unit previously described at the individual level, the intervention in the school environment will involve the main teachers of the participating classrooms, as well as the Physical Education teachers of the centers involved. They will be given training and a guide for teachers will be provided. Moreover, (as indicated in the previous section), the teachers will provide the schoolchildren with a workbook so that they can carry out recreational activities with the family in their time outside of school. Teachers will monitor whether these activities are carried out by reviewing the workbook and, if necessary, by contacting parents. Once the intervention period is over, all participating schools (both those in the intervention group and those in the control group) will be given a report of results and sample teaching guides that they can implement if they wish in subsequent courses.

2.4. Procedures and Assessments

2.4.1. Participation of the Schools in Health Promotion Activities

Before the intervention, a questionnaire (S10) created by the research team will be administered to the directors, management teams or teachers of each center. This questionnaire will be used to collect information on whether or not the center currently participates in other health promotion programs, type of program, activities carried out, time spent, among other issues. It is necessary because participation or not in any health promotion program or activity can condition the results of this study. No school will be excluded from the study if it participates in a health promotion program, regardless of whether it belongs to the intervention group or the control group. What will be done, when the analysis is carried out, will be a differentiation into several categories, taking into account

in a differentiated way the centers that participate in some of these programs from centers that do not.

2.4.2. Sociodemographic and Socioeconomic Information

Two questionnaires (S2 and S4) will be used to record the sociodemographic and socioeconomic information of both schoolchildren and family members. The questionnaire administered to schoolchildren (S2) will include questions about the number of people they live with at home, who they live with, among others. The questionnaire addressed to parents (S4) will include questions related to the place of birth, educational level, employment situation and occupation, income level, among others. In this way, the sociocultural situation of each participating family will be assessed.

This information will be recorded both before and after the intervention. Before, in the pre-intervention measurements, which will be carried out during the two months before starting the intervention. And later, in the post-intervention measurements, which will take place during the two months after the intervention.

These questionnaires have been adapted from the study “Previene” [Prevent] carried out in Granada [10] and the study “Prevention of childhood obesity in Barcelona” (POIBA) carried out in Barcelona [38], since our project is based on the experiences of these previous studies. The results of the study carried out in Granada have not yet been published, so it is not yet known whether the intervention was effective or not. In the case of Barcelona, the Public Health Agency has published results of the intervention [38], showing that the program is capable of preventing one out of every 3 new cases of childhood obesity, improving eating frequency and behavior, practicing physical activity, habits sedentary and knowledge.

As a result of these interventions, certain aspects will be corrected and the present one will be improved. The main differences will be that in “PREVIENE-CÁDIZ” [CADIZ-PREVENT] more variables will be included in the pre- and post-intervention measures (evaluation of physical activity, physical condition, sedentary lifestyle, breastfeeding, type of childbirth and birth weight). The intervention will be improved, including activities such as “Photovoice”, which will be explained later. Two tools will be included to improve the evaluation of the satisfaction/reaction of schoolchildren, family members, teachers and management teams. These tools will be the “World Cafe”, which will be explained in detail later, and a questionnaire for teachers and management teams. All these aspects were not considered in the previous interventions and have been considered relevant by the research team to include them in this one.

2.4.3. Anthropometric Measurements

Measurements will be taken both before and after the intervention by previously trained research team members, following the standardized International Society for the Advancement of Kinanthropometry (ISAK) procedure [39]. ISAK is an international society dedicated to the study of kinanthropometry, which has created an internationally standardized procedure for taking anthropometric measurements of children and adults.

Body weight will be measured with a mechanical scale sensitive to 100 g (SECA Colorata 760, Hamburg, Germany). Height will be measured using a portable stadiometer with a precision of 0.1 cm (SECA 213, Hamburg, Germany). Body Mass Index (BMI) will be calculated as weight in kilograms divided by height in meters squared and will be used to determine the level of overweight or obesity. If the BMI of the students is between 18.44 and 19.84 according to Cole’s cut-off points [40], they will be considered to be overweight. If the BMI is between 21.60 and 24.00 [40], they will be considered obese. In addition to this formula, the BMI will also be calculated by estimating the percentiles according to their age based on the World Health Organization recommendations.

The skinfold thickness of the triceps and subscapularis will be measured with a caliper with a precision of 0.2 mm (HOLTAIN DIM-98.610ND, London, UK) and will be used to estimate both the percentage of fatty tissue and muscle tissue. For the calculation of

the percentage of fatty tissue, the regression equation proposed by Boileau, Lohman and Slaughter [41] will be used. The skinfold thickness of the triceps will also be used as an indicator (proxy) of obesity, considering values greater than 20 mm as obesity, with a sensitivity of 0.79 for the age range of our study [42]. Furthermore, the waist and hip circumferences will be measured with a 1 mm precision tape measure (SECA 201, Hamburg, Germany) and the waist-hip ratio will be calculated. In addition, the waist/height ratio will be calculated as an indicator related to childhood obesity [43].

2.4.4. Self-Reported Physical Fitness

The self-reported physical fitness of children (S5) and parents (S6) will be registered using The International Fitness Scale (IFIS), previously validated [44,45], before and after the intervention. This scale evaluates both overall physical condition as well as each one of its primary components specifically: cardiorespiratory fitness, muscular strength, speed-agility and flexibility.

2.4.5. Physical Activity and Screen Time

Physical activity and screen time will be recorded by means of a self-report by the schoolchildren (S3) and observation of the parents using a built-in questionnaire (S4) from the one used in the “Previene” [Prevent] study in Granada [10]. Information will be collected on the amount of physical activity and screen time (TV, computer, video games . . .) of schoolchildren both before and after the intervention. In addition, the knowledge, attitudes and beliefs about physical activity, sports and sedentary lifestyle presented by both students and families will be evaluated.

2.4.6. Diet

The daily/weekly consumption of processed baked goods, fried foods, snacks, sugary soft drinks, fruits, vegetables, packaged juices, sandwiches, dairy products, carbohydrates, meat, cold cuts, fish, and vegetables, among others, will be recorded through questionnaires [10] applied to schoolchildren (S2) and family members (S4) both before and after the intervention. In addition, the knowledge/beliefs about food and diet of schoolchildren and relatives, and the use of the school canteen and its evaluation [10] will be assessed. Schoolchildren will answer questions about all of these variables about themselves, and parents will answer both about themselves and about their children.

2.4.7. Sleep, Overall Health, Feelings and Emotions

Schoolchildren’s daily hours of sleep, both for Monday to Friday as well as for weekends, will be recorded through questionnaires (S3 and S4) adapted from those used in the “Previene” [Prevent] study in Granada [10]. Parents will be asked about their children before and after the intervention. Parents will have to register the time their children normally go to bed and get up. Furthermore, the general health status, feelings and emotions of the students will be recorded using a specific questionnaire (S3) also adapted from the “Previene” [Prevent] study [10] applied before and after the intervention.

2.4.8. Health Resources

Health resources will be evaluated using the Photovoice qualitative technique [46]. This technique will consist of taking two photographs, one of a resource that encourages healthy eating and the other from a resource that encourages healthy physical activity. Once each family identifies two health resources, the students will return to work on it in the classroom, which means that this activity will involve two sessions in the classroom and at least one with the family. This technique will be used for a dual purpose: (1) to identify the main health resources/assets related to physical activity and diet available to families in the environment of each school; (2) for educational purposes, as this technique will be part of the activities of the intervention, with which it is intended that both schoolchildren and

family members identify, become aware of and promote the use of previously identified resources/assets.

2.4.9. Breastfeeding, Childbirth Type and Birth Weight

The characteristics of breast milk intake, type of delivery and birth weight will be recorded after the intervention using a questionnaire for parents (S7), which has been created by the research team based on the information from the scientific literature determined as important about these variables related to childhood obesity [47–51].

2.4.10. Participant Satisfaction/Reaction and Adherence to the Intervention

Once the intervention has been carried out, the participants will be asked about their perception of the program, the main health resources that have been discovered or identified, the strengths and weaknesses of the intervention and any aspects to be improved. The research team will record the answers to these questions to assess the adherence of the participants to the intervention, including children's adherence, caregivers' adherence and teachers' adherence.

These aspects will be studied using two different activities. First, a qualitative technique called "World Cafe" [52] which will consist of gathering a sample of the participating agents (teachers, management teams, parents and schoolchildren) and dividing them into three different groups: (1) teachers and management team, (2) parents, and (3) schoolchildren. Each of the groups will be accompanied by someone from the research team, who will act as a moderator of the table, guiding the conversation through a script of semi-structured questions.

There will be 3 rounds and two changes. Each round will consist of having a conversation between the members of each group about the questions of the semi-structured script. Once all questions in the first-round semi-structured question script are completed, there will be a change. This change will consist in that a member of group 1 will go to group 2, a member of group 2 to group 3 and a member of group 3 to group 1. In this way all groups will have a new member of another group, and it will start a new round following the script of semi-structured questions. Once this round is completed there will be another change, but this time a member of group 1 will go to group 3, a member of group 2 to group 1, and a member of group 3 to group 2, to get each group to have at least one member from each one of the 3 groups, to achieve a multi-group exchange of ideas. Then the last round will begin again following the semi-structured question script, and once it is finished, the main ideas that have emerged from the conversation will be shared. A member of the research team, who will act as moderator of the session, will be in charge of making the decision of when to change rounds and of making the changes.

The aim of this technique will be to know the satisfaction of the participants with respect to the intervention, and also to assess the adherence to the intervention. It will be intended to know if the intervention has achieved real change in the home of the schoolchildren regarding better eating habits, increased levels of physical activity, reduction of sedentary lifestyle and sleep improvement (children's adherence and caregivers' adherence), and also to know how the program has gone in the schools (teachers' adherence).

Qualitative methodology will be used for the analysis of the World Cafe interviews. A content analysis will be carried out on all the information obtained. Both the verbal information (of which an exhaustive transcription will be made), the reports of the table coordinators, the photographic images, as well as the written and iconographic material generated. The development of the sessions, the moment, context and origin of the ideas that arise will always be taken into account. When considering the World Cafe as a semi-structured group interview technique, opinions on development and general effectiveness, the health assets that have been identified, the main strengths and the elements that should be improved in the program will be studied, but within a flexible framework in which all emerging elements will be considered.

Secondly, in addition to the World Cafe, in order to know the satisfaction/reaction and adherence to the intervention of teachers and management teams, a questionnaire will be administered to teachers (S9) and management teams (S8) participating in the study. They will be asked about the development/implementation of the program (whether they carried it out or not, time spent in developing it, dynamics, etc.), as well as if they have modified or supplemented it, and any possible proposals for improvement. These questionnaires will be designed by the research team of this study.

Table 3 lists all the measurements that will be collected, the tools with which they will be measured, and when they will be measured.

Table 3. Measures that will be collected in the study.

Measure/s	Tool/s	Measurement Time
Participation of the schools in health promotion activities	Questionnaire addressed to directors, management team or teachers Name: Questionnaire—Cádiz Prevent Program: Directors—Management teams—Teachers (S10) Number of items: 6 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38]	Within 6 months before the intervention
Sociodemographic and socioeconomic information	Questionnaire addressed to schoolchildren Name: How we eat (S2) Number of items: 8 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38] Questionnaire addressed to family or legal guardians Name: Families. How we eat and move (S4) Number of items: 11 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38]	Pre intervention measurements: within 2 months before the intervention and post intervention measurements: within 2 months after the intervention
Anthropometric measurements	Body weight: mechanical scale sensitive to 100 g (SECA Colorata 760, Hamburg, Germany) Height: portable stadiometer with a precision of 0.1 cm (SECA 213, Hamburg, Germany) Triceps skinfold thickness and subscapular skinfold thickness: caliper with a precision of 0.2mm (HOLTAIN DIM-98.610ND, London, England) Waist and hip circumference: tape measure with a precision of 1mm (SECA 201, Hamburg, Germany)	Pre intervention measurements: within 2 months before the intervention and post intervention measurements: within 2 months after the intervention
Self-reported physical fitness	Questionnaire addressed to schoolchildren Name: International Fitness Scale (IFIS) (Children version) (S5) Number of items: 5 Reference: PROFITH research group, Granada, Spain [44] Questionnaire addressed to family or legal guardians Name: International Fitness Scale (IFIS) (Adults version) (S6) Number of items: 5 Reference: PROFITH research group, Granada, Spain [45]	Pre intervention measurements: within 2 months before the intervention and post intervention measurements: within 2 months after the intervention
Physical activity and screen time	Questionnaire addressed to schoolchildren Name: How we move and feel (S3) Number of items: 17 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38] Questionnaire addressed to family or legal guardians Name: Families. How we eat and move (S4) Number of items: 15 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38]	Pre intervention measurements: within 2 months before the intervention and post intervention measurements: within 2 months after the intervention

Table 3. Cont.

Measure/s	Tool/s	Measurement Time
Diet	<p>Questionnaire addressed to schoolchildren Name: How we eat (S2) Number of items: 56 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38]</p> <p>Questionnaire addressed to family or legal guardians Name: Families. How we eat and move (S4) Number of items: 91 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38]</p>	Pre intervention measurements: within 2 months before the intervention and post intervention measurements: within 2 months after the intervention
Sleep, overall health, feelings and emotions	<p>Questionnaire addressed to schoolchildren Name: How we move and feel (S3) Number of items: 22 Reference: modified from the intervention carried out in the study “Previene” [Prevent] from Granada [10] and POIBA from Barcelona [38]</p>	Pre intervention measurements: within 2 months before the intervention and post intervention measurements: within 2 months after the intervention
Health resources	<p>Photovoice Addressed to schoolchildren and family or legal guardians Reference: Wang et al. [46]</p>	During the intervention (6 months)
Breastfeeding, delivery type and birth weight	<p>Questionnaire addressed to family or legal guardians Name: CADIZ-PREVENT—Breastfeeding, childbirth and birth weight (S7) Number of items: 7 Reference: created by the research team based on the information from the scientific literature [47–51]</p>	Post intervention measurements: within 2 months after the intervention
Participant satisfaction/reaction and adherence to the intervention	<p>World Cafe Addressed to schoolchildren, family or legal guardians, teachers and management teams of four schools selected of the intervention group Reference: www.theworldcafe.com</p> <p>Questionnaire addressed to management teams of the intervention group Name: CADIZ-PREVENT Program Evaluation Questionnaire. Directors—Management teams (S8) Number of items: 14 Reference: designed by the research team of the CADIZ-PREVENT study</p> <p>Questionnaire addressed to teachers of the intervention group Name: CADIZ-PREVENT Program Evaluation Questionnaire. Teachers (S9) Number of items: 35 Reference: designed by the research team of the CADIZ-PREVENT study</p>	Post intervention measurements: within 2 months after the intervention

2.5. Statistical Analysis

A descriptive analysis of the main outcome variables will be carried out with measures of centrality, dispersion and 95% confidence intervals (CI), and percentages or prevalence for the categorical variables. Chi square tests will be used for categorical variables and *t*-test or ANOVA for continuous variables, which will be used for comparisons of percentages or means, respectively, when they have a normal distribution. The effectiveness will be studied by comparing the changes in the groups. Simple and multiple linear regressions and/or logistic regressions with the respective odds ratios (OR) and the 95% CI will be applied as an association measure. The grouping term will be modeled in the analysis to adjust the effect of the intraclass correlation and a multilevel test will be conducted. For this, several levels of grouping will be established. The first level will be constituted by the geographical areas of study, the second by the municipality, the third level of grouping will be the school center and the line or classroom, and the fourth and last will be given by the intervention (control and experimental group).

For the analysis of longitudinal data, MANOVA of maximum likelihood and least squares will be used under conditions of normality of the data (assuming that large sample sizes will be obtained). If the data are not normal, generalized linear models (GLM) will be used. As a strategy for the analysis of missing data, the analysis of missing values of the SPSS statistical package will be used. In most situations it is not possible to verify the association of the missing data with other variables that allow it to be used to impute them in a probabilistic way; the Little's MCAR test will be used to determine if the missing data occurs completely randomly ("Missing Completely at Random Data: MCAR") and if its imputation is necessary. If the value of p obtained is less than 0.5, it cannot be assumed that the data are completely lost by chance and a multiple imputation will be made.

The dependent variables of our study will be BMI, skinfold thickness of the triceps, waist/hip ratio (as anthropometric variables) and the prevalence of overweight and obesity. As surrogate or intermediate variables we will analyze behaviors related to eating, physical activity and sedentary lifestyle, hours of sleep, knowledge and beliefs about eating and physical activity, as well as the physical condition (IFIS) [44,45] of the children.

In the models, possible covariates related to personal, family, school and environment characteristics will be analyzed. Especially will be analyzed: sex, birth weight, breastfeeding, sociodemographic characteristics, family socioeconomic level, level of physical activity and time of sedentary activities of the parents; behavior, knowledge and beliefs about family food and physical activity, participation of the school in the intervention and level of adherence, participation of the center in other health promotion programs, availability or use of the school canteen and the existence of health assets in the environment.

To determine the efficacy of the different components of the intervention, predictive models will be obtained for each of the outcome variables by backward multiple linear regression, in which all possible components are included and are progressively eliminated from lowest to highest contribution. To analyze the specific contribution of a certain component on a dependent variable, the semi-partial correlations will be obtained; this method allows the effect of the component to be controlled to be subtracted from the predictors being treated. The R^2 values of the components measure their theoretical contribution and allow establishing a theoretical hierarchy among the components that will be used in the regression by blocks; by changing R^2 the different contributions of the variables will be seen.

2.6. Timeline of the Intervention

With the intention of covering the proposed objectives, the intervention will be conceived as a gradual process in which three phases will be able to be distinguished fundamentally: (I) preparation phase, (II) implementation phase and (III) evaluation and dissemination phase.

Phase I will essentially cover the first year of the project. It will include activities such as the search and updated review of the scientific literature, preparation of the necessary material to carry out the evaluations and the intervention (questionnaires, educational program, booklets), consensus meetings between the research team, recruitment and meetings with the management teams and/or teachers from the centers participating in the study, recruitment of participating teachers and agreements on the monitoring system during the intervention, design and implementation of teacher training and design of workshops for families.

Phase II, which will be the implementation phase, will cover the second year of the study. It will include activities such as conducting pre and post intervention evaluations, implementation of the multimodal intervention, realization of workshops for families, creating databases and entering data. In addition, it will include activities such as the identification of resources/assets for health related to healthy eating and physical activity in the environment of each school, through the Photovoice technique. In turn, it will include the implementation of the World Cafe technique, which will be used to describe the perception of the participants of the intervention (schoolchildren, teachers and parents).

Finally, it will include the identification of the current prevalence of childhood overweight and obesity in the province of Cádiz.

All schools will have the same time to implement the intervention (6 months). Within these 6 months, each school will have to combine its usual activities with the implementation of the educational program. To guarantee that all the schools carry out all the sessions, the research team will schedule the school calendar with the teachers and management teams of the participating centers in the teacher training workshops that will be carried out in phase I. The research team will provide to the schools all the necessary resources to implement the educational program.

Phase III, which corresponds to the evaluation and dissemination phase, will basically cover the third and final year of the study. It will include activities such as the statistical analysis of the data and disseminating results. The results will be disseminated both to the scientific community (through scientific papers, congresses, conferences, etc.) and to the participating schools (through a report in which the main results of the study will be specified). In addition, it is also intended to disseminate the results to society in general, so that the relevant authorities become aware of the problem and, if it is possible the intervention is implemented (with all the relevant modifications) in as many schools as possible.

3. Discussion

“PREVIENE-CÁDIZ” [CADIZ-PREVENT] intervention is based on the scientific literature on strategies to reduce childhood overweight and obesity. The design of the most effective interventions for the prevention of childhood obesity must include an education program carried out in the classroom and at home, where children and parents work aspects such as the practice of regular physical activity [53], recreational activities [54], extracurricular sports [35], reduced screen time, reduced fat consumption, increased fruit and vegetable servings and decreased consumption of carbonated beverages [54], in order to improve the behavior of children and parents and get them to acquire healthier lifestyle habits [29].

According to a Cochrane Review [29], most interventions take place within the 6–12 year range. Solid evidence has been found regarding the benefits which can be obtained within those ages [29]. This result is consistent with a later review [29] which concludes that those interventions combining physical activity and diet were those which yielded the best results both in their family settings and in school. Taking this into account, it can be very interesting to delve deeper into this age range, focusing on third grade of Spanish Primary Education due to the maturity of the students to be able to fill in questionnaires and to understand the intervention. Due to the fact that this intervention will take place through sessions included in their ordinary curriculum, it is necessary to pick a subject to develop such material and to implement it on the same level in all schools, considering that such school year is the best one to do that. In addition, this age has been chosen by other authors for different interventions on health promotion [25,55].

Among the strengths of this project, we highlight that a multimodal intervention will be carried out incorporating the main agents responsible for education (school and family) on a representative sample of boys and girls aged 8–9 years from the province of Cádiz. In addition, the multidisciplinary composition of the research team with more than 10 different disciplines and the continuous feedback and workshops (seminars) between the research team and the teachers will be strengths of the PREVIENE-CÁDIZ [CADIZ-PREVENT] project.

Regarding sustainability, it is worth mentioning that the initiative could be extended without the need for considerable additional resources. The fact that the educational sessions are implemented by the teachers enables an easier continuity of the intervention.

As a limitation, getting all the schools in the intervention group to carry out the ten sessions on the planned schedule will be a challenge for the project. For this limitation, a contingency plan is contemplated whereby, through the teacher training courses developed by the research team in the CEP of Cádiz, a section will be included to organize the scholar calendar with the management teams and teachers. This will ensure that all schools commit

to implementing the intervention at the same time, and it is expected that this will favor the implementation of the sessions.

In another vein, not measuring the physical condition of schoolchildren and family members objectively, but doing so subjectively using the self-report questionnaire of perceived physical condition (IFIS), could be a limitation. However, due to the complexity of bringing together schoolchildren, and especially their families to perform a series of physical tests, a decision has been made to use the IFIS scale, which has previously been validated and used in this population group [44,45].

4. Conclusions

This study will enable the evaluation of the effectiveness of an educational multimodal intervention at the individual, school and family levels, focused on the acquisition of healthier lifestyle habits with regard to diet, increased levels of physical activity, reduced sedentary lifestyle and improved sleep to prevent overweight and obesity in a representative sample of schoolchildren from 8 to 9 years old in the province of Cádiz. Once the evaluation has been carried out, the weaknesses and strengths of the educational program with respect to the population of the third year of primary education as a target group will be able to be identified, and therefore, timely decisions will be able to be made to adapt, modify and improve the educational intervention.

The results of this project will allow for the creation of well-adapted educational programs for this child population, which will be able to serve as a reference for the implementation of similar programs in other locations. Once the factors that will influence the possible effectiveness of the educational intervention have been determined, its implementation strategy (focused, selective or adapted implementation) will be able to be improved according to the personal, behavioral, family, and contextual characteristics of the relevant target population.

Supplementary Materials: The following are available online at <https://www.mdpi.com/1660-4601/18/4/1622/s1>, Document S1: Summary of the didactic guide applied in the intervention of the study. Document S2: Questionnaire addressed to schoolchildren: How we eat. Document S3: Questionnaire addressed to schoolchildren: How we move and feel. Document S4: Questionnaire addressed to family or legal guardians: Families. How we eat and move. Document S5: International Fitness Scale (IFIS): Children version. Document S6: International Fitness Scale (IFIS): Adults version. Document S7: CADIZ-PREVENT—Breastfeeding, childbirth and birth weight. Document S8: CADIZ-PREVENT Program Evaluation Questionnaire. Directors—Management teams. Document S9: CADIZ-PREVENT Program Evaluation Questionnaire. Teachers. Document S10: Questionnaire to know the participation of the schools in health promotion activities.

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Institutional Review Board Statement: The study will be conducted according to the guidelines of the Declaration of Helsinki, and it has been approved by the Coordinating Committee of Ethics of Biomedical Research of Andalusia (Date: 21 March 2018).

Informed Consent Statement: Informed consent will be obtained from all subjects involved in the study.

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References

1. WHO. *Obesity: Preventing and Managing The Global Epidemic: Report of a WHO Consultation*; World Health Organization: Geneva, Switzerland, 2000; ISBN 92-4-120894-5.
2. WHO. *Diet, Nutrition and the Prevention of Chronic Diseases: Report of a Joint WHO/FAO Expert Consultation*; World Health Organization: Geneva, Switzerland, 2003.
3. Abarca-Gómez, L.; Abdeen, Z.A.; Hamid, Z.A.; Abu-Rmeileh, N.M.; Acosta-Cazares, B.; Acuin, C.; Adams, R.J.; Aekplakorn, W.; Afsana, K.; Aguilar-Salinas, C.A.; et al. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet* **2017**, *390*, 2627–2642. [[CrossRef](#)]
4. Ahrens, W.; Pigeot, I.; Pohlabeln, H.; De Henauw, S.; Lissner, L.; Molnár, D.; Moreno, L.A.; Tornaritis, M.; Veidebaum, T.; Siani, A.; et al. Prevalence of overweight and obesity in European children below the age of 10. *Int. J. Obes.* **2014**, *38*, S99–S107. [[CrossRef](#)]
5. Cadenas-Sanchez, C.; Nyström, C.; Sanchez-Delgado, G.; Martinez-Tellez, B.; Mora-Gonzalez, J.; Risinger, A.S.; Ruiz, J.R.; Ortega, F.B.; Löf, M. Prevalence of overweight/obesity and fitness level in preschool children from the north compared with the south of Europe: An exploration with two countries. *Pediatr. Obes.* **2016**, *11*, 403–410. [[CrossRef](#)]
6. Lauria, L.; Spinelli, A.; Buoncristiano, M.; Nardone, P. Decline of childhood overweight and obesity in Italy from 2008 to 2016: Results from 5 rounds of the population-based surveillance system. *BMC Public Health* **2019**, *19*, 618. [[CrossRef](#)]
7. Hassapidou, M.; Tzotzas, T.; Makri, E.; Pagkalos, I.; Kaklamanos, I.; Kapantais, E.; Abrahamian, A.; Polymeris, A.; Tziomalos, K. Prevalence and geographic variation of abdominal obesity in 7- and 9-year-old children in Greece; World Health Organization Childhood Obesity Surveillance Initiative 2010. *BMC Public Health* **2017**, *17*, 126. [[CrossRef](#)] [[PubMed](#)]
8. *ALADINO 2015 Study: Study of Growth Surveillance, Nutrition, Physical Activity, Child Development and Obesity in Spain 2015*; Spanish Agency for Consumption, Food Safety and Nutrition, Ministry of Health, Social Services and Equality: Madrid, Spain, 2016.
9. Sergio, V.P.; Novalbos-Ruiz, J.P.; Rodríguez-Martín, A.; Martínez-Nieto, J.M.; Lechuga-Sancho, A.M. Implicaciones del nivel socioeconómico familiar sobre las conductas de riesgo en la obesidad infantojuvenil. *Nutr. Hosp.* **2013**, *28*, 1951–1960. [[CrossRef](#)]
10. Lineros-González, C.; Marcos-Marcos, J.; Ariza, C.; Hernán-García, M. Importancia del proceso en la evaluación de la efectividad de una intervención sobre obesidad infantil. *Gac. Sanit.* **2017**, *31*, 238–241. [[CrossRef](#)] [[PubMed](#)]
11. De Lorenzo, A.; Gratteri, S.; Gualtieri, P.; Cammarano, A.; Bertucci, P.; Di Renzo, L. Why primary obesity is a disease? *J. Transl. Med.* **2019**, *17*. [[CrossRef](#)]
12. Kachur, S.; Lavie, C.J.; De Schutter, A.; Milani, R.V.; Ventura, H.O. Obesity and cardiovascular diseases. *Minerva Med.* **2017**, *108*, 212–228. [[CrossRef](#)]
13. Engin, A. The definition and prevalence of obesity and metabolic syndrome. *Adv. Exp. Med. Biol.* **2017**, *960*, 1–17. [[CrossRef](#)] [[PubMed](#)]
14. Lavie, C.J.; De Schutter, A.; Parto, P.; Jahangir, E.; Kokkinos, P.; Ortega, F.B.; Arena, R.; Milani, R.V. Obesity and Prevalence of Cardiovascular Diseases and Prognosis-The Obesity Paradox Updated. *Prog. Cardiovasc. Dis.* **2016**, *58*, 537–547. [[CrossRef](#)]
15. World Health Organization. *Methodology and Summary: Country Profiles on Nutrition, Physical Activity and Obesity in the 53 WHO European Region Member States*; WHO Regional Office for Europe: Copenhagen, Denmark, 2013; ISBN 978-92-890-5003-6.

16. Cappuccio, F.P.; Taggart, F.M.; Kandala, N.-B.; Currie, A.; Peile, E.; Stranges, S.; Miller, M.A. Meta-Analysis of Short Sleep Duration and Obesity in Children and Adults. *Sleep* **2008**, *31*, 619–626. [[CrossRef](#)] [[PubMed](#)]
17. Börnhorst, C.; Wijnhoven, T.M.; Kunešová, M.; Yngve, A.; Rito, A.I.; Lissner, L.; Duleva, V.; Petrauskienė, A.; Breda, J. WHO European Childhood Obesity Surveillance Initiative: Associations between sleep duration, screen time and food consumption frequencies. *BMC Public Health* **2015**, *15*, 442. [[CrossRef](#)] [[PubMed](#)]
18. Ortega Anta, R.M.; López-Solaber, A.M.; Pérez-Farinós, N. Associated factors of obesity in Spanish representative samples. *Nutr. Hosp.* **2013**, *28* (Suppl. 5), 56–62. [[CrossRef](#)]
19. Rodríguez-Rodríguez, E.; Palmeros-Exsome, C.; López-Sobaler, A.M.; Ortega, R.M.; Research Group: 920030. Preliminary data on the association between waist circumference and insulin resistance in children without a previous diagnosis. *Eur. J. Pediatr.* **2011**, *170*, 35–43. [[CrossRef](#)] [[PubMed](#)]
20. Griffiths, L.J.; Parsons, T.J.; Hill, A.J. Self-esteem and quality of life in obese children and adolescents: A systematic review. *Int. J. Pediatr. Obes.* **2010**, *5*, 282–304. [[CrossRef](#)]
21. Stuart, B.; Panico, L. Early-childhood BMI trajectories: Evidence from a prospective, nationally representative British cohort study. *Nutr. Diabetes* **2016**, *6*. [[CrossRef](#)] [[PubMed](#)]
22. Munthali, R.J.; Kagura, J.; Lombard, Z.; Norris, S.A. Early Life Growth Predictors of Childhood Adiposity Trajectories and Future Risk for Obesity: Birth to Twenty Cohort. *Child. Obes.* **2017**, *13*, 384–391. [[CrossRef](#)] [[PubMed](#)]
23. Lloyd, J.J.; Wyatt, K.M.; Creanor, S. Behavioural and weight status outcomes from an exploratory trial of the Healthy Lifestyles Programme (HeLP): A novel school-based obesity prevention programme. *BMJ Open* **2012**, *2*, e000390. [[CrossRef](#)]
24. Van Ansem, W.J.C.; Schrijvers, C.T.M.; Rodenburg, G.; Van De Mheen, D. Childrens snack consumption: Role of parents, peers and child snack-purchasing behaviour. Results from the INPACT study. *Eur. J. Public Health* **2015**, *25*, 1006–1011. [[CrossRef](#)]
25. Spinelli, A.; Buoncristiano, M.; Kovacs, V.A.; Yngve, A.; Spiroski, I.; Obreja, G.; Starc, G.; Pérez, N.; Rito, A.I.; Kunešová, M.; et al. Prevalence of severe obesity among primary school children in 21 European countries. *Obes. Facts* **2019**, *12*, 244–258. [[CrossRef](#)]
26. Vaquera, E.; Jones, R.; Mari-Klose, P.; Mari-Klose, M.; Cunningham, S.A. Unhealthy weight among children in Spain and the role of the home environment. *BMC Res. Notes* **2018**, *11*, 591. [[CrossRef](#)] [[PubMed](#)]
27. Iguacel, I.; Fernández-Alvira, J.M.; Ahrens, W.; Bammann, K.; Gwozdz, W.; Lissner, L.; Michels, N.; Reisch, L.; Russo, P.; Szommer, A.; et al. Prospective associations between social vulnerabilities and children's weight status. Results from the IDEFICS study. *Int. J. Obes.* **2018**, *42*, 1691–1703. [[CrossRef](#)] [[PubMed](#)]
28. Martín, A.R.; Nieto, J.M.M.; Ruiz, J.P.N.; Jiménez, L.E. Overweight and obesity: The role of education, employment and income in Spanish adults. *Appetite* **2008**, *51*, 266–272. [[CrossRef](#)]
29. Waters, E.; de Silva-Sanigorski, A.; Burford, B.J.; Brown, T.; Campbell, K.J.; Gao, Y.; Armstrong, R.; Prosser, L.; Summerbell, C.D. Interventions for preventing obesity in children. *Cochrane Database Syst. Rev.* **2011**, CD001871. [[CrossRef](#)] [[PubMed](#)]
30. Kelishadi, R.; Azizi-Soleiman, F. Controlling childhood obesity: A systematic review on strategies and challenges. *J. Res. Med. Sci.* **2014**, *19*, 993–1008.
31. Guerra, P.H.; Da Silveira, J.A.C.; Salvador, E.P. Physical activity and nutrition education at the school environment aimed at preventing childhood obesity: Evidence from systematic reviews. *J. Pediatr.* **2016**, *92*, 15–23. [[CrossRef](#)] [[PubMed](#)]
32. Benjamin Neelon, S.E.; Namenek Brouwer, R.J.; Østbye, T.; Evenson, K.R.; Neelon, B.; Martinie, A.; Bennett, G. A community-based intervention increases physical activity and reduces obesity in school-age children in North Carolina. *Child. Obes.* **2015**, *11*, 297–303. [[CrossRef](#)]
33. Folta, S.C.; Kuder, J.F.; Goldberg, J.P.; Hyatt, R.R.; Must, A.; Naumova, E.N.; Nelson, M.E.; Economos, C.D. Changes in diet and physical activity resulting from the shape up Somerville community intervention. *BMC Pediatr.* **2013**, *13*, 157. [[CrossRef](#)]
34. Karacabeyli, D.; Allender, S.; Pinkney, S.; Amed, S. Evaluation of complex community-based childhood obesity prevention interventions. *Obes. Rev.* **2018**, *19*, 1080–1092. [[CrossRef](#)]
35. Martínez Vizcaino, V.; Salcedo Aguilar, F.; Franquelo Gutiérrez, R.; Solera Martínez, M.; Sánchez López, M.; Serrano Martínez, S.; López García, E.; Rodríguez Artalejo, F. Assessment of an after-school physical activity program to prevent obesity among 9- to 10-year-old children: A cluster randomized trial. *Int. J. Obes.* **2008**, *32*, 12–22. [[CrossRef](#)] [[PubMed](#)]
36. Ávila García, M.; Huertas Delgado, F.J.; Tercedor Sánchez, P. Intervention programs to promote food habits and physical activity in Spanish Primary Schoolchildren: Systematic review. *Nutr. Hosp.* **2016**, *33*, 1438–1443. [[PubMed](#)]
37. Ocaña-Riola, R.; Saez, M.; Sánchez-Cantalejo, C.; Barceló, M.A.; Fernández, A.; Saurina, C. Protocolo de investigación del atlas de mortalidad de las capitales de provincia de Andalucía y Cataluña (proyecto AMCAC). *Rev. Esp. Salud Pública* **2005**, *79*, 613–620. [[CrossRef](#)]
38. Sanchez-Martinez, F. Factors Associated with Overweight and Obesity in Schoolchildren from 8 to 9 Years Old. Barcelona, Spain. *Rev. Esp. Salud Pública* **2016**, *90*, e1–e11.
39. Stewart, A.A.; Marfell-Jones, M.; Olds, T.; De Ridder, J.H. *International standards for Anthropometric Assessment*; International Society for the Advancement of Kinanthropometry: Lower Hutt, New Zealand, 2012.
40. Cole, T.J.; Bellizzi, M.C.; Flegal, K.M.; Dietz, W.H. Establishing a standard definition for child overweight and obesity worldwide: International survey. *Br. Med. J.* **2000**, *320*, 1240–1243. [[CrossRef](#)] [[PubMed](#)]
41. Boileau, R.A.; Lohman, T.G.; Slaughter, M.H. Exercise and body composition of children and youth. *Scand. J. Sport. Sci.* **1985**, *7*, 17–27.

42. Sardinha, L.B.; Going, S.B.; Teixeira, P.J.; Lohman, T.G. Receiver operating characteristic analysis of body mass index, triceps skinfold thickness, and arm girth for obesity screening in children and adolescents. *Am. J. Clin. Nutr.* **1999**, *70*, 1090–1095. [[CrossRef](#)] [[PubMed](#)]
43. Khoury, M.; Manlhiot, C.; McCrindle, B.W. Role of the waist/height ratio in the cardiometabolic risk assessment of children classified by body mass index. *J. Am. Coll. Cardiol.* **2013**, *62*, 742–751. [[CrossRef](#)] [[PubMed](#)]
44. Sánchez-López, M.; Martínez-Vizcaino, V.; García-Hermoso, A.; Jiménez-Pavón, D.; Ortega, F.B. Construct validity and test-retest reliability of the International Fitness Scale (IFIS) in Spanish children aged 9–12 years. *Scand. J. Med. Sci. Sport.* **2015**, *25*, 543–551. [[CrossRef](#)]
45. Ortega, F.B.; Sánchez-López, M.; Solera-Martínez, M.; Fernández-Sánchez, A.; Sjöström, M.; Martínez-Vizcaino, V. Self-reported and measured cardiorespiratory fitness similarly predict cardiovascular disease risk in young adults. *Scand. J. Med. Sci. Sport.* **2013**, *23*, 749–757. [[CrossRef](#)]
46. Wang, C.; Burris, M.A. Photovoice: Concept, Methodology, and Use for Participatory Needs Assessment. *Health Educ. Behav.* **1997**, *24*, 369–387. [[CrossRef](#)]
47. Goetz, A.R.; Mara, C.A.; Stark, L.J. Greater Breastfeeding in Early Infancy Is Associated with Slower Weight Gain among High Birth Weight Infants. *J. Pediatr.* **2018**, *201*, 27–33.e4. [[CrossRef](#)]
48. Papoutsou, S.; Savva, S.C.; Hunsberger, M.; Jilani, H.; Michels, N.; Ahrens, W.; Tornaritis, M.; Veidebaum, T.; Molnár, D.; Siani, A.; et al. Timing of solid food introduction and association with later childhood overweight and obesity: The IDEFICS study. *Matern. Child Nutr.* **2018**, *14*. [[CrossRef](#)] [[PubMed](#)]
49. Mannan, H. Early infant feeding of formula or solid foods and risk of childhood overweight or obesity in a socioeconomically disadvantaged region of Australia: A longitudinal cohort analysis. *Int. J. Environ. Res. Public Health* **2018**, *15*, 1685. [[CrossRef](#)]
50. Kuhle, S.; Tong, O.S.; Woolcott, C.G. Association between caesarean section and childhood obesity: A systematic review and meta-analysis. *Obes. Rev.* **2015**, *16*, 295–303. [[CrossRef](#)] [[PubMed](#)]
51. Keag, O.E.; Norman, J.E.; Stock, S.J. Long-term risks and benefits associated with cesarean delivery for mother, baby, and subsequent pregnancies: Systematic review and meta-analysis. *PLoS Med.* **2018**, *15*, e1002494. [[CrossRef](#)] [[PubMed](#)]
52. Biondo, P.D.; King, S.; Minhas, B.; Fassbender, K.; Simon, J.E. How to increase public participation in advance care planning: Findings from a World Café to elicit community group perspectives. *BMC Public Health* **2019**, *19*, 679. [[CrossRef](#)]
53. Lazaar, N.; Aucouturier, J.; Ratel, S.; Rance, M.; Meyer, M.; Duché, P. Effect of physical activity intervention on body composition in young children: Influence of body mass index status and gender. *Acta Paediatr.* **2007**, *96*, 1321–1325. [[CrossRef](#)] [[PubMed](#)]
54. Gortmaker, S.L.; Peterson, K.; Wiecha, J.; Sobol, A.M.; Dixit, S.; Fox, M.K.; Laird, N. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch. Pediatr. Adolesc. Med.* **1999**, *153*, 409–418. [[CrossRef](#)] [[PubMed](#)]
55. Lombardo, F.L.; Spinelli, A.; Lazzeri, G.; Lamberti, A.; Mazzarella, G.; Nardone, P.; Pilato, V.; Buoncristiano, M.; Caroli, M. Severe obesity prevalence in 8- to 9-year-old Italian children: A large population-based study. *Eur. J. Clin. Nutr.* **2015**, *69*, 603–608. [[CrossRef](#)] [[PubMed](#)]

ANNEX II: Manuscript of Study II: Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. Previene-Cádiz.



Article

Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren

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Abstract: (1) Background: Lifestyle behaviours and physical fitness play a critical role in the development of childhood obesity. It has been demonstrated in this study that self-reported physical fitness is representative of a healthy lifestyle and thus is associated with a lower incidence of overweight/obesity. The objective of this study was to analyse the independent and combined association of lifestyles (physical activity, screen time, diet and hours of sleep) and self-reported physical fitness with body weight in schoolchildren. (2) Methods: This study performed a descriptive and cross-sectional analysis. The study sample consisted of 864 schoolchildren between 8–9 years old from 26 schools of the province of Cádiz. To measure lifestyles and self-reported physical fitness, questionnaires were administered to both schoolchildren and families. To obtain the body weight status, the children were measured by body mass index (BMI). To verify the influence of lifestyles and self-reported physical fitness on the body weight status of schoolchildren, a combined score of lifestyles and self-reported physical fitness was calculated. (3) Results: Schoolchildren who followed healthier lifestyles and presented good physical fitness had a better body weight status ($p < 0.001$). Schoolchildren who had less healthful lifestyles and bad physical fitness had a 10.34 times higher risk of being overweight or obese ($p = 0.004$). (4) Conclusions: It has been shown that there is an independent and combined association between lifestyles and physical fitness on the body weight of the schoolchildren. We have suggested strategies to get children to adopt healthy lifestyles and good physical fitness to maintain a healthy body weight and prevent obesity.

Keywords: childhood obesity; healthy lifestyle; physical fitness; body mass index; physical activity; sedentary behaviour; diet; sleep; screen time

1. Introduction

The World Health Organization (WHO) describes childhood obesity as one of the most important public health problems in developed countries [1]. However, it is not only epidemic in developed countries, such as western European countries, Australia, Canada and the USA, but also in developing countries, such as Mexico, Chile and China [2]. Mexico reported in 2016 a combined prevalence of obesity and overweight of 33.2% in children [3]. Around 23% of children and adolescents in developed countries and 13% in developing countries are overweight or obese [4]. Therefore, childhood obesity is a global problem. Currently, 1 in 3 children in the United States is afflicted with overweight or obesity [5]. The prevalence of this epidemic exceeds 40% of children in southern European countries, with Bulgaria, Greece, Italy and Spain being the most affected countries [6–9]. The prevalence of this disease has increased in Spain three to four times in the last 20 years, causing a strong impact on chronic diseases, on health costs and on the quality of life of the population [10]. The Aladdin 2019 study, which was carried out in Spain recently, found a prevalence of overweight and obesity of 40.6% in the Spanish child population aged 6 to 9 years, of which 23.3% were overweight and 17.3% obese. Within obesity, 4.2% had severe obesity, and in turn, the percentage of obesity was higher in boys than in girls [11]. Within Spain, the province of Cádiz (southwest) has the highest prevalence of overweight and obesity (35% children aged 6 to 12 years) compared to the rest of Spain [12].

Obesity in early life is associated with a higher prevalence of various disease risk factors, such as prediabetes, increased blood pressure, accumulation of cholesterol in the arteries, increased oxidative vulnerability and sleep disorders [13–17]. Furthermore, paediatric and adolescent obesity is associated with obesity in adults [18], which increases the risk of multiple diseases in adulthood, such as diabetes, high blood pressure, dyslipidaemia, cardiovascular diseases, some types of cancer, musculoskeletal disease, obstructive sleep apnoea and fatty liver disease [19–22]. Life expectancy for 40-year-old people who suffer obesity is seven years less than that of one without excess weight [23].

On the other hand, lifestyle behaviours play a critical role in the development of childhood obesity [24,25]. The Jimenez-Pavón et al. study [26] analysed the relationship between dietary patterns and obesity and found that a dietary pattern that combined foods rich in fats, sugars and salt was directly related to an increased risk of obesity. Other studies [27–31] reported an inverse association between physical fitness and body weight status in children. Those children who presented a greater physical fitness in turn had a healthier body weight status. The same occurs with screen time; numerous studies [32,33] show that spending more than 2 h a day with a computer, mobile phone, tablet, playing video games or watching television considerably increases the probability of suffering from obesity in childhood. Likewise, sleep is also related to childhood overweight and obesity. According to a recent systematic review [34], children who slept less than 9 h a day had a greater risk of suffering from obesity than those who slept for more time. Therefore, carrying out healthy lifestyles (balanced diet, complying with the global recommendations for physical activity, reducing sedentary lifestyle and sleeping enough) keeps children healthy and reduces the probability of becoming overweight or obese [26–35].

In addition to lifestyles, physical fitness is well reported as a powerful marker of overall health and particularly related with overweight and obesity in children [36,37]. The role of fitness in children's health is so relevant that even self-reported physical fitness, measured through the International Fitness Scale (IFIS), has shown to be a good tool to assess fitness and its relationships with health in children [36,38]. A systematic review found evidence to suggest that there are positive associations among physical activity, fitness, cognition and academic achievement in children [39]. On the other hand, a study carried out with

Lithuanian children concluded by saying that obese and overweight children were less physically active and had lower physical fitness than normal-weight children, which shows that physical fitness is related to overweight and obesity [40]. Another systematic review found strong evidence for an inverse association between muscular fitness and total and central adiposity, and cardiovascular disease and metabolic risk factors in children and adolescents. In turn, they also found strong evidence for a positive association between muscular fitness and bone health and self-esteem [41]. The novelty of this study is the analysis of the combined role of lifestyle behaviours and self-reported physical fitness to check if there is association on body weight status in children. This is the first study in Spain that analyses the influence of these two dimensions on body weight status in children.

The hypothesis of the study is that the healthier the children's lifestyle behaviours and self-reported physical fitness, the better their body weight status. Therefore, the objective of this article is to analyse the independent and combined association of lifestyle behaviours and self-reported physical fitness with body weight status in schoolchildren.

2. Materials and Methods

2.1. Study Design and Participants

The current study performed descriptive cross-sectional analysis of lifestyle behaviours and self-reported physical fitness of 864 schoolchildren between 8 and 9 years old enrolled in the third grade of primary education from 26 schools distributed throughout the province of Cádiz (southwest of Spain). An analysis to check if there was an independent and combined association between lifestyle behaviours and self-reported physical fitness on body weight status of the schoolchildren was carried out. The research implementation period was 2 months, which were the months of September and October 2018.

This target population (children from 8 to 9 years old, which is the age at which they attend the third year of primary education in Spain) was selected due to the need to detect and solve the problem of childhood obesity in early stages to promote healthier lifestyle habits, and thus achieve health benefits that allow correct weight management from childhood until adulthood, and because, at this age, children are very receptive to receiving information that implies changes in habits [42].

In order to select the schools, their management teams were informed by the research team about the research project. Of all the schools that were informed of the project, some preferred not to participate, but finally 26 schools spread throughout the province of Cádiz decided to participate and they were the ones that were recruited. To select the participating schoolchildren within each school, an informed consent was sent to the parents, who decided whether their children would participate or not. At the same time, children who did not want to participate even though their parents had signed the informed consent, were not forced to participate. The invitation to participate in the study was sent to 936 parents. Of these, among the parents who signed the informed consent and among the children who decided to participate, a total of 864 children were recruited. The response rate was 92.3%.

The inclusion criteria were as follows: children belonging to the selected school, who were in the third grade of primary school, regardless of their age, who had the informed consent signed by their parents or legal guardians, who responded to the questionnaires and who submitted to the anthropometric measurements. The exclusion criteria were that some of these requirements were not met.

The project was conducted in accordance with the Declaration of Helsinki and in accordance with Organic Law 3/2018, of December 5, on the Protection of Personal Data, Regulation (EU) 2016/679 of the European Parliament and of the Council, of 27 April 2016 (General Data Protection Regulation). Additionally, it was approved by the Andalusian Biomedical Research Ethics Committee, along with approval from the Delegation of Education and Science of the province of Cádiz (PI-007-2017, 21 March 2018). Parents or legal guardians were provided with a project information sheet and asked to sign the written

informed consent. Participation was voluntary and schoolchildren could leave the study at any time. The methodological details have been previously published [42].

2.2. Calculation of the Sample Size

Although this article follows a cross-sectional design, the original sample size calculation was calculated to determine the effectiveness of an intervention on the prevalence of overweight and obesity in the study population, which is described in the study protocol already published [42].

2.3. Procedures and Assessments

2.3.1. Anthropometric Measurements

Measurements were taken by trained research team members following the standardized International Society for the Advancement of Kinanthropometry (ISAK) procedure [43]. Body weight was measured with a mechanical scale sensitive to 100 g (SECA Colorata 760, Hamburg, Germany). Height was measured using a portable stadiometer with a precision of 0.1 cm (SECA 213, Hamburg, Germany). Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared and was used to determine the level of overweight or obesity. If the BMI of the students was between 18.44 and 19.84 according to Cole's cut-off points [44], they were considered to be overweight, and if it was between 21.60 and 24.00, they were considered obese. In addition to this formula, the BMI categories were also calculated by estimating the percentiles according to their age based on the WHO recommendations, establishing that schoolchildren who were between the 50th and 80th percentile suffered overweight, and above the 85th percentile suffered obesity.

2.3.2. Self-Reported Physical Fitness

The self-reported physical fitness of children and parents was measured using the IFIS scale (the International Fitness Scale). The IFIS scale is a tool/questionnaire that has been translated into nine different languages, and which aims to assess the physical fitness of people in a self-reported/subjective way, without the need to carry out a battery of tests that are established to measure physical fitness objectively. This scale evaluates both overall physical condition as well as each one of its primary components specifically: cardiorespiratory fitness, muscular strength, speed-agility and flexibility. It has been previously validated with both children and adults [36,38], so its reliability is scientifically proven. There is a different version for adults and children, but both versions measure the same.

2.3.3. Physical Activity and Screen Time

Physical activity and screen time were recorded through two questionnaires administered to schoolchildren and their parents, in order to have the information of the schoolchildren about themselves and that of the parents about their children. To record the levels of physical activity, both the students and their parents were asked about aspects such as travel to and from school, if they practiced extracurricular sports activities with a coach or monitor at that time, what activities, how often and for how long, if they practiced sports activities with family or friends at that time, how often and for how long, among others. Additionally, to record the screen time, both the schoolchildren and their parents were asked about the average daily time spent on television (TV), computer, mobile, tablet and video games during the weekdays and on weekends. The questionnaires were filled out at the same time they were administered, remembering what they usually did. The questionnaires administered were "Physical Activity Questionnaire: How do we move and feel?" for children and "Families: How do we eat and move?" for parents, which were the ones previously used by the Previene Study in Granada and POIBA Study in Barcelona [45,46].

2.3.4. Eating Habits

Eating habits were recorded through two questionnaires, one applied to schoolchildren, who answered about themselves, and another applied to parents, who answered about their children. The administered questionnaires were “Food Consumption Frequency Questionnaire: How do we eat?” for children and “Families: How do we eat and move?” for parents, which were the ones previously used in the Previene Study in Granada and POIBA Study in Barcelona [45,46]. The frequency of food consumption was recorded (average daily/weekly consumption of processed baked goods, fried foods, snacks, sugary soft drinks, fruits, vegetables, packaged juices, sandwiches, dairy products, carbohydrates, meat, cold cuts, fish, and vegetables, among others), the average frequency with which schoolchildren ate breakfast before going to school and the average frequency with which they ate outside the home (in fast food establishments or restaurants). Like the previous ones, these questionnaires were also completed at the same time they were administered, using memory and remembering what they used to do regarding their eating habits.

2.3.5. Hours of Sleep

Schoolchildren’s daily hours of sleep, both for Monday to Friday as well as for weekends, were also recorded through a questionnaire administered to parents called “Families: How do we eat and move?”, which was adapted from the one previously used in a similar sample in the Previene Study in Granada and POIBA Study in Barcelona [45,46]. Parents registered the average time their children normally went to bed and got up on weekdays and weekends. To assess compliance with the recommendation for healthy habits, the cut-off points recommended by the Canadian 24-Hour Movement Guidelines [47] were established. This questionnaire was also filled out at the same time it was applied, using memory and remembering the average time at which their children used to go to bed at night and got up in the morning, both during the week and at the weekends.

2.3.6. Lifestyle Behaviours

Lifestyle behaviours were evaluated from the variables that influenced the lifestyle of schoolchildren, such as the variables that influenced the levels of physical activity of schoolchildren (going and coming home from school, hours of Physical Education at school, attendance at extracurricular sports activities, practice of sports activities with family or friends, among others), the variables that influenced the eating habits of schoolchildren (frequency of food consumption, frequency of breakfast, frequency of meals in fast food establishments or restaurants, among others), the variables that influenced the levels of sedentary lifestyle of schoolchildren (screen time) and those that influenced sleeping habits (hours of sleep).

2.4. Statistical Analysis

A descriptive analysis of the outcome variables was performed with measures of centrality, dispersion and 95% confidence intervals (CI), and a frequency analysis to obtain percentages and prevalence of the categorical variables. The data are presented as mean \pm standard deviation, unless otherwise stated. The outcome variables were log-transformed to get a normal distribution. To calculate the association between self-reported physical fitness, having breakfast, screen time and sleep time on body weight status, an ANOVA test was realized. In order to verify the influence of lifestyle behaviours and self-reported physical fitness on the body weight status of schoolchildren, a combined score of lifestyle behaviours and self-reported physical fitness was calculated. To calculate the combined score, a variable was taken from each category (one from eating habits, which was breakfast frequency, one from sedentary behaviours, which was hours of TV on weekends, one from sleep time, which was hours of sleep on weekends, and one of self-reported physical fitness, which was the general physical condition), the dichotomous variable of each of them was calculated, and a sum of the four dichotomous variables was made, giving rise to a result variable with 5 categories. This result variable ranged from

0 to 4, and was re-categorized into another variable with 3 categories, which were called “healthy, moderately healthy and unhealthy”. Once this variable was calculated, it was checked whether there was an association between this variable (combined score) and body weight status. For this, an ANOVA test was performed. Logistic regression was then performed to analyse the influence of the combined score on body weight status. A logistic regression was realized to analyse the influence of the combined score on body weight status. The statistical analyses were performed using IBM SPSS Statistics (version 24.0) and the level of significance was set to 0.05.

3. Results

3.1. Baseline Characteristics

Of the 864 participants, as can be seen in Table 1, 47.7% were girls, 35.2% were overweight (12.9% obesity and 3.9% severe obesity), 25% had a BMI ≥ 97th percentile for age and sex, and the mean age of the participants was 8.42 ± 0.34 years.

Table 1. Descriptive characteristics of schoolchildren by sex.

Variable	Total Sample n = 864	Male n = 452	Female n = 412
Physical characteristics			
		Mean (SD) or Percentage	
Age (years)	8.42 ± 0.34	8.43 ± 0.35	8.42 ± 0.33
Weight (kg)	31.33 ± 7.62	31.92 ± 8.13	30.77 ± 7.07
Height (cm)	130.68 ± 5.99	131.53 ± 6.12	129.88 ± 5.75 **
BMI (kg/m ²)	18.17 ± 3.44	18.27 ± 3.55	18.08 ± 3.44
BMI Status (%) (UW/NW/OW/Ob)	5/60/22/13	4/62/20/14	7/56/24/13
Self-reported physical fitness			
General physical fitness (%) (B/A/G/VG)	2/15/37/46	2/16/33/49	2/14/41/43
Cardiorespiratory fitness (%) (B/A/G/VG)	7/21/33/39	6/20/30/44	7/22/37/34 *
Muscular strength (%) (B/A/G/VG)	3/19/33/45	4/20/25/51	3/17/41/39 †
Speed/Agility (%) (B/A/G/VG)	4/15/30/51	3/12/31/54	5/18/29/48
Flexibility (%) (B/A/G/VG)	14/24/25/37	20/28/25/27	7/20/25/48 †
Feeding (children reported)			
Breakfast (%) (Yes/No)	91/9	89/11	92/8
To eat in a restaurant (%) (Al/MT/S/N)	2/28/64/6	3/30/61/6	2/25/67/6
Feeding (parents reported)			
Breakfast (%) (Al/MT/S/N)	86/6/5/3	87/6/5/2	85/6/6/3
To eat in a restaurant (%) (N/S/MT/Al)	30/67/2/1	29/69/2/0	30/67/2/1
Screen time (children reported)			
TV and VG weekdays (%) (<2 h/2–4 h/>4 h)	61/23/16	55/25/20	67/21/12 **
TV and VG weekends (%) (<2 h/2–4 h/>4 h)	46/28/26	38/30/32	54/26/20 †
PC and MP weekdays (%) (<2 h/2–4 h/>4 h)	72/17/11	68/18/14	76/17/7 **
PC and MP weekends (%) (<2 h/2–4 h/>4 h)	60/21/19	54/23/23	67/19/14 †
Screen time (parents reported)			
TV weekdays (%) (<2 h/2–4 h/>4 h)	89/10/1	87/11/2	91/8/1
TV weekends (%) (<2 h/2–4 h/>4 h)	64/33/3	63/34/3	64/33/3
VG weekdays (%) (<2 h/2–4 h/>4 h)	97/2/1	95/4/1	98/1/1 **
VG weekends (%) (<2 h/2–4 h/>4 h)	85/13/2	78/17/5	90/8/2 †
PC and MP weekdays (%) (<2 h/2–4 h/>4 h)	97/2/1	98/1/1	96/3/1
PC and MP weekends (%) (<2 h/2–4 h/>4 h)	86/12/2	85/13/2	87/11/2
Hours of sleep			
Weekdays (h/day)	10.00 ± 0.55	10.05 ± 0.52	9.96 ± 0.58 *
Weekends (h/day)	10.38 ± 0.89	10.33 ± 0.95	10.43 ± 0.83
Weekdays (%) (<9 h/9–12 h/>12 h)	2/98/0	1/99/0	2/98/0
Weekends (%) (<9 h/9–12 h/>12 h)	2/96/2	2/96/2	2/96/2

Values are presented as mean ± standard deviation or percentages. *t*-test and χ^2 square statistics was applied. Abbreviations: A, acceptable; Al, always; B, bad; BMI, body mass index; Cm, centimetres; G, good; h/day, hours per day; Kg, kilograms; Kg/m², kilogram per square meter; MP, mobile phone; MT, many times; N, never; NW, normal weight; Ob, obesity; OW, overweight; PC, personal computer; S, sometimes; SD, standard deviation; UN, underweight; VG, video games; VG, very good; (<2 h, less than two hours; 2–4 h, between two and four hours; >4 h, more than four hours; <9 h, less than nine hours; 9–12 h, between nine and twelve hours; >12 h, more than twelve hours. * *p*-value < 0.05, ** *p*-value < 0.01 and † *p*-value < 0.001.

3.2. Independent Associations of Lifestyle Behaviours

A positive association was found between lifestyle behaviours of schoolchildren (levels of physical activity, eating habits, levels of sedentary lifestyle and sleeping habits) and their

body weight status. The healthier the schoolchildren’s lifestyle behaviours, the better their body weight status.

Regarding breakfast frequency, a positive association was found between this variable and body weight status of schoolchildren, both for the total sample and segmented by sex. As can be seen in Figure 1, schoolchildren who had breakfast more regularly had a better body weight status than those who skip breakfast or had breakfast less frequently. The schoolchildren who had breakfast always or almost always (6 or 7 days a week)/many times (3 to 5 times a week)/sometimes (less than 3 times a week)/never or almost never (once a week or less), had a mean BMI of 18, 19, 19.5 and 20.6, respectively, $F = 7.5$ (3) $p < 0.001$.

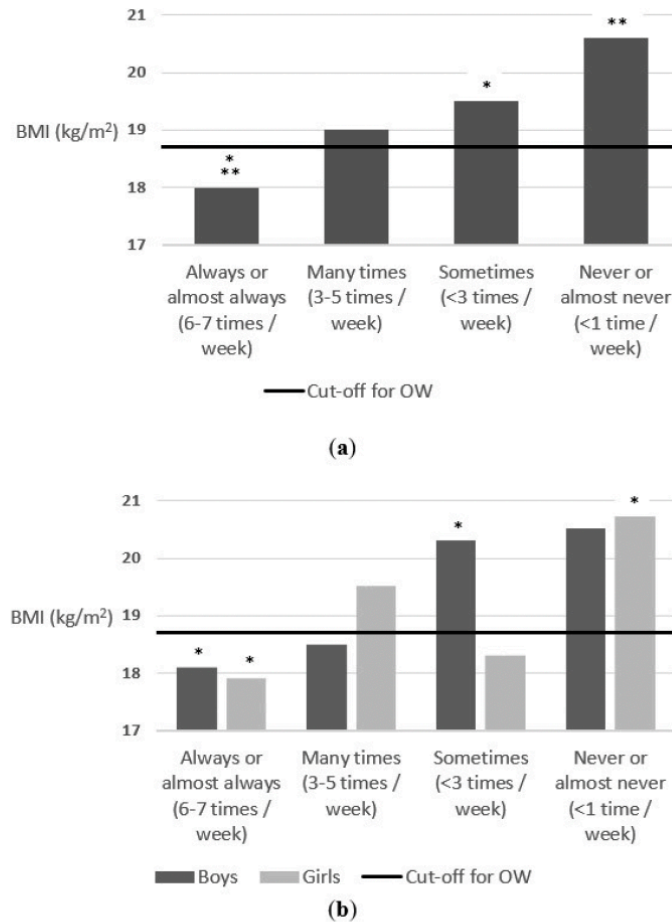


Figure 1. (a) Association between breakfast frequency and body weight status (parents reported); (b) Association between breakfast frequency and body weight status (parents reported) segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole’s cut-off points [44]. * p -value < 0.05 and ** p -value < 0.01 .

There was also an association between screen time (parents reported) and body weight status. As shown in Figure 2, schoolchildren who spent less than 2 h/between 2 and 4 h/more than 4 h a day in front of TV on weekends, had a mean BMI of 17.8, 18.7 and 19.3,

respectively, $F = 6.7$ (2) $p = 0.001$. When separated by sex, in the case of boys, the differences were statistically significant $F = 7.1$ (2) $p = 0.001$. Boys who spent less than 2 h/between 2 and 4 h/more than 4 h a day in front of TV on weekends, had a mean BMI of 17.8, 18.9 and 20.5, respectively. However, the results were not statistically significant for the girls. Those who spent less than 2 h/between 2 and 4 h/more than 4 h a day in front of TV on weekends, had a mean BMI of 17.8, 18.4 and 18.2, respectively, $F = 1.2$ (2) $p = 0.296$.

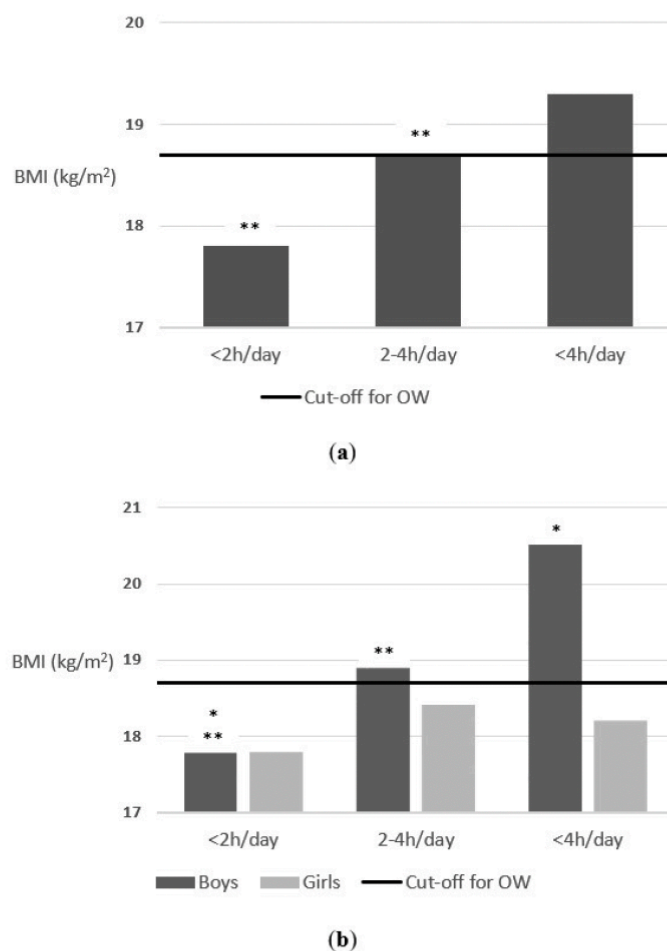


Figure 2. (a) Association between time in front of TV on weekends a day and body weight status (parents reported); (b) Association between time in front of TV on weekends a day and body weight status (parents reported) segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole's cut-off points [44]. * p -value < 0.05 and ** p -value < 0.01.

Finally, a positive association was also found between sleep time and body weight status. As can be seen in Figure 3, schoolchildren who slept less than 9 h/between 9 and 11 h/more than 11 h a day on weekends, had a mean BMI of 20.4, 18.2 and 18.1, respectively, $F = 3.2$ (2) $p = 0.041$. However, although the results followed the same trend, no significant results were found when segmented by sex. Boys who slept less than 9 h/between 9 and 11 h/more than 11 h a day on weekends, had a mean BMI of 21, 18.3 and 17.7, respectively,

$F = 2.9$ (2) $p = 0.054$. Additionally, girls who slept less than 9 h/between 9 and 11/more than 11 h a day on weekends, had a mean BMI of 19.8, 18 and 18.3, respectively, $F = 1.2$ (2) $p = 0.300$.

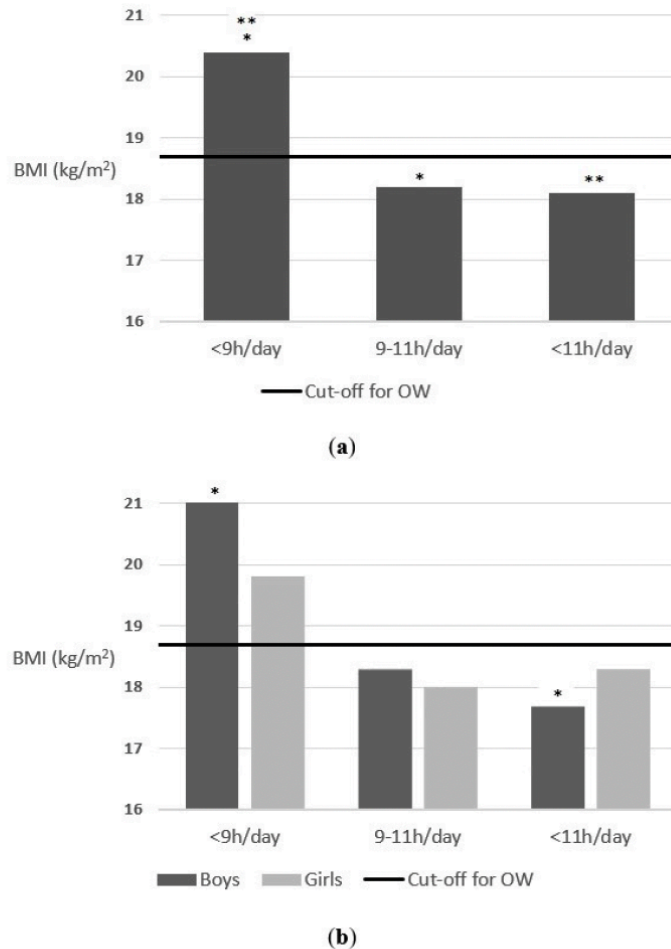


Figure 3. (a) Association between hours of sleep a day on weekends and body weight status (parents reported); (b) Association between hours of sleep a day on weekends and body weight status (parents reported) segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole's cut-off points [44]. * p -value < 0.05 and ** p -value < 0.05.

3.3. Independent Associations of Self-Reported Physical Fitness

There was a positive association between several of the self-reported physical fitness and body weight status. As shown in Figure 4, the higher the self-reported physical fitness, the better the body weight status of schoolchildren. In the case of general physical fitness, it was observed that the schoolchildren who answered that they had a very good/good/acceptable/bad general physical fitness had a mean BMI of 17.5, 18.04, 19.6 and 21.2, respectively, $F = 15.2$ (3) $p < 0.001$. The answers regarding cardiorespiratory fitness and muscular strength followed the same trend, although the differences were not significant: $F = 1.5$ (3) $p = 0.21$ and $F = 0.6$ (3) $p = 0.61$, respectively. However, the difference

in the mean BMI across the answer categories of speed-agility were significant: $F = 22.5$ (3) $p < 0.001$ ranging from 17.3 to 20.8. The schoolchildren who answered that they had a very good/good/acceptable/bad speed-agility had a mean BMI of 17.3, 18.5, 19.4 and 20.8, respectively. Regarding flexibility, significant differences were also found with respect to BMI. The schoolchildren who answered that they had a very good/good/acceptable/bad flexibility had a mean BMI of 17.4, 18.3, 18.7 and 18.8, respectively, $F = 8.2$ (3) $p < 0.001$. The same happened when it was segmented by sex (general physical fitness, $F = 10.7$ (3) $p < 0.001$; cardiorespiratory fitness, $F = 1.3$ (3) $p = 0.26$; muscular strength, $F = 0.4$ (3) $p = 0.71$; speed-agility, $F = 14.7$ (3) $p < 0.001$; flexibility, $F = 2.4$ (3) $p = 0.07$ for boys, and general physical fitness, $F = 5.03$ (3) $p = 0.002$; cardiorespiratory fitness, $F = 0.5$ (3) $p = 0.69$; muscular strength, $F = 1.04$ (3) $p = 0.37$; speed-agility, $F = 8.8$ (3) $p < 0.001$; flexibility, $F = 8.1$ (3) $p < 0.001$ for girls).

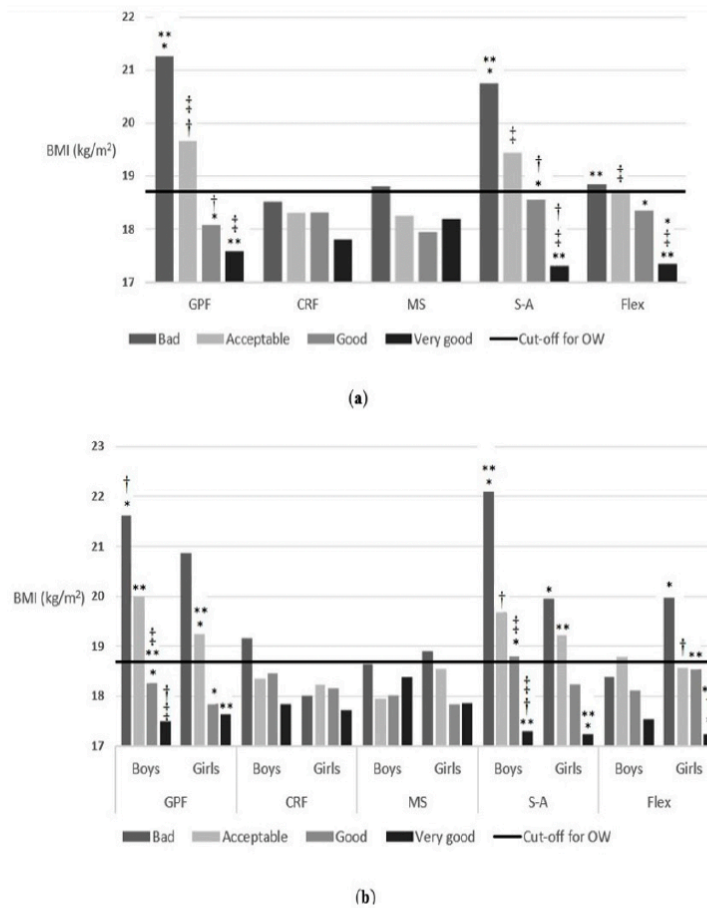


Figure 4. (a) Association between self-reported physical fitness and body weight status (children reported); (b) Association between self-reported physical fitness and body weight status (children reported) segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole’s cut-off points [44]. * p -value < 0.05 , ** p -value < 0.05 , † p -value < 0.05 and ‡ p -value < 0.05 . Abbreviations: CRF, cardiorespiratory fitness; Flex, flexibility; GPF, general physical fitness; MS, muscular strength; S-A, speed-agility.

3.4. Combined Associations of Lifestyle Behaviours and Self-Reported Physical Fitness

Once these results were obtained, in order to verify the influence of lifestyle behaviours and physical fitness on the body weight status of schoolchildren, a combined score of lifestyle behaviours and self-reported physical fitness was calculated. For this, a variable was selected from each category (eating habits, sedentary behaviour, sleep time and self-reported physical fitness). Then, a summation of variables was performed, and finally, the outcome variable was re-categorized into three categories according to the lifestyle behaviours that the schoolchildren follow (good/regular/bad lifestyle behaviours). This means that the schoolchildren who had a good/regular/bad score, had healthier/regular health/less healthy lifestyle behaviours and good/regular/bad self-reported physical fitness.

Effectively, as shown in Figure 5, schoolchildren who followed healthier lifestyle behaviours and presented good values of physical fitness had a better body weight status. Schoolchildren who presented a good/regular/bad score in the combined score of lifestyle behaviours and physical fitness had a mean BMI of 17.4, 18.8 and 21.7, respectively, $F = 18.1$ (2) $p < 0.001$. The same happened when it was segmented by sex. Boys who presented a good/regular/bad score in the combined score of lifestyle behaviours and physical fitness had a mean BMI of 17.2, 19.2 and 21.1, respectively, $F = 14.5$ (2) $p < 0.001$. Additionally, girls who presented a good/regular/bad score in the combined score of lifestyle behaviours and physical fitness had a mean BMI of 17.6, 18.3 and 22.4, respectively, $F = 6.3$ (2) $p = 0.002$.

After realising the logistic regression, it was observed that the schoolchildren who had a regular lifestyle behaviours and regular physical fitness (a regular assessment on the combined score) had a 2.015 times higher risk of being overweight or obese than those who followed healthy lifestyle behaviours and had a good physical fitness (had a good assessment on the combined score) ($p < 0.001$). Additionally, schoolchildren who had bad lifestyle behaviours and bad physical fitness (a bad assessment on the combined score) had a 10.34 times higher risk of being overweight or obese than those who followed healthy lifestyle behaviours and had a good physical fitness (had a good assessment on the combined score) ($p = 0.004$).

These results demonstrate the importance of following healthy lifestyle behaviours and having a good physical fitness to maintain a correct and healthy body weight status at school age.

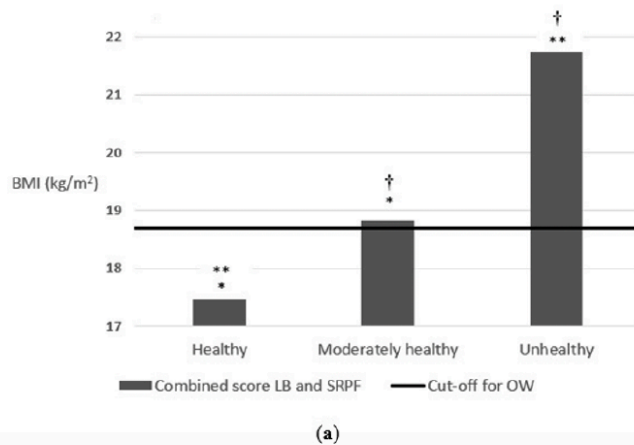


Figure 5. Cont.

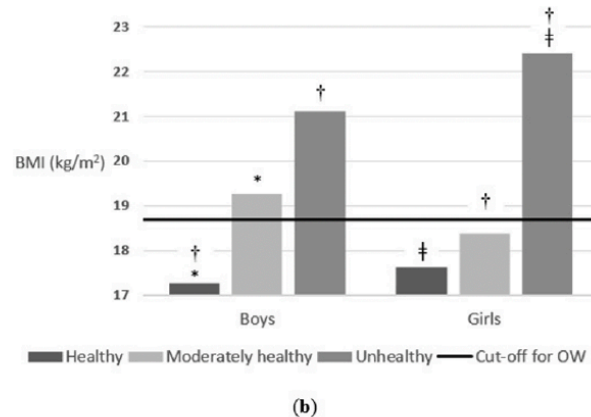


Figure 5. (a) Association between the combined score of lifestyle behaviours and self-reported physical fitness on body weight status; (b) Association between the combined score of lifestyle behaviours and self-reported physical fitness on body weight status segmenting by sex. The cut-off for OW line indicates the beginning of the OW category according to Cole's cut-off points [44]. * p -value < 0.001, ** p -value < 0.001, † p -value < 0.01 and ‡ p -value < 0.05. Abbreviations: LB, lifestyle behaviours; SRPF, self-reported physical fitness.

4. Discussion

This study aimed to verify the association between lifestyle behaviours and self-reported physical fitness (individually and combined) with body weight status in schoolchildren from the province of Cádiz. Particularly, it was found that there were independent and combined associations of lifestyle behaviours and physical fitness with body weight status in schoolchildren.

Lifestyle behaviours are key determinants in the developing of healthy/unhealthy body weight status. It has been shown in this study that self-reported physical fitness predicted overweight and/or obesity in schoolchildren, as well as the combination of lifestyle factors in this cohort, and can thus be a valuable screening tool. In addition, the combined score of lifestyle behaviours and self-reported physical fitness as a tool may also be valuable for predicting childhood overweight and obesity.

One of these lifestyle behaviours is related with nutrition habits such as breakfast, which is one of the more controversial meals, considered a key meal of the day on some occasions and questioned in others. Most of the studies associated breakfast with better body weight control and healthy cardiometabolic risk indicators in children [48–50]. However, other studies suggest inverse or controversial relationships [51–53]. Several studies have shown a direct relationship between breakfast skipping and being overweight or obese [49,54]. According to López-Sobaler et al. [48], the breakfast of the Spanish population can be improved, since a high percentage skip breakfast, have an insufficient breakfast or incorporate inadequate foods. Our findings concur with those reported by López-Sobaler et al., Szajewska et al. and Monzani et al. [48–50,54], who suggest breakfast is associated with better body weight control and skipping breakfast is directly related with being overweight or obese.

Screen-based sedentary behaviours (watching TV, playing video games, using mobile phones, tablets and computers) are common among young people, most children failing to meet guidelines of <2 h of television per day [55]. This is of concern given the positive associations between increased levels of screen time, sedentary behaviour and adverse health outcomes [56]. The results found in the present study are in line with this; schoolchildren who spent more than 4 h a day on screen time had a worse body weight status than those who spent between 2 and 4 h or less than 2 h. Therefore, as supported by previous studies,

a negative association was found in the present study between screen time and the body weight status of the schoolchildren.

Insufficient sleep in childhood has been shown to significantly raise the risk of overweight and obesity [13,57]. These observations suggest that insufficient sleep affects food intake via hedonic rather than homeostatic processes [58]. Evidence to date points to food intake rather than activity as the primary pathway [59]. Epidemiological studies in children have identified an inverse relationship between sleep duration and energy intake [60,61]. According to these studies, a positive association was found between hours of sleep and body weight status. Schoolchildren who slept more hours a day had a better body weight status than those who slept fewer hours.

On the other hand, according to several studies [62–64], perceived physical fitness is considered a powerful marker of health already in youth. This supports the results obtained in the present study, where a positive association was observed between physical fitness and body weight status. It was found that the higher the physical fitness, the better the children's body weight status. Along the same lines are the results of the cross-sectional study carried out by Ruiz-Montero, J.P. et al. [65], where a positive association between self-reported physical fitness and body weight status was found in a group of adolescent secondary school students. According to this study, a higher body mass index in adolescents was associated with a worse general physical fitness, cardiorespiratory fitness, muscle strength, speed-agility and flexibility.

A recent systematic review [35] showed that lifestyle behaviour interventions were generally effective at reducing excess weight in children and adolescents. Absolute reductions in BMI z-score of 0.2 or more were observed in the intervention groups, compared with virtually no reduction in the control groups. In turn, a community intervention focused on improving the lifestyle behaviours of schoolchildren between 10 and 12 years old, carried out in Australia, showed a 6% reduction in the prevalence of overweight and obesity in a follow-up at 3 years after the intervention among schoolchildren in the intervention group [66]. Furthermore, in a study carried out by Anna-Kaisa, K. et al. [67] a positive association was found between physical fitness and body weight status in 8-year-old children. Children who were overweight or obese had an impaired performance in tests requiring muscle endurance, balance, explosive power of lower extremities, upper body strength, endurance and speed and agility in both genders and exercise capacity in boys. These findings support the positive association found in the present study between the combined score created for lifestyle behaviours and physical fitness on body weight status of schoolchildren. Children who followed healthier lifestyle behaviours and had better physical fitness had better body weight status than those who followed unhealthy lifestyle behaviours and presented bad physical fitness.

As a possible limitation of the study, it should be noted that the physical fitness of schoolchildren and family members was not objectively assessed but doing so subjectively using the self-report questionnaire of perceived physical condition IFIS. It was decided to evaluate the physical fitness in this way due to the complexity of bringing together schoolchildren, and especially their families to perform a series of physical tests. As a positive aspect to support this decision, point out that the IFIS has been previously validated and used successfully in this population group [38]. Another possible limitation of this study is that it is a cross-sectional study, where a single measurement is collected at a specific point in time, so it cannot be compared with a previous or subsequent measurement, but since what has been done is to check if there is association between the study variables and the body weight status of the schoolchildren by way of description, there should be no problem when using this design. In future studies, the pre and post intervention measurements will be compared to see if there have been changes with the performance of the intervention or not, and to verify its efficacy or not.

Among the strengths of this project, it should be noted that there is a large and representative sample of boys and girls aged 8 to 9 from all over the province of Cádiz, with schools spread throughout the province. In addition, it had the response of the

schoolchildren and their families, which made it possible to counteract the information of the children and parents, obtaining more complete and truthful information from the study sample.

5. Conclusions

In accordance with the objective proposed in the present study, it has been shown that there is an independent and combined association between lifestyle behaviours and physical fitness on the body weight status of schoolchildren in the third grade of primary education in the province of Cádiz.

The better the lifestyle behaviours and the physical fitness that schoolchildren lead, the better their body weight status. Therefore, it is suggested that strategies or interventions be carried out in schools, involving teachers, schoolchildren and their families, to get children to adopt healthy lifestyles and have a good physical fitness from an early age. This will allow them to maintain a healthy body weight status both in childhood and in adulthood, preventing overweight and obesity, as well as various health problems associated with this disease.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Andalusian Biomedical Research Ethics Committee, along with approval from the Delegation of Education and Science of the province of Cádiz (PI-007-2017, 21 March 2018) for studies involving humans.

Informed Consent Statement: Informed consent was obtained from all parents or caregivers of the subjects involved in the study.

Data Availability Statement: The data supporting the current findings can be found upon request to the corresponding author in the repository of scientific data from the local university.

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References

1. World Health Organization. *Report of the Commission on Ending Childhood Obesity*; WHO Document Production Services: Geneva, Switzerland, 2016; pp. 1–30.
2. Qi, S.-J. Childhood obesity and food intake. *World J. Pediatr.* **2015**, *11*, 101–107. [[CrossRef](#)]
3. Pérez-Herrera, A.; Cruz-López, M. Childhood obesity: Current situation in Mexico. *Nutr. Hosp.* **2019**, *36*, 463–469. [[CrossRef](#)] [[PubMed](#)]

4. Ng, M.; Fleming, T.; Robinson, M.; Thomson, B.; Graetz, N.; Margono, C.; Mullany, E.C.; Biryukov, S.; Abbafati, C.; Abera, S.F.; et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet* **2014**, *384*, 766–781. [[CrossRef](#)]
5. Kumar, S.; Kelly, A.S. Review of Childhood Obesity: From Epidemiology, Etiology, and Comorbidities to Clinical Assessment and Treatment. *Mayo Clin. Proc.* **2017**, *92*, 251–265. [[CrossRef](#)] [[PubMed](#)]
6. Ahrens, W.; Pigeot, I.; Pohlbeln, H.; De Henauw, S.; Lissner, L.; Molnár, D.; Moreno, L.A.; Tornaritis, M.; Veidebaum, T.; Siani, A.; et al. Prevalence of overweight and obesity in European children below the age of 10. *Int. J. Obes.* **2014**, *38*, S99–S107. [[CrossRef](#)] [[PubMed](#)]
7. Cadenas-Sanchez, C.; Nyström, C.; Sanchez-Delgado, G.; Martinez-Tellez, B.; Mora-Gonzalez, J.; Risinger, A.S.; Ruiz, J.R.; Ortega, F.B.; Löf, M. Prevalence of overweight/obesity and fitness level in preschool children from the north compared with the south of Europe: An exploration with two countries. *Pediatr. Obes.* **2016**, *11*, 403–410. [[CrossRef](#)] [[PubMed](#)]
8. Lauria, L.; Spinelli, A.; Buoncristiano, M.; Nardone, P. Decline of childhood overweight and obesity in Italy from 2008 to 2016: Results from 5 rounds of the population-based surveillance system. *BMC Public Health* **2019**, *19*, 618. [[CrossRef](#)] [[PubMed](#)]
9. Hassapidou, M.; Tzotzas, T.; Makri, E.; Pagkalos, I.; Kaklamanos, I.; Kapantais, E.; Abrahamian, A.; Polymeris, A.; Tziomalos, K. Prevalence and geographic variation of abdominal obesity in 7- and 9-year-old children in Greece; World Health Organization Childhood Obesity Surveillance Initiative 2010. *BMC Public Health* **2017**, *17*, 126. [[CrossRef](#)]
10. Abarca-Gómez, L.; Abdeen, Z.A.; Hamid, Z.A.; Abu-Rmeileh, N.M.; Acosta-Cazares, B.; Acuin, C.; Adams, R.J.; Aekplakorn, W.; Afsana, K.; Aguilar-Salinas, C.A.; et al. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. *Lancet* **2017**, *390*, 2627–2642. [[CrossRef](#)]
11. Agencia Española De Seguridad Alimentaria Y Nutrición. *Aladino 2019. Informe Breve. Estudio Sobre La Alimentación, Actividad Física, Desarrollo Infantil Y obesidad En España 2019*; Estrategia NAOS; Ministerio de Consumo: Madrid, Spain, 2020.
12. Villagrán-Pérez, S.; Novalbos-Ruiz, J.P.; Rodríguez-Martín, A.; Martínez-Nieto, J.M.; Lechuga-Sancho, A.M. Implicaciones del nivel socioeconómico familiar sobre las conductas de riesgo en la obesidad infantojuvenil. *Nutr. Hosp.* **2013**, *28*, 1951–1960. [[CrossRef](#)]
13. Cappuccio, F.P.; Taggart, F.M.; Kandala, N.-B.; Currie, A.; Peile, E.; Stranges, S.; Miller, M.A. Meta-Analysis of Short Sleep Duration and Obesity in Children and Adults. *Sleep* **2008**, *31*, 619–626. [[CrossRef](#)] [[PubMed](#)]
14. Börnhorst, C.; Wijnhoven, T.M.; Kunešová, M.; Yngve, A.; Rito, A.I.; Lissner, L.; Duleva, V.; Petrauskiene, A.; Breda, J. WHO European Childhood Obesity Surveillance Initiative: Associations between sleep duration, screen time and food consumption frequencies. *BMC Public Health* **2015**, *15*, 442. [[CrossRef](#)]
15. Ortega Anta, R.M.; López-Solaber, A.M.; Pérez-Farinós, N. Associated factors of obesity in Spanish representative samples. *Nutr. Hosp.* **2013**, *28* (Suppl. 5), 56–62. [[CrossRef](#)] [[PubMed](#)]
16. Rodríguez-Rodríguez, E.; Palmeros-Exsome, C.; López-Sobaler, A.M.; Ortega, R.M. Research Group: 920030 Preliminary data on the association between waist circumference and insulin resistance in children without a previous diagnosis. *Eur. J. Pediatr.* **2011**, *170*, 35–43. [[CrossRef](#)]
17. Griffiths, L.J.; Parsons, T.J.; Hill, A.J. Self-esteem and quality of life in obese children and adolescents: A systematic review. *Int. J. Pediatr. Obes.* **2010**, *5*, 282–304. [[CrossRef](#)] [[PubMed](#)]
18. Biro, F.M.; Wien, M. Childhood obesity and adult morbidities. *Am. J. Clin. Nutr.* **2010**, *91*, 1499–1505. [[CrossRef](#)]
19. De Lorenzo, A.; Gratteri, S.; Gualtieri, P.; Cammarano, A.; Bertucci, P.; Di Renzo, L. Why primary obesity is a disease? *J. Transl. Med.* **2019**, *17*, 169. [[CrossRef](#)]
20. Kachur, S.; Lavie, C.J.; De Schutter, A.; Milani, R.V.; Ventura, H.O. Obesity and cardiovascular diseases. *Minerva Med.* **2017**, *108*, 212–228. [[CrossRef](#)]
21. Engin, A. The definition and prevalence of obesity and metabolic syndrome. *Adv. Exp. Med. Biol.* **2017**, *960*, 1–17. [[CrossRef](#)] [[PubMed](#)]
22. Lavie, C.J.; De Schutter, A.; Parto, P.; Jahangir, E.; Kokkinos, P.; Ortega, F.B.; Arena, R.; Milani, R.V. Obesity and Prevalence of Cardiovascular Diseases and Prognosis-The Obesity Paradox Updated. *Prog. Cardiovasc. Dis.* **2016**, *58*, 537–547. [[CrossRef](#)] [[PubMed](#)]
23. World Health Organization. Country profiles on nutrition, physical activity and obesity in the 53 WHO European Region Member States: Methodology and summary. *Reg. Off. Eur.* **2013**, 1–13.
24. Fitzgerald, M.P.; Hennigan, K.; O’Gorman, C.S.; McCarron, L. Obesity, diet and lifestyle in 9-year-old children with parentally reported chronic diseases: Findings from the Growing Up in Ireland longitudinal child cohort study. *Ir. J. Med. Sci.* **2019**, *188*, 29–34. [[CrossRef](#)] [[PubMed](#)]
25. Bischoff, S.C.; Boirie, Y.; Cederholm, T.; Chourdakis, M.; Cuerda, C.; Delzenne, N.M.; Deutz, N.E.; Fouque, D.; Genton, L.; Gil, C.; et al. Towards a multidisciplinary approach to understand and manage obesity and related diseases. *Clin. Nutr.* **2017**, *36*, 917–938. [[CrossRef](#)] [[PubMed](#)]
26. Borges, C.A.; Slater, B.; Santaliestra-Pasías, A.M.; Mouratidou, T.; Huybrechts, I.; Widhalm, K.; Gottrand, F.; Manios, Y.; Jimenez-Pavón, D.; Valtueña, J.; et al. Dietary Patterns in European and Brazilian Adolescents: Comparisons and Associations with Socioeconomic Factors. *Nutrients* **2018**, *10*, 57. [[CrossRef](#)]

27. Seo, Y.G.; Lim, H.; Kim, Y.; Ju, Y.S.; Lee, H.J.; Jang, H.B.; Park, K.H. The Effect of a Multidisciplinary Lifestyle Intervention on Obesity Status, Body Composition, Physical Fitness, and Cardiometabolic Risk Markers in Children and Adolescents with Obesity. *Nutrients* **2019**, *11*, 137. [[CrossRef](#)] [[PubMed](#)]
28. Müller, I.; Schindler, C.; Adams, L.; Endes, K.; Gall, S.; Gerber, M.; Htun, N.; Nqweniso, S.; Joubert, N.; Probst-Hensch, N.; et al. Effect of a Multidimensional Physical Activity Intervention on Body Mass Index, Skinfolds and Fitness in South African Children: Results from a Cluster-Randomised Controlled Trial. *Int. J. Environ. Res. Public Health* **2019**, *16*, 232. [[CrossRef](#)] [[PubMed](#)]
29. Carson, V.; Tremblay, M.S.; Chaput, J.P.; Chastin, S. Associations between sleep duration, sedentary time, physical activity, and health indicators among Canadian children and youth using compositional analyses. *Appl. Physiol. Nutr. Metab.* **2016**, *41*, S294–S302. [[CrossRef](#)]
30. Bustos, N.; Olivares, S.; Leyton, B.; Cano, M.; Albala, C. Impact of a school-based intervention on nutritional education and physical activity in primary public schools in Chile (KIND) programme study protocol: Cluster randomised controlled trial. *BMC Public Health* **2016**, *16*, 1217. [[CrossRef](#)]
31. Staiano, A.E.; Beyl, R.A.; Guan, W.; Hendrick, C.A.; Hsia, D.S.; Newton, R.L. Home-based exergaming among children with overweight and obesity: A randomized clinical trial. *Pediatr. Obes.* **2018**, *13*, 724–733. [[CrossRef](#)] [[PubMed](#)]
32. Fang, K.; Mu, M.; Liu, K.; He, Y. Screen time and childhood overweight/obesity: A systematic review and meta-analysis. *Child. Care Health Dev.* **2019**, *45*, 744–753. [[CrossRef](#)] [[PubMed](#)]
33. Robinson, T.N.; Banda, J.A.; Hale, L.; Lu, A.S.; Fleming-Milici, F.; Calvert, S.L.; Wartella, E. Screen Media Exposure and Obesity in Children and Adolescents. *Pediatrics* **2017**, *140*, S97–S101. [[CrossRef](#)] [[PubMed](#)]
34. Sluggert, L.; Wagner, S.L.; Harris, R.L. Sleep Duration and Obesity in Children and Adolescents. *Can. J. Diabetes.* **2019**, *43*, 146–152. [[CrossRef](#)] [[PubMed](#)]
35. O'Connor, E.A.; Evans, C.V.; Burda, B.U.; Walsh, E.S.; Eder, M.; Lozano, P. Screening for obesity and intervention for weight management in children and adolescents evidence report and systematic review for the us preventive services task force. *JAMA J. Am. Med. Assoc.* **2017**, *317*, 2427–2444. [[CrossRef](#)] [[PubMed](#)]
36. Ortega, F.B.; Sánchez-López, M.; Solera-Martínez, M.; Fernández-Sánchez, A.; Sjöström, M.; Martínez-Vizcaino, V. Self-reported and measured cardiorespiratory fitness similarly predict cardiovascular disease risk in young adults. *Scand. J. Med. Sci. Sport.* **2013**, *23*, 749–757. [[CrossRef](#)] [[PubMed](#)]
37. Jiménez-Pavón, D.; Castillo, M.J.; Moreno, L.A.; Kafatos, A.; Manios, Y.; Kondaki, K.; Béghin, L.; Zaccaria, M.; de Henauw, S.; Widhalm, K.; et al. Fitness and fatness are independently associated with markers of insulin resistance in European adolescents; the HELENA study. *Int. J. Pediatr. Obes.* **2011**, *6*, 253–260. [[CrossRef](#)] [[PubMed](#)]
38. Sánchez-López, M.; Martínez-Vizcaino, V.; García-Hermoso, A.; Jiménez-Pavón, D.; Ortega, F.B. Construct validity and test-retest reliability of the International Fitness Scale (IFIS) in Spanish children aged 9–12 years. *Scand. J. Med. Sci. Sport.* **2015**, *25*, 543–551. [[CrossRef](#)] [[PubMed](#)]
39. Donnelly, J.E.; Hillman, C.H.; Castelli, D.; Etnier, J.L.; Lee, S.; Tomporowski, P.; Lambourne, K.; Szabo-Reed, A.N. Physical Activity, Fitness, Cognitive Function, and Academic Achievement in Children: A Systematic Review. *Med. Sci. Sports Exerc.* **2016**, *48*, 1197–1222. [[CrossRef](#)] [[PubMed](#)]
40. Raistenskis, J.; Sidlauskienė, A.; Strukcinskienė, B.; Baysal, S.U.; Buckus, R. Physical activity and physical fitness in obese, overweight, and normal-weight children. *Turkish J. Med. Sci.* **2016**, *46*, 443–450. [[CrossRef](#)]
41. Smith, J.J.; Eather, N.; Morgan, P.J.; Plotnikoff, R.C.; Faigenbaum, A.D.; Lubans, D.R. The health benefits of muscular fitness for children and adolescents: A systematic review and meta-analysis. *Sports Med.* **2014**, *44*, 1209–1223. [[CrossRef](#)] [[PubMed](#)]
42. Aragón-Martín, R.; Gómez-Sánchez, M.D.M.; Jiménez-Pavón, D.; Martínez-Nieto, J.M.; Schwarz-Rodríguez, M.; Segundo-Iglesias, C.; Novalbos-Ruiz, J.P.; Santi-Cano, M.J.; Castro-Piñero, J.; Lineros-González, C.; et al. A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ.”. *Int. J. Environ. Res. Public Health* **2021**, *18*, 1622. [[CrossRef](#)] [[PubMed](#)]
43. Marfell-Jones, M.J.; Stewart, A.D.; De Ridder, J.H. *International Standards for Anthropometric Assessment*; International Society for the Advancement of Kinanthropometry: Wellington, New Zealand, 2011; ISBN 0620362073.
44. Cole, T.J.; Bellizzi, M.C.; Flegal, K.M.; Dietz, W.H. Establishing a standard definition for child overweight and obesity worldwide: International survey. *Br. Med. J.* **2000**, *320*, 1240–1243. [[CrossRef](#)] [[PubMed](#)]
45. Lineros-González, C.; Marcos-Marcos, J.; Ariza, C.; Hernán-García, M. Importancia del proceso en la evaluación de la efectividad de una intervención sobre obesidad infantil. *Gac. Sanit.* **2017**, *31*, 238–241. [[CrossRef](#)] [[PubMed](#)]
46. Sánchez-Martínez, F.; Torres Capcha, P.; Serral Cano, G.; Valmayor Safont, S.; Castell Abat, C.; Grupo de Evaluación del Proyecto POIBA. Factors Associated with Overweight and Obesity in Schoolchildren from 8 to 9 Years Old. Barcelona, Spain. *Rev. Esp. Salud Pública* **2016**, *90*, e1–e11.
47. Tremblay, M.S.; Carson, V.; Chaput, J.P.; Connor Gorber, S.; Dinh, T.; Duggan, M.; Faulkner, G.; Gray, C.E.; Grube, R.; Janson, K.; et al. Canadian 24-hour movement guidelines for children and youth: An integration of physical activity, sedentary behaviour, and sleep. *Appl. Physiol. Nutr. Metab.* **2016**, *41*, S311–S327. [[CrossRef](#)] [[PubMed](#)]
48. López-Sobaler, A.M.; Cuadrado-Soto, E.; Peral-Suárez, Á.; Aparicio, A.; Ortega, R.M. Importancia del desayuno en la mejora nutricional y sanitaria de la población. *Nutr. Hosp.* **2018**, *35*, 3–6. [[CrossRef](#)] [[PubMed](#)]
49. Szajewska, H.; Ruszczyński, M. Systematic review demonstrating that breakfast consumption influences body weight outcomes in children and adolescents in Europe. *Crit. Rev. Food Sci. Nutr.* **2010**, *50*, 113–119. [[CrossRef](#)] [[PubMed](#)]

50. Monzani, A.; Ricotti, R.; Caputo, M.; Solito, A.; Archero, F.; Bellone, S.; Prodam, F. A systematic review of the association of skipping breakfast with weight and cardiometabolic risk factors in children and adolescents What should we better investigate in the future? *Nutrients* **2019**, *11*, 387. [[CrossRef](#)]
51. Andersen, L.F.; Lillegaard, I.T.L.; Øverby, N.; Klepp, K.I.; Lytle, L.; Johansson, L. Overweight and obesity among Norwegian schoolchildren: Changes from 1993 to 2000. *Scand. J. Public Health* **2005**, *33*, 99–106. [[CrossRef](#)] [[PubMed](#)]
52. Kim, J.H.; So, W.Y. Association between frequency of breakfast eating and obesity in Korean adolescents. *Iran. J. Public Health* **2012**, *41*, 50–57.
53. Küpers, L.K.; De Pijper, J.J.; Sauer, P.J.J.; Stolk, R.P.; Corpeleijn, E. Skipping breakfast and overweight in 2-and 5-year-old Dutch children—the GECKO Drenthe cohort. *Int. J. Obes.* **2014**, *38*, 569–571. [[CrossRef](#)]
54. Ardeshtirlarijani, E.; Namazi, N.; Jabbari, M.; Zeinali, M.; Gerami, H.; Jalili, R.B.; Larijani, B.; Azadbakht, L. The link between breakfast skipping and overweight/obesity in children and adolescents: A meta-analysis of observational studies. *J. Diabetes Metab. Disord.* **2019**, *18*, 657–664. [[CrossRef](#)] [[PubMed](#)]
55. Roos, R.; Mason, K.M.; Stefanogiannis, N.; Templeton, R.; Weerasekera, D. *The Health of New Zealand Children 2011/12: Key findings of the New Zealand Health Survey*; Ministry of Health: Wellington, New Zealand, 2012.
56. Nelson, M.C.; Neumark-Stzainer, D.; Hannan, P.J.; Sirard, J.R.; Story, M. Longitudinal and secular trends in physical activity and sedentary behavior during adolescence. *Pediatrics* **2006**, *118*, e1627–e1634. [[CrossRef](#)] [[PubMed](#)]
57. Chen, X.; Beydoun, M.A.; Wang, Y. Is sleep duration associated with childhood obesity? A systematic review and meta-analysis. *Obesity* **2008**, *16*, 265–274.
58. Chaput, J.-P.; St-Onge, M.-P. Increased Food Intake by Insufficient Sleep in Humans: Are We Jumping the Gun on the Hormonal Explanation? *Front. Endocrinol.* **2014**, *5*, 116. [[CrossRef](#)] [[PubMed](#)]
59. McDonald, L.; Wardle, J.; Llewellyn, C.H.; Fisher, A. Nighttime sleep duration and hedonic eating in childhood. *Int. J. Obes.* **2015**, *39*, 1463–1466. [[CrossRef](#)] [[PubMed](#)]
60. Golley, R.K.; Maher, C.A.; Matricciani, L.; Olds, T.S. Sleep duration or bedtime? Exploring the association between sleep timing behaviour, diet and BMI in children and adolescents. *Int. J. Obes.* **2013**, *37*, 546–551. [[CrossRef](#)]
61. Fisher, A.; McDonald, L.; van Jaarsveld, C.H.M.; Llewellyn, C.; Fildes, A.; Schrempft, S.; Wardle, J. Sleep and energy intake in early childhood. *Int. J. Obes.* **2014**, *38*, 926–929. [[CrossRef](#)]
62. Ortega, F.B.; Silventoinen, K.; Tynelius, P.; Rasmussen, F. Muscular strength in male adolescents and premature death: Cohort study of one million participants. *BMJ* **2012**, *345*, e7279. [[CrossRef](#)] [[PubMed](#)]
63. Ortega, F.B.; Ruiz, J.R.; Castillo, M.J.; Sjöström, M. Physical fitness in childhood and adolescence: A powerful marker of health. *Int. J. Obes.* **2007**, *32*, 1–11. [[CrossRef](#)] [[PubMed](#)]
64. Ruiz, J.R.; Castro-Piñero, J.; Artero, E.G.; Ortega, F.B.; Sjöström, M.; Suni, J.; Castillo, M.J. Predictive validity of health-related fitness in youth: A systematic review. *Br. J. Sports Med.* **2009**, *43*, 909–923. [[CrossRef](#)]
65. Ruiz-Montero, P.J.; Chiva-Bartoll, O.; Baena-Extremera, A.; Hortigüela-Alcalá, D. Gender, Physical Self-Perception and Overall Physical Fitness in Secondary School Students: A Multiple Mediation Model. *Int. J. Environ. Res. Public Health* **2020**, *17*, 6871. [[CrossRef](#)] [[PubMed](#)]
66. Swinburn, B.; Malakellis, M.; Moodie, M.; Waters, E.; Gibbs, L.; Millar, L.; Herbert, J.; Virgo-Milton, M.; Mavoa, H.; Kremer, P.; et al. Large reductions in child overweight and obesity in intervention and comparison communities 3 years after a community project. *Pediatr. Obes.* **2014**, *9*, 455–462. [[CrossRef](#)] [[PubMed](#)]
67. Karppanen, A.-K.; Ahonen, S.-M.; Tammelin, T.; Vanhala, M.; Korpelainen, R. Physical activity and fitness in 8-year-old overweight and normal weight children and their parents. *Int. J. Circumpolar Health* **2012**, *71*, 17621. [[CrossRef](#)] [[PubMed](#)]

ANNEX III: Manuscript of Study III: Effectiveness of a School-Based Multimodal Intervention on Promoting Healthy Lifestyle Behaviours Among Schoolchildren. Previene-Cádiz Study.

Effectiveness of a School-Based Multimodal Intervention on Promoting Healthy Lifestyle Behaviours Among Schoolchildren. Previene-Cádiz Study.

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Abstract.

Childhood obesity is a pressing global health concern, with significant implications for long-term health outcomes. To address this issue, particularly among youth, this study aimed to evaluate the effectiveness of a school-based multimodal intervention targeting healthy lifestyle behaviours among schoolchildren in the province of Cádiz. A quasi-experimental design was employed, comparing outcomes between the experimental and control groups. The intervention adopted a multimodal approach, targeting students, their families, and educational institutions. The students participated in a healthy educational programme of 10 sessions and were provided with two workbooks to use at home with their families. Additionally, parents attended three training courses aimed at improving their children's lifestyle behaviours. The intervention aimed to achieve significant improvements in various health-related parameters such as body composition, physical fitness, physical activity levels, sedentary behaviours, dietary patterns, and sleep pattern. The results suggested that the intervention produced moderate and at times variable effects in promoting healthier lifestyle behaviours among schoolchildren. While improvements were noted in the experimental group compared to the control group, these did not fully meet the initial expectations. This outcome underscores the need for further research and adjustments in implementation, such as the integration of specialised external personnel to support teachers, embedding the intervention into the school curriculum, and extending its duration throughout an entire academic year. This study contributes valuable insights into childhood obesity prevention and intervention strategies, paving the way for future research endeavours aimed at promoting the health and well-being of children worldwide.

Keywords: Childhood obesity, school-based multimodal intervention, healthy lifestyle behaviours, school curriculum integration, external support, effectiveness assessment.

Introduction

Childhood obesity represents a global public health problem. According to the World Health Organization (WHO), since 1975, obesity has nearly tripled worldwide (1). While historically prevalent in developed nations, it is increasingly affecting developing countries (2). For example, Mexico reported a prevalence of overweight and obesity in children of the 33.2% in 2016 (3). Across developed countries, approximately 23% of children and adolescents are overweight or obese, with a 13% prevalence in developing nations (4). In the United States, one in three children currently grapples with overweight or obesity (5). Southern European countries, including Bulgaria, Greece, Italy, and Spain, exhibit obesity rates exceeding 40% (6–9). Over the past two decades, Spain has witnessed a three to four-fold increase in obesity prevalence, significantly impacting chronic disease rates, healthcare costs, and overall population well-being (10). The Aladdin study reported in 2019 a 40.6% prevalence of overweight and obesity among Spanish children aged 6 to 9 years (11). Additionally, a study from our project (Previene-Cádiz) reported in 2019 a prevalence of overweight and obesity of 35.2% (12.9% obesity) among schoolchildren aged 8 to 9 years in the province of Cádiz (southwest of Spain), indicating a considerably prevalence compared to other regions (12).

Overweight or obesity has serious health consequences, especially for children. In particular, children and adolescents who are obese face a heightened risk of developing obesity in adulthood (13). Obesity during childhood and adolescence significantly heightens the likelihood of developing metabolic syndrome and cardiovascular diseases such as hypertension, type 2 diabetes mellitus, dyslipidaemia, and arteriosclerosis in adulthood (14,15). Moreover, obesity in childhood and adolescence is associated with an increased risk of cardiovascular diseases during these developmental stages (16). These non-communicable diseases not only contribute to premature mortality but also result in long-term morbidity (17). Given the dramatic rise in obesity prevalence and its profound public health implications, obesity stands as one of the most critical public health challenges of the twenty-first century (18).

Establishing healthy behaviours early in life is crucial for preventing childhood obesity and ensuring long-term health. Childhood obesity often persists into adulthood, making early intervention essential. Despite the cross-sectional evidence clearly support the promotion of healthy behaviours in prevention and fighting against obesity, still more intervention evidence is needed (12). In fact, interventions targeting those healthy behaviours in childhood are pivotal for obesity prevention, as addressing obesity later in adulthood can be more challenging (17). Recent systematic reviews have highlighted the effectiveness of lifestyle-based interventions, emphasizing the need for multidisciplinary interventions tailored to the needs of children and adolescents (19). However, previous intervention program aimed at overweight children and adolescents frequently encountered challenges when applied in real-life scenarios, highlighting the crucial need for creating interventions that are both feasible and enduring (20). Lifestyle

modifications, including dietary changes and increased physical activity, are central to childhood obesity prevention (21). School-based interventions have shown promise in promoting healthy behaviours, but other settings, like communities and families, also play vital roles in supporting healthy lifestyles from an early age (21).

With the aim of shedding light on a possible strategy to address this global health issue, with a particular focus on youth, the present study has been developed, which aims to evaluate the effectiveness of an intervention addressed at promoting healthy lifestyle behaviours among schoolchildren in the province of Cádiz. It is intended to determine whether the intervention leads to significant changes in body composition, physical fitness, levels of physical activity, sedentary behaviours, dietary patterns, and sleep behaviours among participants. By comparing the results between the experimental and control groups, the relative effectiveness of the intervention in fostering healthier lifestyle behaviours will be assessed. The hypothesis posits that the intervention will significantly improve various health-related parameters, with greater improvements expected in the experimental group compared to the control group.

Materials and Methods

Study Design and Participants

The current study performed a quasi-experimental design with an intervention group and a control group. An educational intervention was carried out in the experimental group, and it is intended to evaluate the effectiveness of the intervention to prevent childhood overweight and obesity in schoolchildren of the province of Cádiz.

The study sample consisted of 833 schoolchildren between 8 and 9 years old, enrolled in the third grade of primary education from 25 schools of the province of Cádiz. The parents of each schoolchild were part of that same study subject (father, mother or caregivers and child were the same subject of study). The inclusion criteria were: children belonging to the selected school, who were in the third grade of primary school, regardless of their age, who had the informed consent signed by their parents or legal guardians, who responded to the questionnaires and who submitted to the anthropometric measurements. The exclusion criteria were that some of these requirements were not met.

The sample was divided into two, the intervention and the control groups. The intervention group contained 469 schoolchildren and consisted of 12 of the 25 school centres which participated in the study. While, the control group contained 364 schoolchildren and consisted of the others 13 school centres participating in the study. Both groups underwent pre- and post-intervention measurements, and only the experimental group underwent the intervention, to compare the results with the control group and find out if an effect was emerged or not.

The project was conducted in accordance with the Declaration of Helsinki and in accordance with Organic Law 3/2018, of December 5, on the Protection of Personal Data, Regulation (EU) 2016/679 of the European Parliament and of the Council, of 27 of April 2016 (General Data Protection Regulation). Also, it was approved by the Andalusian

Biomedical Research Ethics Committee, along with approval from the Delegation of Education and Science of the province of Cádiz (PI-007-2017, 21 March 2018). Parents or legal guardians were provided with a project information sheet and asked to sign the written informed consent. Participation was voluntary and schoolchildren could leave the study at any time. The methodological details have been previously published (22).

Calculation of the Sample Size

The sample size calculation details have been previously published (22). Briefly, the sample size was calculated to determine the effectiveness of the intervention on the prevalence of overweight and obesity in the study population. After reviewing the results obtained by different studies carried out in our environment, an estimated prevalence of overweight and obesity of 35% was assumed, which was previously found (23) in a population from Cádiz similar to our study. The sample size necessary to test hypotheses was calculated by comparison of two proportions. The percentage of overweight and obesity of schoolchildren was compared before and after the intervention in both groups (intervention and control; paired data) and inter-group (independent data). In our case, for an estimated difference of proportions of 9% (35% vs 26%) with a confidence level of 95% and a power of 80%, the minimum sample size required was 410 participants in each group (intervention and control), which makes a total of 820 children.

PREVIENE-CÁDIZ Intervention

The intervention details have been previously published (22). In short, the intervention adopted a multimodal approach, targeting students, their families, and educational institutions. The activities and sessions of the intervention programme were carried out by the teachers from the participating schools, after receiving training from the research team in a 10-hour in-person course. The students from the intervention group took part in the 10 sessions of the healthy educational programme, delivered by the teachers in the classroom, and were provided with two workbooks to use at home: one exclusively designed to delve into the programme's content, directed at the students, and another aimed at both students and their families to encourage family involvement in the addressed participants. Additionally, the parents received training in an in-person session held one afternoon in each of the intervention schools, where three training courses focused on improving their children's lifestyles were delivered: healthy nutrition, physical activity, and the resources available in their environment to enhance nutrition and increase levels of physical activity.

Procedures and Assessments

The procedures and assessments details have been previously published (12). However, a summary of how the procedures and assessments were conducted is provided below.

Anthropometric Measurements

Measurements were conducted by proficient members of the research team in accordance with the standardized protocol outlined by the International Society for the Advancement

of Kinanthropometry (ISAK) (24). Body weight was assessed using a precise mechanical scale sensitive to 100 g (SECA Colorata 760, Hamburg, Germany), while height was determined utilizing a portable stadiometer with an accuracy of 0.1 cm (SECA 213, Hamburg, Germany). Body mass index (BMI) was computed by dividing weight in kilograms by the square of height in meters and served as an indicator of overweight or obesity. Based on Cole's established thresholds (25), individuals with a BMI falling between 18.44 and 19.84 were classified as overweight, while those with a BMI between 21.60 and 24.00 were classified as obese. Furthermore, BMI categories were stratified based on age-specific percentiles recommended by the WHO, categorizing schoolchildren between the 50th and 80th percentile as overweight and those above the 85th percentile as obese.

Physical Fitness

Physical fitness of both children and parents was assessed by self-report using the International Physical Fitness Scale (IFIS) (26,27). The IFIS scale is a questionnaire designed to subjectively evaluate the physical fitness of individuals, which replaces the need to use a battery of objective tests. It has been translated into nine languages and evaluates both overall physical condition as well as each one of its primary components specifically: cardiorespiratory fitness, muscular strength, speed-agility and flexibility. Validation studies with both children and adults have demonstrated its reliability (26,27). Although there are separate versions for adults and children, they measure the same constructs.

Physical Activity

Physical activity was recorded by the students through a self-reported questionnaire (28,29). They were asked about the weekly frequency of engaging in physical activity with their parents, as well as the mode of transportation used to go to school, distinguishing between active modes (such as walking, cycling, skateboarding, or non-electric scootering, among others) and passive modes (such as travelling by car, motorcycle, bus, electric scooter, or other passive means of transportation). Other topics related to physical activity were also addressed, including the weekly frequency of participating in extracurricular physical activities, the type of activity, and the time spent in active play with friends. Additionally, to complement the information provided by the students, parents also provided information through a questionnaire (28,29) and by direct observation regarding their children's levels of physical activity. Additional information was gathered on weekly family physical activity, the mode of transportation used to go to school, as well as details about the quantity and type of extracurricular activities in which the children participated, the time spent in active play with friends, among other aspects.

Eating behaviours

The daily/weekly consumption of processed baked products, fried foods, snacks, sugary soft drinks, fruits, vegetables, packaged juices, sandwiches, dairy products, carbohydrates, meats, cold cuts, fish, and vegetables, among others, was recorded through

two questionnaires administered to both students (who provided self-reports) and their families (who reported on their children) (28,29). Additionally, using the same questionnaires (28,29), five questions regarding knowledge and beliefs about food were recorded. These were used to create an index to establish the students' knowledge and beliefs about food on a scale from 0 to 6, where 0 represents no knowledge and 6 represents excellent knowledge.

Screen Time

Screen time was recorded through two questionnaires administered to schoolchildren and their parents (28,29), in order to have the information of the schoolchildren about themselves and that of the parents about their children. Both were asked about the average daily time spent on television (TV), computer, mobile, tablet and video games during the weekdays and on weekends.

Hours of Sleep

Hours of sleep were recorded through a questionnaire administered to parents (28,29), who provided information about their children's daily sleep hours, both from Monday to Friday and on weekends. To assess compliance with the recommendation for healthy behaviours, the cut-off points recommended by the Canadian 24-Hour Movement Guidelines (30) were established.

Lifestyle Behaviours Score

Lifestyle behaviours were assessed based on various variables impacting the behaviours of schoolchildren, encompassing levels of physical activity, sedentary behaviour, dietary patterns, and sleep routines. These factors, combined with self-reported physical fitness, contributed to a composite score reflecting overall lifestyle behaviours. In essence, one variable was selected from each category (eating behaviours, sedentary behaviour, sleep duration, and self-reported physical fitness), followed by summation and recategorization into three lifestyle behaviour categories (good/regular/bad). Thus, schoolchildren with respective scores exhibited healthier/more regular/less healthy lifestyle behaviours and corresponding levels of self-reported physical fitness.

Statistical Analysis

A descriptive analysis of outcome variables was conducted, including measures of central tendency, dispersion, and 95% confidence intervals (CI). Frequency analysis was performed to obtain percentages and prevalence of categorical variables. Data are presented as mean \pm standard deviation unless otherwise specified. Normality of study variables was assessed, and as none met the normality criterion, non-parametric analyses were conducted. Two analyses were conducted to compare groups before and after the intervention. Firstly, the Mann-Whitney U test was used for numerical variables, and secondly, the delta of study variables was calculated, and a differences-in-differences analysis was performed. Numerical delta variables were analysed using the Mann-Whitney U test, and categorical delta variables were analysed using the chi-square test.

Statistical analyses were conducted using IBM SPSS Statistics software (version 24.0), with a significance level set at 0.05.

Results

Overview of Descriptive Characteristics in Pre- and Post-Intervention Analysis

A comprehensive overview of the descriptive characteristics of the schoolchildren before and after the intervention, differentiating by control and experimental groups, is provided in Table 1. Additionally, the table includes the delta variables, showing the results of the difference-in-differences analysis. This table encapsulates an overview of study results.

Table 1. Descriptive characteristics of the schoolchildren pre-intervention, post-intervention and delta by groups.

Variable	Total Sample			Control Group			Intervention Group			p-value*		
	Pre n=864	Post n=833	Delta n=833	Pre n=364	Post n=364	Delta n=364	Pre n=499	Post n=469	Delta n=469	Pre	Post	Delta
Physical characteristics												
Age (years)	8.43 ± 0.35	8.85 ± 0.35	0.42 ± 0.06	8.43 ± 0.36	8.81 ± 0.36	0.38 ± 0.05	8.43 ± 0.34	8.88 ± 0.34	0.45 ± 0.04	0.570	<0.001	<0.001
Weight (kg)	31.48 ± 7.72	32.92 ± 8.39	1.49 ± 1.72	31.44 ± 7.49	32.97 ± 8.00	1.51 ± 1.68	31.51 ± 7.89	32.88 ± 8.69	1.47 ± 1.75	0.790	0.474	0.454
Height (cm)	130.68 ± 6.03	132.73 ± 6.38	2.07 ± 1.81	131.06 ± 5.82	132.97 ± 6.09	1.92 ± 2.13	130.38 ± 6.19	132.54 ± 6.60	2.18 ± 1.51	0.094	0.307	<0.001
Body mass index (kg/m ²)	18.28 ± 3.40	18.51 ± 3.56	0.26 ± 0.95	18.16 ± 3.31	18.48 ± 3.42	0.32 ± 0.92	18.37 ± 3.47	18.52 ± 3.67	0.21 ± 0.98	0.476	0.941	0.648
Body mass index status (%) (UW/NW/OB)	5/60/22/13	6/56/24/14	NA	5/57/24/14	6/56/24/15	NA	5/58/23/14	6/56/24/13	NA	0.994	0.969	NA
Triceps skinfold (mm)	14.67 ± 6.20	14.96 ± 6.30	0.37 ± 2.35	14.65 ± 6.21	14.92 ± 6.27	0.28 ± 2.22	14.68 ± 6.20	14.98 ± 6.32	0.44 ± 2.45	0.934	0.948	0.314
Subscapular skinfold (mm)	10.40 ± 7.12	10.69 ± 7.74	0.42 ± 2.45	10.28 ± 6.64	10.52 ± 7.28	0.27 ± 2.39	10.50 ± 7.48	10.83 ± 8.09	0.54 ± 3.48	0.334	0.870	0.856
Waist circumference (cm)	63.32 ± 9.58	63.32 ± 10.17	0.62 ± 3.24	63.28 ± 9.52	64.44 ± 10.15	1.16 ± 3.29	63.36 ± 9.63	63.33 ± 10.16	0.20 ± 3.14	0.988	0.052	<0.001
Hip circumference (cm)	72.14 ± 8.09	73.68 ± 8.35	1.62 ± 2.44	72.42 ± 7.89	73.63 ± 8.12	1.21 ± 2.56	71.92 ± 8.24	73.72 ± 8.52	1.94 ± 2.29	0.216	0.865	<0.001
Waist to hip ratio	0.87 ± 0.05	0.86 ± 0.06	-0.01 ± 0.04	0.87 ± 0.06	0.87 ± 0.07	0.0007 ± 0.42	0.88 ± 0.05	0.86 ± 0.06	-0.02 ± 0.04	0.063	<0.001	<0.001
Waist to height ratio	0.48 ± 0.06	0.48 ± 0.07	-0.003 ± 0.02	0.48 ± 0.06	0.48 ± 0.07	0.002 ± 0.03	0.48 ± 0.06	0.48 ± 0.06	-0.006 ± 0.02	0.479	0.145	<0.001
Self reported physical fitness (children reported)												
General physical fitness (%) (B/A/G/VG)	2/15/37/46	3/13/32/53	NA	3/18/37/45	3/18/34/50	NA	1/15/38/48	3/12/30/55	NA	0.422	0.481	NA
Cardiorespiratory fitness (%) (B/A/G/VG)	7/21/33/39	9/18/28/46	NA	7/19/32/42	9/18/29/45	NA	6/23/33/37	8/19/26/47	NA	0.548	0.671	NA
Muscular strength (%) (B/A/G/VG)	3/19/33/45	4/16/31/49	NA	4/17/33/47	5/14/31/50	NA	3/21/32/44	4/17/30/49	NA	0.581	0.569	NA
Speed/Agility (%) (B/A/G/VG)	4/15/30/51	3/13/29/54	NA	3/18/30/49	3/12/32/53	NA	5/13/30/52	3/14/26/56	NA	0.175	0.328	NA
Flexibility (%) (B/A/G/VG)	14/24/23/34	19/24/23/34	NA	12/25/24/38	18/23/24/35	NA	14/24/26/36	19/24/22/34	NA	0.812	0.878	NA
Physical activity (children reported)												
Weekly family physical activity days	2.27 ± 2.05	2.37 ± 2.03	0.11 ± 2.37	2.32 ± 2.09	2.14 ± 1.93	-0.20 ± 2.26	2.23 ± 2.01	2.55 ± 2.09	0.35 ± 2.43	0.673	0.004	0.602
School transportation mode (%) (AD/PD)	40/60	42/58	NA	51/49	47/53	NA	37/63	41/59	NA	0.255	0.009	NA
Eating behaviours (children reported)												
Feeding beliefs and knowledge index (%) (Nk/Lk/Sk/Gk/Vgk/Ek)	4/15/28/34/17/2	3/11/28/35/20/3	NA	4/10/27/36/21/2	4/11/27/36/18/3	NA	4/18/29/32/15/3	3/11/28/34/22/3	NA	0.023	0.843	NA
Breakfast (%) (Yes/No)	91/9	92/8	NA	91/9	93/7	NA	91/9	91/9	NA	0.878	0.269	NA
Fast food consumption (%) (AIMT/ST/S)	2/28/64/6	1/23/67/10	NA	2/26/65/7	1/22/67/9	NA	2/29/63/6	1/23/66/10	NA	0.266	0.044	NA
Screen time (children reported)												
TV and VG weekdays (%) (<2h-4h-4h)	61/23/16	70/21/9	NA	61/22/17	69/22/9	NA	60/24/16	70/21/9	NA	0.891	0.842	NA
TV and VG weekends (%) (<2h-4h-4h)	46/28/26	49/31/20	NA	46/29/25	52/29/19	NA	45/27/28	46/33/21	NA	0.727	0.238	NA
PC and MP weekdays (%) (<2h-4h-4h)	72/17/11	75/16/9	NA	71/19/10	75/18/8	NA	71/16/12	76/14/10	NA	0.439	0.276	NA
PC and MP weekends (%) (<2h-4h-4h)	60/21/19	60/25/15	NA	61/24/15	64/22/14	NA	59/20/21	57/27/15	NA	0.061	0.124	NA
Screen time (parents reported)												
TV weekdays (%) (<2h-4h-4h)	89/10/1	89/10/1	NA	89/9/1	89/9/1	NA	88/11/1	88/11/1	NA	0.628	0.820	NA
TV weekends (%) (<2h-4h-4h)	64/33/3	66/30/5	NA	65/31/4	62/33/5	NA	62/35/3	68/27/4	NA	0.436	0.228	NA
Vg weekdays (%) (<2h-4h-4h)	97/2/1	96/3/0	NA	97/3/0	96/3/0	NA	97/2/1	96/3/0	NA	0.870	0.984	NA
Vg weekends (%) (<2h-4h-4h)	85/13/2	85/14/1	NA	87/10/2	88/11/1	NA	83/14/2	83/16/1	NA	0.259	0.127	NA
PC and MP weekdays (%) (<2h-4h-4h)	97/2/1	97/3/0	NA	96/3/1	97/2/1	NA	98/2/0	97/3/0	NA	0.364	0.254	NA
PC and MP weekends (%) (<2h-4h-4h)	86/12/2	85/13/2	NA	86/12/2	85/14/2	NA	86/12/2	85/13/2	NA	0.910	0.782	NA
Hours of sleep												
Weekdays (h/day)	10.01 ± 0.57	10.01 ± 0.57	0.01 ± 0.71	10.04 ± 0.58	10.03 ± 0.56	0.002 ± 0.76	9.98 ± 0.57	10.00 ± 0.55	0.02 ± 0.67	0.273	0.495	0.682
Weekends (h/day)	10.40 ± 0.91	10.40 ± 0.90	-0.008 ± 1.16	10.51 ± 0.97	10.47 ± 0.93	-0.05 ± 1.35	10.30 ± 0.85	10.32 ± 0.85	0.02 ± 0.98	0.055	0.147	0.377
Weekends (%) (<9h-11h-11h)	2/98/0	8/85/7	NA	8/90/2	8/85/7	NA	8/91/1	8/85/6	NA	0.158	0.932	NA
Weekends (%) (<9h-11h-11h)	2/96/2	8/59/32	NA	7/76/17	7/58/35	NA	10/77/13	9/60/31	NA	0.277	0.369	NA
Parent's educational level												
Father's educational level (%) (PS/SS/HS)	9/65/26	9/65/26	NA	8/66/25	10/65/25	NA	8/64/28	8/64/28	NA	0.810	0.443	NA
Mother's educational level (%) (PS/SS/HS)	7/61/32	7/60/33	NA	7/61/32	8/59/33	NA	7/60/33	7/60/33	NA	0.953	0.808	NA
Lifestyle behaviour score												
Lifestyle behaviour score (%) (GR/B)	48/49/3	50/49/1	NA	50/49/1	47/51/2	NA	48/49/3	53/47/0	NA	0.343	0.368	NA

Values are presented as mean ± standard deviation or percentages. Mann Whitney U tests and χ^2 Chi square statistics was applied. Statistically significant differences between groups are highlighted in bold. Abbreviations: A, acceptable; AD, active displacement; All, always; B, bad; BMI, body mass index; Cm, centimetres; Ek, excellent knowledge; G, good; Gk, good knowledge; h/day, hours per day; HS, higher studies; Kg, kilograms; kg/m², kilogram per square meter; Lk, little knowledge; Mm, millimetres; MP, mobile phone; MT, many times; N, never; NA, not applicable; Nk, no knowledge; NW, normal weight; OB, obesity; OW, overweight; PC, personal computer; PD, passive displacement; PS, primary studies; R, regular; S, sometimes; SD, standard deviation; Sk, some knowledge; SS, secondary studies; ST, something; TV, television; UW, underweight; VG, very good; Vg, video games; Vgk, very good knowledge; <2h, less than two hours; 2-4h, between two and four hours; >4h, more than four hours; <9h, less than nine hours; 9-11h, between nine and eleven hours; >11h, more than eleven hours; * p-value for differences between control and intervention.

Changes in Body Composition

BMI Distribution Across Weight Categories

A chi-square analysis of the BMI delta variable (difference-in-differences study) revealed a significant difference in the distribution of BMI categories between the intervention and control groups before and after the intervention ($p=0.029$). As shown in Figure 1, the intervention group exhibited slight reductions in the normal weight and obesity categories post-intervention, alongside modest increases in the underweight and overweight categories. In contrast, the control group experienced a slight decrease in both the underweight and normal weight categories, coupled with a slight increase in the overweight and obesity categories.

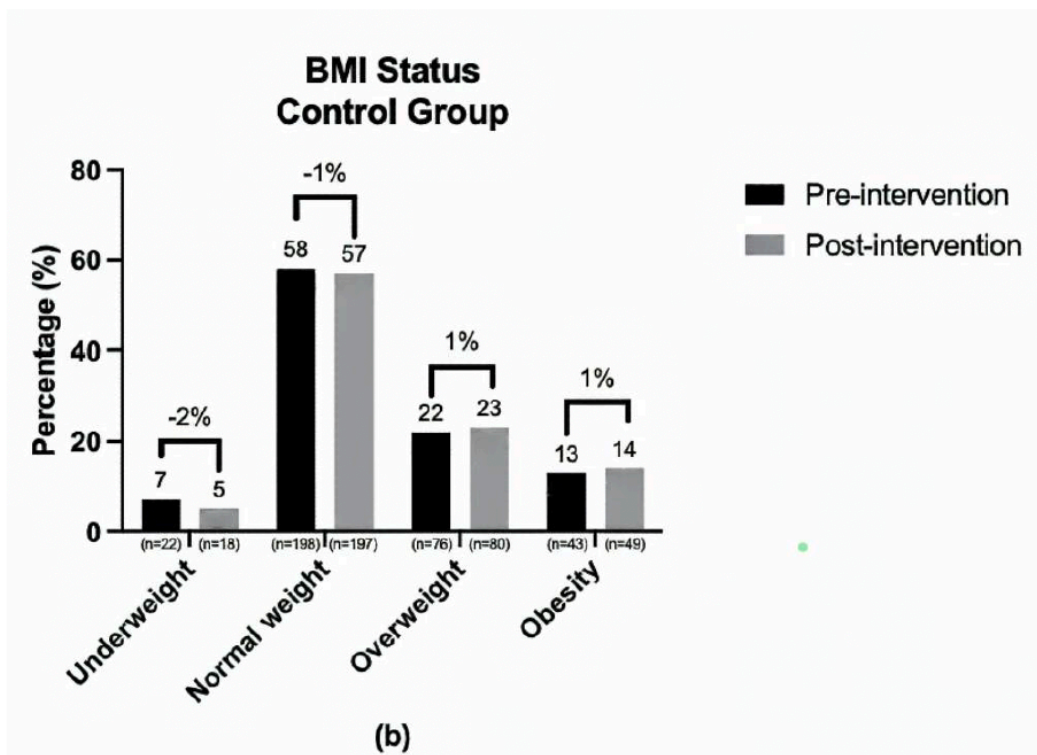
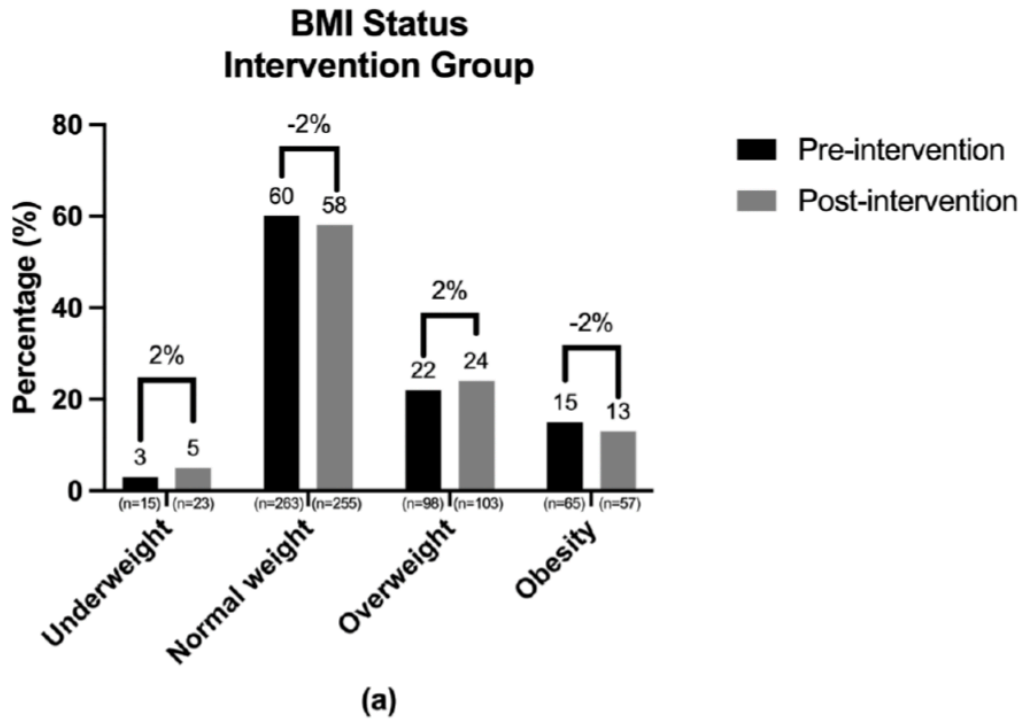


Figure 1. (a) BMI distribution across weight categories of the experimental group before and after intervention. (b) BMI distribution across weight categories of the control group before and after intervention. A chi-square analysis of the delta variable reveals a significant difference in BMI distribution across weight categories between groups pre- and post-intervention ($p = 0.029$). The numbers above the boxes represent the delta.

Changes in Waist Circumference

Figure 2 illustrates the changes in waist circumference across both groups following the intervention. In the experimental group, waist circumference remained virtually unchanged post-intervention. Conversely, the control group exhibited a slight increase. A Mann-Whitney U analysis of the delta variable for waist circumference (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p < 0.001$).

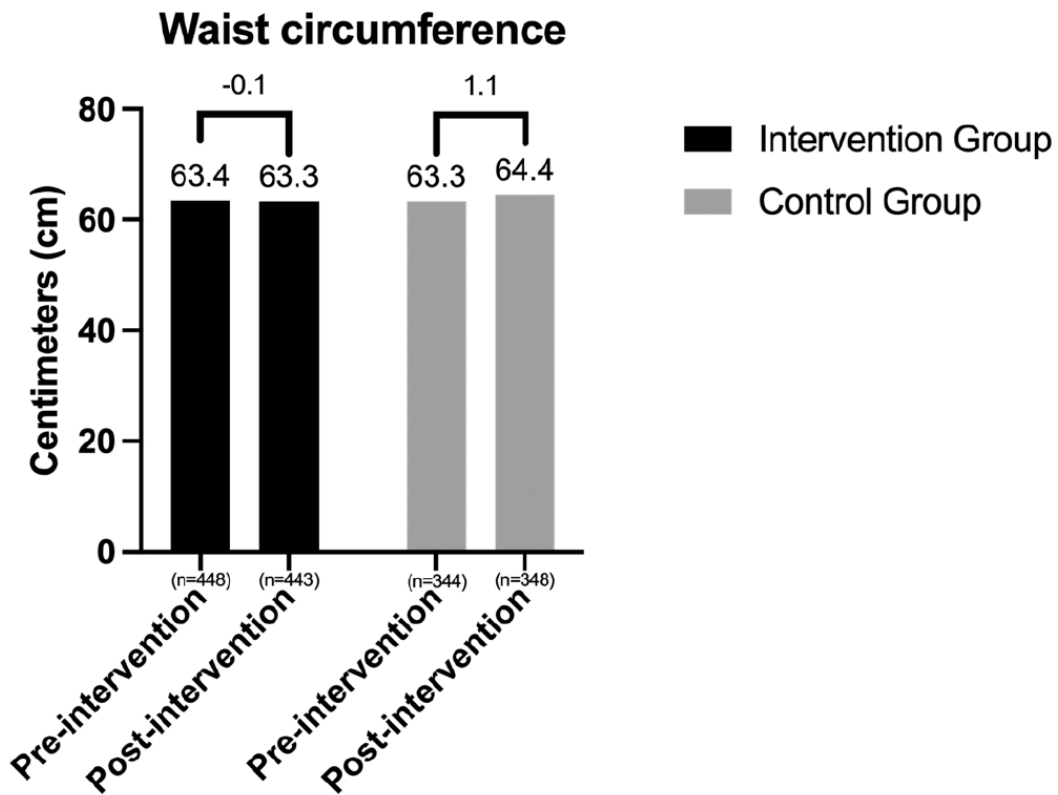


Figure 2. Changes in waist circumference before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in waist circumference changes between groups pre- and post-intervention ($p < 0.001$). The numbers above the boxes represent the delta.

Changes in Waist to Hip Ratio

A Mann-Whitney U analysis of the delta variable for the waist to hip ratio (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p < 0.001$). As shown in Figure 3, the intervention group experienced a slight decrease in the waist-to-hip ratio following the intervention, while the control group maintained consistent values.

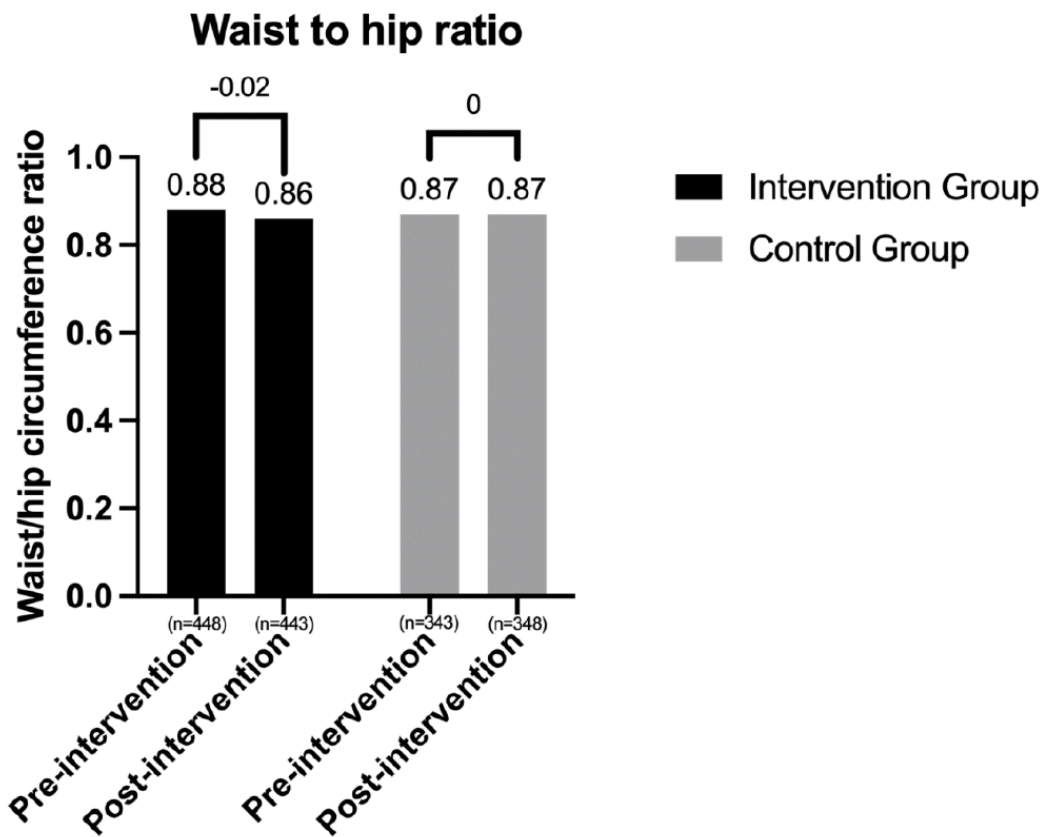


Figure 3. Changes in waist to hip ratio before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in waist to hip ratio changes between groups pre- and post-intervention ($p < 0.001$). The numbers above the boxes represent the delta.

Changes in Waist to Height Ratio

As depicted in Figure 4, the waist to height ratio slightly decreased in the experimental group following the intervention, whereas it slightly increased in the control group. A Mann-Whitney U analysis of the delta variable for the waist to height ratio (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p < 0.001$).

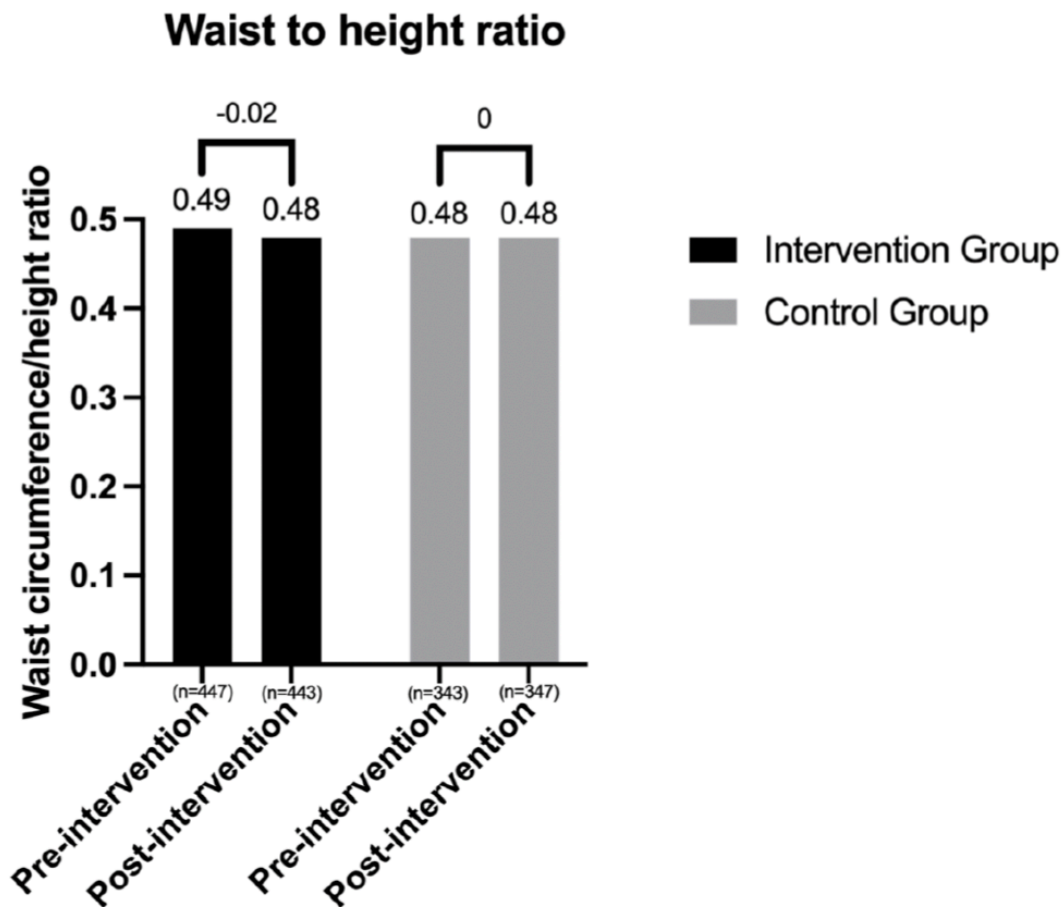


Figure 4. Changes in waist to height ratio before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in waist to height ratio changes between groups pre- and post-intervention ($p < 0.001$). The numbers above the boxes represent the delta.

Changes in Physical Activity Levels

Weekly Frequency of Family Physical Activity

A Mann-Whitney U analysis of the delta variable (difference-in-differences study) revealed a significant difference between the groups in the weekly frequency of family physical activity before and after the intervention ($p=0.004$). As illustrated in Figure 5, the average number of days per week that schoolchildren engaged in family physical activity slightly increased in the experimental group post-intervention. Conversely, the control group experienced a slight decrease.

Weely frequency of family physical activity

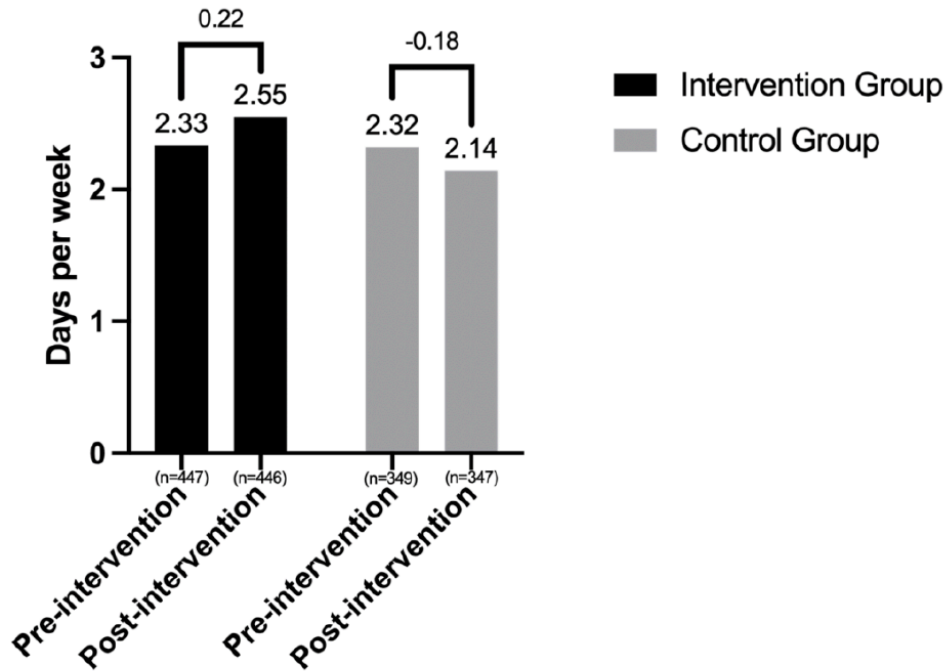


Figure 5. Weekly frequency of family physical activity before and after intervention differentiating by groups. Mann-Whitney U analysis of the delta variable indicates a significant difference in weekly frequency of family physical activity changes between groups pre- and post-intervention ($p=0.004$). The numbers above the boxes represent the delta.

School Transportation Mode

The mode of transportation to school before and after the intervention was analysed for both the experimental and control groups. A chi-square analysis of the delta variable for the mode of transportation to school (difference-in-differences study) revealed a significant difference between the groups pre- and post-intervention ($p=0.009$). As shown in Figure 6, the experimental group experienced a slight increase in active travel to school and a corresponding decrease in passive travel after the intervention. Conversely, the control group saw a slight decrease in active transportation and a subtle increase in passive transportation.

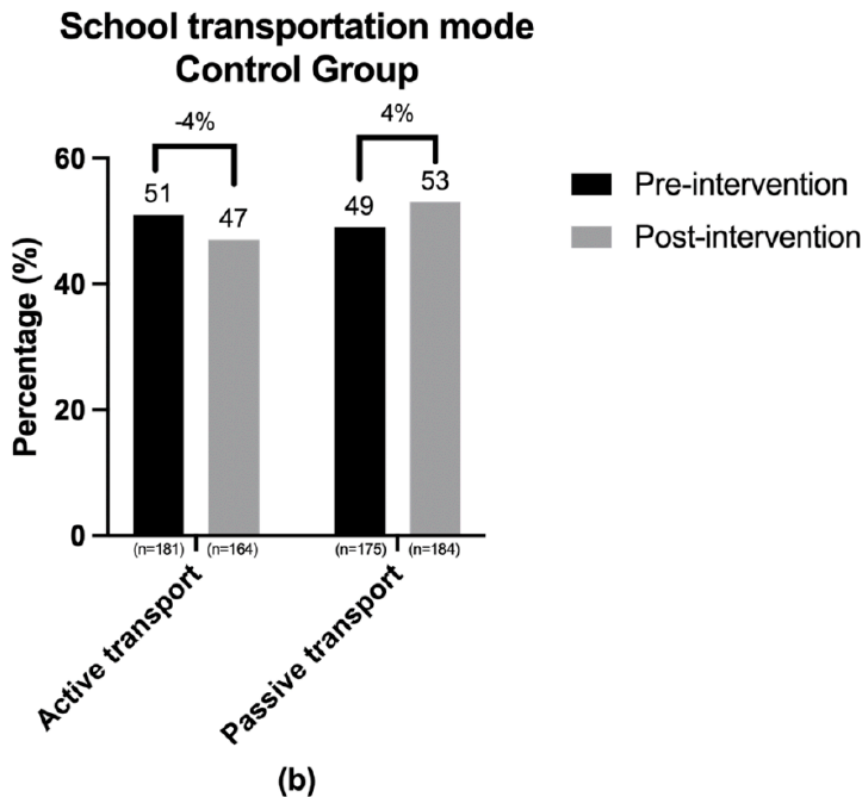
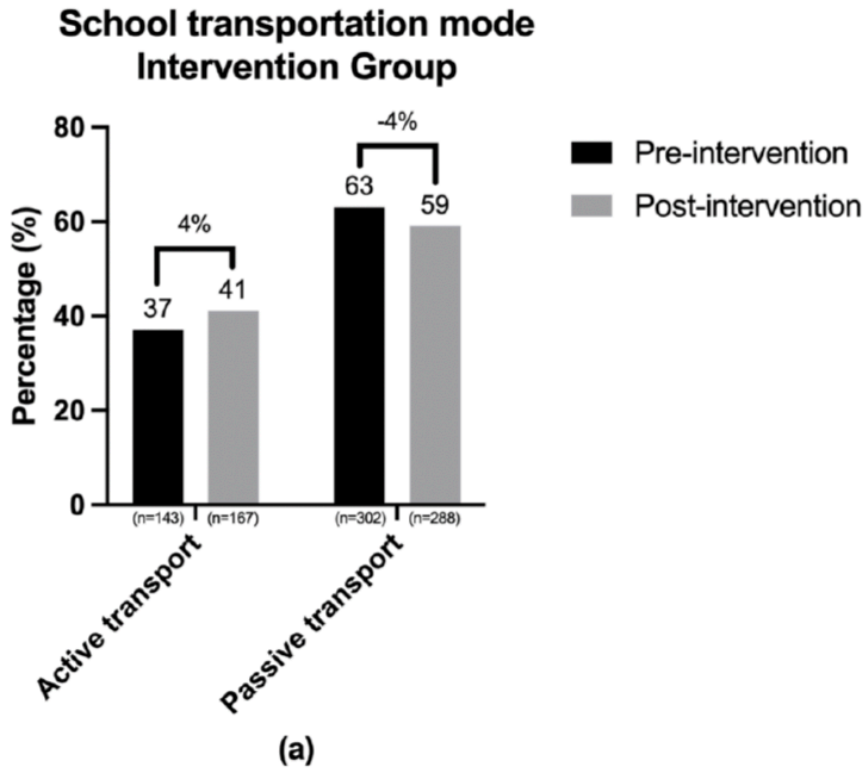


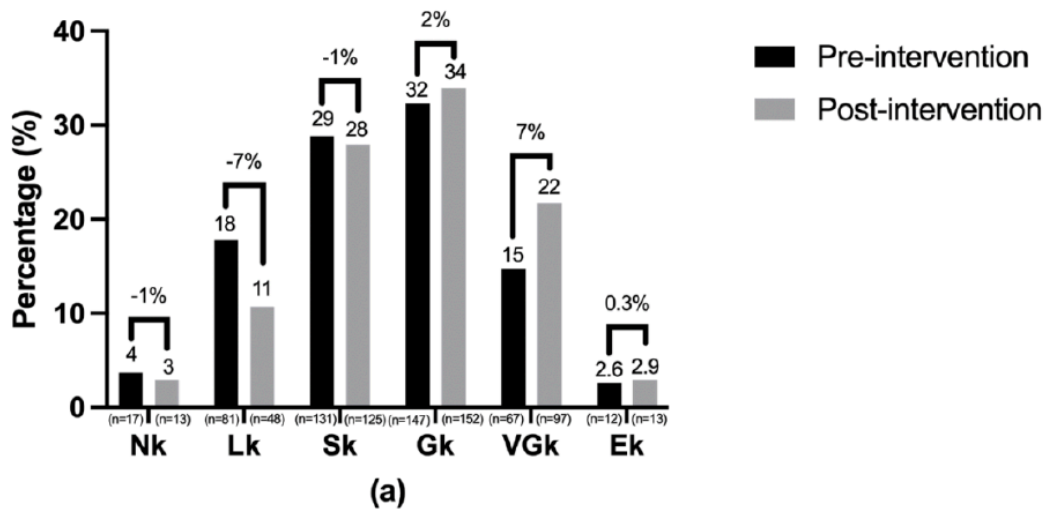
Figure 6. (a) School transportation mode of the experimental group before and after intervention. (b) School transportation mode of the control group before and after intervention. Chi-square analysis indicates a significant difference in school transportation mode changes between groups pre- and post-intervention ($p=0.009$). The numbers above the boxes represent the delta.

Changes in Eating Behaviours

Feeding Beliefs and Knowledge Index

The eating beliefs and knowledge index was evaluated before and after the intervention for both the experimental and control groups. As depicted in Figure 7, the experimental group exhibited a slight increase in dietary knowledge after the intervention, whereas in the control group, this knowledge slightly decreased following the intervention. A chi-square analysis conducted on the delta variable of the eating beliefs and knowledge index (difference-in-differences study) revealed a significant difference between groups pre- and post-intervention ($p=0.042$).

Feeding Beliefs and Knowledge Index Intervention Group



Feeding Beliefs and Knowledge Index Control Group

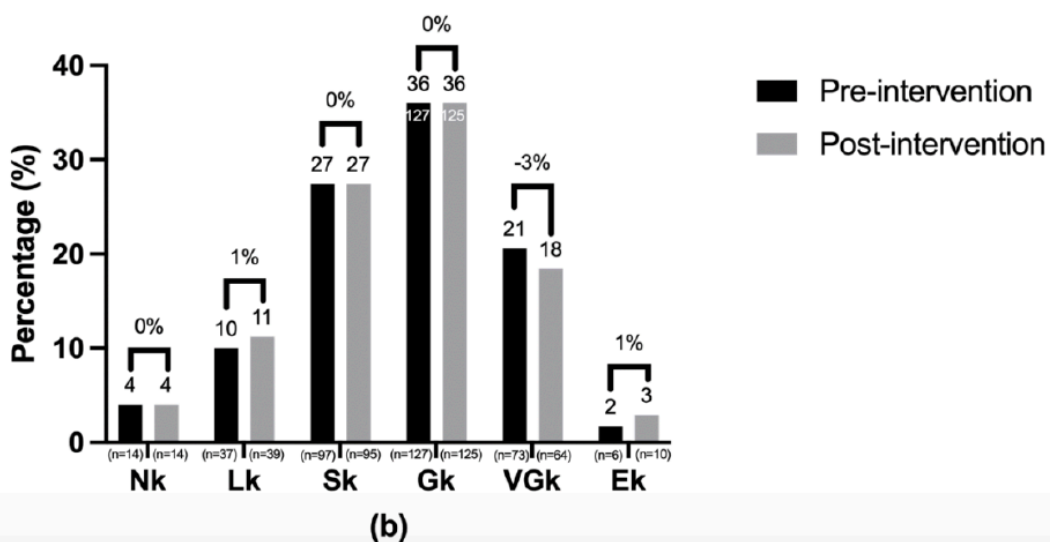


Figure 7. (a) Feeding beliefs and knowledge index of the experimental group before and after intervention. (b) Feeding beliefs and knowledge index of the control group before and after intervention. A chi-square analysis of the delta variable reveals a significant difference in feeding beliefs and knowledge index between groups pre- and post-intervention ($p = 0.049$). The numbers above the boxes represent the delta. Abbreviations: Ek, Excellent knowledge; Gk, good knowledge; Lk, little knowledge; Nk, no knowledge; Sk, some knowledge; VGk, very good knowledge.

It is noteworthy that all these variables displayed similar trends of subtle improvement. While the changes observed in each specific parameter may appear modest individually, collectively they indicate a positive shift in various aspects of health behaviour and outcomes following the intervention. These findings suggest that the intervention had a nuanced but overall beneficial impact on the studied variables for the experimental group.

Changes in Physical Fitness, Sedentary Behaviours and Sleep Behaviours

The analysis found that there were no statistically significant differences in physical fitness, sedentary behaviours, or sleep behaviours between the experimental and control groups following the intervention. Although both groups exhibited similar patterns and trends in these areas, the intervention did not lead to notable changes in these variables. This indicates the necessity for further refinement and enhancement of intervention strategies to more effectively target these specific aspects of children's health.

Discussion

This study aimed to evaluate the effectiveness of an intervention designed to promote healthy lifestyle behaviours among schoolchildren in the province of Cádiz and to assess its impact on various outcomes including body composition, self-reported physical fitness, physical activity levels, sedentary behaviours, eating behaviours, and sleep behaviours among the participants. Overall, the intervention led to improvements in some key areas. Specifically, there were subtle enhancements in BMI distribution, waist circumference, waist-to-hip ratio, and waist-to-height ratio among participants in the experimental group. Additionally, the experimental group demonstrated modest increases in knowledge regarding dietary habits, as well as a slight rise in the frequency of family physical activity and active transportation to school.

The intervention had a slight effect on schoolchildren, albeit not to the extent expected in our hypothesis. In overall, obesity indicators slightly improved for those in the intervention group. Moreover, several physical activity indicators such as weekly family activity days and children active transport were increased after intervention. Finally, beliefs and knowledge on nutrition behaviours showed a slight but significant improvement. This modest change in pattern that the impact of the intervention was small on the various health and behavioural parameters that have been analysed so far.

Despite favourable changes observed in body composition parameters, such as reductions in BMI, waist circumference or waist to hip/height ratios, the magnitude of these changes was not relevant enough from the biological point of view. Consequently, the intervention seems to have initiated a certain positive effect on schoolchildren, the intensity of which should be improved in future studies with adjustments to the multimodal intervention.

These findings align with previous studies that have reported modest effects of school-based interventions on body composition outcomes. In fact, there are several systematic reviews and meta-analyses (31–39), which analysed, among other parameters, the effectiveness of educational interventions on body composition of schoolchildren, showing efficacy in less than 50% of the interventions. Although others (40–42) showed efficacy in improving the body composition of students in more than 50% of the interventions. These findings highlight the variability in the effectiveness of school-based interventions on body composition outcomes and underscore the importance of identifying strategies that yield more consistent and impactful results.

It's noteworthy that the intervention consisted of only 10 sessions, a relatively limited exposure period, so the likelihood of significant changes in body composition is inherently low. Instead, the primary aim of the intervention was to instil healthier behaviours among the schoolchildren. By focusing on behaviour modification and promoting healthier lifestyle choices, the intervention sought to lay the groundwork for long-term improvements of body composition and obesity reduction. The rationale behind this approach lies in the understanding that sustained adoption of healthy behaviours over time is more likely to yield meaningful changes in body composition and overall health outcomes among the schoolchildren. Thus, even these modest changes in body composition should be explained by some behavioural changes as promoted by the current study.

The analysis of another relevant component of health, the physical fitness, revealed no significant changes after intervention between groups. This result is contradictory to the findings found by Seo, Y et al. (43), who showed how a specific 16-week physical exercise program obtains satisfactory results regarding the physical condition of a group of children and adolescents with obesity, which suggests that short-term interventions, such as the 10-session program in our study, may not be sufficient to produce noticeable changes in physical fitness. Moreover, it is possible that a specific exercise intervention would provide more intense and effective improvement of physical fitness, rather than multimodal approach. Thus, we believe that for meaningful improvements to occur, interventions should be integrated into the school curriculum and include a greater number of sessions, both within and outside of school, providing more time for students to engage in physical activity and aiming to achieve a moderate to high intensity. By prioritizing consistent physical activity participation in both school and extracurricular settings over time, we anticipate observing more significant improvements in physical fitness among schoolchildren.

Despite observing significant changes in physical activity levels, these changes were not as impactful as anticipated. While there were improvements, they did not fully align with the expected outcomes, suggesting that the increase in physical activity levels among schoolchildren was moderate. This is in line with findings from other studies (35,36,39,44), suggesting that short-term interventions may not effectively increase physical activity levels among school-aged children. It is thought that interventions should extend over at least one full school year to achieve meaningful and sustainable

changes. Moreover, given the complexity of behaviour change and the specialized knowledge required, it is suggested that teachers should benefit from the support of external experts to effectively deliver these interventions. This need for external support has been underscored in previous research (45,46), where collaboration with health professionals and physical activity experts has been found to enhance the effectiveness of school-based interventions aimed at increasing physical activity levels. Another potential factor to consider is the fat of intensity but not only volume or duration (47,48).

The analysis indicated that there were no substantial differences between groups regarding sedentary behaviours, suggesting that the intervention had a limited impact on this aspect. Sedentary behaviours are complex and deeply ingrained, requiring comprehensive and sustained efforts to modify effectively. Previous research, such as Neil-Sztramko and Dobbins's systematic review (44), supports this challenge. Neil-Sztramko and Dobbins analysed 16 studies of school-based physical activity interventions and highlighted that most interventions showed little or no decrease in sedentary time among children and adolescents, emphasizing the need for multifaceted approaches addressing various aspects of sedentary behaviours, including screen time, sitting time, and overall activity patterns. Thus, while our intervention aimed to promote healthier behaviours, especially regarding sedentary one, the results suggest that a greater number of sessions emphasizing this aspect may be necessary, as well as the assistance of qualified external personnel who work directly with students and families to achieve significant and lasting changes in this area.

Additionally, while some meaningful changes were observed between groups regarding dietary behaviours, these changes were not as extensive as anticipated. Similar to findings in previous research, interventions with a small number of sessions may not effectively address dietary behaviours among schoolchildren (35,36,39). Dietary behaviours are deeply ingrained and influenced by various factors, including cultural norms, family environment, and individual preferences. Therefore, interventions aimed at promoting healthier eating behaviours may require more extensive and targeted strategies, such as further extending the nutrition education program, increasing the number of cooking workshops for both children and parents, and further increasing the participation of parents and caregivers. Additionally, collaboration with nutritionists or dietitians may be beneficial in providing tailored guidance and support to parents.

Regarding sleep behaviours, no significant differences were noted between groups. However, it is encouraging that both groups reported a considerable number of hours of sleep on both weekdays and weekends. While further exploration into sleep quality may be beneficial, it is positive to note that, in terms of sleep quantity, both groups generally adhered to the sleep recommendations set by the Canadian 24-Hour Movement Guidelines (30).

As possible limitations of the study, the following can be mentioned: the duration of the intervention, consisting of only 10 sessions, may have limited its ability to achieve the anticipated outcomes. Extending the intervention period could potentially support more

substantial and lasting changes in health behaviours among schoolchildren. Additionally, the intervention could have benefited from a greater focus on the intensity of physical activity during physical education sessions, as both volume and intensity are important for achieving health benefits. Furthermore, the study faced challenges related to teacher engagement. Unlike collaborative projects such as POIBA in Barcelona (45,46), where external personnel assisted educators, our intervention relied solely on school staff. Incorporating external support could enhance motivation and improve program delivery. Finally, the lack of integration into the school curriculum posed a barrier, as the intervention competed for time with existing school activities, leading to varied levels of commitment among teachers. Embedding health education programs into the curriculum could help prioritize their importance and ensure consistent implementation across all participating schools.

Among the strengths of this study, it should be noted the comprehensive approach of the intervention, which addresses, albeit to a slightly lesser extent than initially anticipated, both school education and the involvement of parents and schoolchildren. This holistic approach allows for greater awareness and commitment to adopting healthy lifestyle behaviours at all levels: school, family, and community. Moreover, collaboration among these different stakeholders enhances the impact of the intervention by creating a supportive environment that facilitates the implementation and maintenance of positive lifestyle changes. Another strength of the study is the rigorous assessment of multiple outcome measures, including body composition, physical fitness, physical activity levels, sedentary, eating, and sleep behaviours. This comprehensive evaluation provides a nuanced understanding of the intervention's effects on various aspects of participants' health and lifestyle.

Conclusions

The intervention demonstrated moderate effectiveness on markers of obesity and behaviours related to physical activity, as well as beliefs and knowledge about feeding. These results suggest that while the intervention partially achieved its objectives, it did not meet all expected outcomes. This outcome is consistent with the challenges inherent in implementing interventions in real-world settings, especially within school environments where teacher engagement can vary. The varying levels of teacher involvement in delivering the intervention may have contributed to differences in its effectiveness, with some teachers potentially demonstrating greater commitment and effectiveness in implementing the intervention protocols than others. This variability in implementation fidelity could explain the mixed results observed across different health and behavioural parameters.

Moreover, the reliance on self-reported measures for certain outcomes, introduces the possibility of response bias and measurement error, which may have influenced the study results. Therefore, while the intervention showed promise in certain areas, the overall effectiveness may have been limited by these contextual factors and methodological challenges. Further research incorporating strategies to enhance intervention fidelity and

employing objective measures of health behaviours may provide deeper insights into the factors influencing the effectiveness of lifestyle interventions among schoolchildren.

References

1. WHO. WHO. 2021 [cited 2024 Feb 21]. Obesity and overweight. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>
2. Huang JY, Qi SJ. Childhood obesity and food intake. *World Journal of Pediatrics* [Internet]. 2015;11(2):101–7. Available from: <https://doi.org/10.1007/s12519-015-0018-2>
3. Pérez-Herrera A, Cruz-López M. Childhood obesity: Current situation in Mexico. *Nutr Hosp*. 2019 Mar 1;36(2):463–9.
4. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2014 Aug 30;384(9945):766–81.
5. Kumar S, Kelly AS. Review of Childhood Obesity: From Epidemiology, Etiology, and Comorbidities to Clinical Assessment and Treatment. *Mayo Clin Proc* [Internet]. 2017 Feb 1 [cited 2019 Jun 20];92(2):251–65. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28065514>
6. Ahrens W, Pigeot I, Pohlabeln H, De Henauw S, Lissner L, Molnár D, et al. Prevalence of overweight and obesity in European children below the age of 10. *Int J Obes* [Internet]. 2014 Sep 15 [cited 2019 Oct 7];38(S2):S99–107. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25376223>
7. Cadenas-Sanchez C, Nyström C, Sanchez-Delgado G, Martinez-Tellez B, Mora-Gonzalez J, Risinger AS, et al. Prevalence of overweight/obesity and fitness level in preschool children from the north compared with the south of Europe: an exploration with two countries. *Pediatr Obes* [Internet]. 2016 Oct [cited 2019 Oct 7];11(5):403–10. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26549795>
8. Lauria L, Spinelli A, Buoncristiano M, Nardone P. Decline of childhood overweight and obesity in Italy from 2008 to 2016: Results from 5 rounds of the population-based surveillance system. *BMC Public Health* [Internet]. 2019 May 21 [cited 2020 Sep 7];19(1):618. Available from: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-6946-3>
9. Hassapidou M, Tzotzas T, Makri E, Pagkalos I, Kaklamanos I, Kapantais E, et al. Prevalence and geographic variation of abdominal obesity in 7- and 9-year-old children in Greece; World Health Organization Childhood Obesity Surveillance Initiative 2010. *BMC Public Health* [Internet]. 2017 Dec 28 [cited 2020 Sep 7];17(1):126. Available from: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4061-x>

10. Abarca-Gómez L, Abdeen ZA, Hamid ZA, Abu-Rmeileh NM, Acosta-Cazares B, Acuin C, et al. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. *The Lancet* [Internet]. 2017 Dec 16 [cited 2019 Oct 7];390(10113):2627–42. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29029897>
11. Gobierno de España. Ministerio de Consumo. Estudio Aladino 2019. Estudio sobre la Alimentación, Actividad Física, Desarrollo Infantil y Obesidad en España 2019.
12. Aragón-Martín R, Gómez-Sánchez M del M, Martínez-Nieto JM, Novalbos-Ruiz JP, Segundo-Iglesias C, Santi-Cano MJ, et al. Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. *Nutrients* [Internet]. 2022;14(6). Available from: <https://www.mdpi.com/2072-6643/14/6/1208>
13. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting Obesity in Young Adulthood from Childhood and Parental Obesity. *New England Journal of Medicine* [Internet]. 1997 Sep 25;337(13):869–73. Available from: <https://doi.org/10.1056/NEJM199709253371301>
14. Juonala M, Magnussen CG, Berenson GS, Venn A, Burns TL, Sabin MA, et al. Childhood Adiposity, Adult Adiposity, and Cardiovascular Risk Factors. *New England Journal of Medicine* [Internet]. 2011 Nov 17;365(20):1876–85. Available from: <https://doi.org/10.1056/NEJMoa1010112>
15. Sachdev HPS, Osmond C, Fall CHD, Lakshmy R, Ramji S, Biswas SKD, et al. Predicting adult metabolic syndrome from childhood body mass index: follow-up of the New Delhi birth cohort. *Arch Dis Child* [Internet]. 2009;94(10):768–74. Available from: <https://adc.bmj.com/content/94/10/768>
16. Weiss R, Dziura J, Burgert TS, Tamborlane W V, Taksali SE, Yeckel CW, et al. Obesity and the Metabolic Syndrome in Children and Adolescents. *New England Journal of Medicine* [Internet]. 2004 Jun 3;350(23):2362–74. Available from: <https://doi.org/10.1056/NEJMoa031049>
17. Lambrinou CP, Androutsos O, Karaglani E, Cardon G, Huys N, Wikström K, et al. Effective strategies for childhood obesity prevention via school based, family involved interventions: a critical review for the development of the Feel4Diabetes-study school based component. *BMC Endocr Disord* [Internet]. 2020;20(2):52. Available from: <https://doi.org/10.1186/s12902-020-0526-5>
18. Alwan Ala, World Health Organization. Global status report on noncommunicable diseases 2010. World Health Organization; 2011. 162 p.
19. O'Connor EA, Evans C V, Burda BU, Walsh ES, Eder M, Lozano P. Screening for Obesity and Intervention for Weight Management in Children and Adolescents: Evidence Report and Systematic Review for the US Preventive Services Task

- Force. JAMA [Internet]. 2017 Jun 20;317(23):2427–44. Available from: <https://doi.org/10.1001/jama.2017.0332>
20. Anderson YC, Wynter LE, Grant CC, Cave TL, Derraik JGB, Cutfield WS, et al. A Novel Home-Based Intervention for Child and Adolescent Obesity: The Results of the Whānau Pakari Randomized Controlled Trial. *Obesity* [Internet]. 2017 Nov 1;25(11):1965–73. Available from: <https://doi.org/10.1002/oby.21967>
 21. Salam RA, Padhani ZA, Das JK, Shaikh AY, Hoodbhoy Z, Jeelani SM, et al. Effects of Lifestyle Modification Interventions to Prevent and Manage Child and Adolescent Obesity: A Systematic Review and Meta-Analysis. *Nutrients* [Internet]. 2020;12(8). Available from: <https://www.mdpi.com/2072-6643/12/8/2208>
 22. Aragón-Martín R, Gómez-Sánchez M del M, Jiménez-Pavón D, Martínez-Nieto JM, Schwarz-Rodríguez M, Segundo-Iglesias C, et al. A Multimodal Intervention for Prevention of Overweight and Obesity in Schoolchildren. A Protocol Study “PREVIENE-CÁDIZ.” *Int J Environ Res Public Health* [Internet]. 2021;18(4). Available from: <https://www.mdpi.com/1660-4601/18/4/1622>
 23. Sergio VP, Novalbos-Ruiz JP, Rodríguez-Martín A, Martínez-Nieto JM, Lechuga-Sancho AM. Implicaciones del nivel socioeconómico familiar sobre las conductas de riesgo en la obesidad infantojuvenil. *Nutr Hosp* [Internet]. 2013 [cited 2019 Oct 8];28(6):1951–60. Available from: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S0212-16112013000600026
 24. Tim Olds AS and LELCMMJ. ISAK manual, International standards for Anthropometric Assessment. In 2012.
 25. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: International survey. *Br Med J*. 2000 May 6;320(7244):1240–3.
 26. Ortega FB, Sánchez-López M, Solera-Martínez M, Fernández-Sánchez A, Sjöström M, Martínez-Vizcaino V. Self-reported and measured cardiorespiratory fitness similarly predict cardiovascular disease risk in young adults. *Scand J Med Sci Sports* [Internet]. 2013 Dec [cited 2020 Mar 16];23(6):749–57. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22417235>
 27. Sánchez-López M, Martínez-Vizcaino V, García-Hermoso A, Jiménez-Pavón D, Ortega FB. Construct validity and test-retest reliability of the International Fitness Scale (IFIS) in Spanish children aged 9-12 years. *Scand J Med Sci Sports* [Internet]. 2015 Aug 1 [cited 2020 Mar 16];25(4):543–51. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24942050>
 28. Lineros-González C, Marcos-Marcos J, Ariza C, Hernán-García M. Importancia del proceso en la evaluación de la efectividad de una intervención sobre obesidad

- infantil. *Gac Sanit* [Internet]. 2017 May [cited 2019 Oct 8];31(3):238–41. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0213911117300080>
29. Carles A, Teresa A, Sara V, Gemma S, Albert M, Luis R, et al. Validation of ‘POIBA-How do we eat?’ questionnaire in 9-10 years old schoolchildren. *Food & Nutrition Research* [Internet]. 2017 Oct;61. Available from: <https://foodandnutritionresearch.net/index.php/fnr/article/view/1215>
 30. Canadian Society for Exercise Physiology. Canadian 24-Hour Movement Guidelines for Children and Youth 5-17 years. Canadian Society for Exercise Physiology [Internet]. 2018;(December 2014):1–2. Available from: <http://csepguidelines.ca/children-and-youth-5-17/%0Afile:///V:/HALO/HALO Staff/Longmuir/New Literature B/Canadian24HourMovementGuidelines2016.pdf>
 31. Doak CM, Visscher TLS, Renders CM, Seidell JC. The prevention of overweight and obesity in children and adolescents: A review of interventions and programmes. Vol. 7, *Obesity Reviews*. 2006. p. 111–36.
 32. Kamath CC, Vickers KS, Ehrlich A, McGovern L, Johnson J, Singhal V, et al. Behavioral interventions to prevent childhood obesity: A systematic review and metaanalyses of randomized trials. Vol. 93, *Journal of Clinical Endocrinology and Metabolism*. Endocrine Society; 2008. p. 4606–15.
 33. Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: An update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. Vol. 10, *Obesity Reviews*. 2009. p. 110–41.
 34. Waters E, de Silva-Sanigorski A, Burford BJ, Brown T, Campbell KJ, Gao Y, et al. Interventions for preventing obesity in children. Vol. 2011, *Cochrane Database of Systematic Reviews*. John Wiley and Sons Ltd; 2011.
 35. Spruijt-Metz D. Etiology, treatment, and prevention of obesity in childhood and adolescence: A decade in review. *Journal of Research on Adolescence*. 2011 Mar;21(1):129–52.
 36. Atlantis E, Barnes EH, Singh MAF. Efficacy of exercise for treating overweight in children and adolescents: A systematic review. Vol. 30, *International Journal of Obesity*. 2006. p. 1027–40.
 37. McGovern L, Johnson JN, Paulo R, Hettinger A, Singhal V, Kamath C, et al. Treatment of pediatric obesity: A systematic review and meta-analysis of randomized trials. Vol. 93, *Journal of Clinical Endocrinology and Metabolism*. Endocrine Society; 2008. p. 4600–5.
 38. Oude Luttikhuis H, Baur L, Jansen H, Shrewsbury VA, O’Malley C, Stolk RP, et al. Cochrane review: Interventions for treating obesity in children. *Evid Based Child Health*. 2009 Dec;4(4):1571–729.

39. Sargent GM, Pilotto LS, Baur LA. Components of primary care interventions to treat childhood overweight and obesity: A systematic review of effect. *Obesity Reviews*. 2011;12(5).
40. Flynn MAT, McNeil DA, Maloff B, Mutasingwa D, Wu M, Ford C, et al. Reducing obesity and related chronic disease risk in children and youth: A synthesis of evidence with “best practice” recommendations. Vol. 7, *Obesity Reviews*. 2006. p. 7–66.
41. Whitlock EP, O’Conner EA, Williams SB, Beil TL, Lutz KW. Effectiveness of Primary Care Interventions for Weight Management in Children and Adolescents: An Updated, Targeted Systematic Review for the USPSTF [Internet]. Agency for Healthcare Research and Quality (US), Rockville (MD); 2010. (U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews). Available from: <http://europepmc.org/books/NBK36416>
42. Lavelle H V., MacKay DF, Pell JP. Systematic review and meta-analysis of school-based interventions to reduce body mass index. *Journal of Public Health (United Kingdom)*. 2012 Aug;34(3):360–9.
43. Seo YG, Lim H, Kim Y, Ju YS, Lee HJ, Jang HB, et al. The Effect of a Multidisciplinary Lifestyle Intervention on Obesity Status, Body Composition, Physical Fitness, and Cardiometabolic Risk Markers in Children and Adolescents with Obesity. *Nutrients* [Internet]. 2019;11(1). Available from: <https://www.mdpi.com/2072-6643/11/1/137>
44. Neil-Sztramko SE CH, Dobbins M. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. *Cochrane Database of Systematic Reviews* [Internet]. 2021;(9). Available from: <https://doi.org/10.1002/14651858.CD007651.pub3>
45. Ariza C, Sánchez-Martínez F, Serral G, Valmayor S, Juárez O, Pasarín MI, et al. The Incidence of Obesity, Assessed as Adiposity, Is Reduced After 1 Year in Primary Schoolchildren by the POIBA Intervention. *J Nutr* [Internet]. 2019;149(2):258–69. Available from: <https://www.sciencedirect.com/science/article/pii/S0022316622165363>
46. Sánchez-Martínez F, Brugueras S, Serral G, Valmayor S, Juárez O, López MJ, et al. Three-Year Follow-Up of the POIBA Intervention on Childhood Obesity: A Quasi-Experimental Study. *Nutrients* [Internet]. 2021;13(2). Available from: <https://www.mdpi.com/2072-6643/13/2/453>
47. Ardoy DN, Fernández-Rodríguez JM, Jiménez-Pavón D, Castillo R, Ruiz JR, Ortega FB. A Physical Education trial improves adolescents’ cognitive performance and academic achievement: the EDUFIT study. *Scand J Med Sci Sports* [Internet]. 2014 Feb 1;24(1):e52–61. Available from: <https://doi.org/10.1111/sms.12093>

48. Daniel N Ardoy JMFRPCEGAVERDJPJRRCGEMJCFBO. Physical fitness enhancement through education, EDUFIT study: background, design, methodology and dropout analysis. Rev Esp Salud Publica [Internet]. 2010 May;84:151–68. Available from: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1135-57272010000200004&nrm=iso

ANNEX IV: Questionnaire “How we eat”



Universidad
de Cádiz



Escuela Andaluza de Salud Pública
CONSEJO REGULADOR DE SALUD



JUNTA DE ANDALUCÍA
CONSEJO REGULADOR DE EDUCACIÓN
CONSEJO REGULADOR DE EDUCACIÓN



Andalucía
se mueve con Europa

Como comemos

¡Hola!

Desde la **Universidad de Cádiz** y la **Escuela Andaluza de Salud Pública** estamos estudiando la **alimentación de los niños y las niñas de tu edad en la provincia de Cádiz**. Te vamos a preguntar sobre lo que comes, la actividad física que haces y cómo te sientes.

No se trata de un examen, no hay respuestas buenas ni malas. Sólo tienes que dar tu opinión y contestar sobre lo que haces. Como **es anónimo**, nadie va a saber cuáles son tus respuestas.

¿Qué tienes que hacer?

- ✓ Lee atentamente cada pregunta y pregúntanos si no la entiendes bien.
- ✓ Responde la verdad, es importante.
- ✓ Si te equivocas puedes cambiar la respuesta. ¿Cómo? Táchala y marca la nueva.

Son 64 preguntas en esta encuesta.

¡Muchas gracias por participar!

Código: Antes de empezar, **por favor escribe el código que te han dado** para ésta encuesta. Recuerda que tendrás que utilizarlo otra vez, para la segunda parte.

Por favor, escribe aquí:

Datos personales

Para empezar, queremos saber algunas cosas sobre ti.

1. Por favor, elige el año en que naciste.

- 2008
- 2009
- 2010
- 2011



2. ¿Eres un chico o una chica?

- Chico
- Chica



3. ¿Cuántas personas viven en tu casa? Incluyéndote a ti.

- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- Más de 10



Datos familiares

4. ¿Con quién vives en tu casa? Señala todas las personas que viven contigo.

Por favor, marque las opciones que correspondan:

- Madre
- Padre
- Pareja de la madre
- Pareja del padre
- Abuela
- Abuelo
- Hermano/s
- Hermana/s
- Familia de acogida
- Centro o residencia de acogida
- Otra/s persona/s:



5. En tu casa, ¿Tienes un dormitorio solo para ti? Por favor, seleccione sólo una de las siguientes opciones:

- Sí
- No

6. ¿Cuántos ordenadores tenéis en tu familia? Por favor, seleccione sólo una de las siguientes opciones:

- Ninguno
- Uno
- Dos
- Más de dos



7. ¿Tiene tu familia coche propio o furgoneta? Por favor, seleccione sólo una de las siguientes opciones:

- No
- Sí, uno
- Sí, dos o más.



8. Durante los últimos 12 meses, ¿Cuántas veces saliste de vacaciones con tu familia?

Por favor, seleccione sólo una de las siguientes opciones:

- Nunca
- Una vez
- Dos veces
- Más de dos veces



Comidas diarias

Ahora te vamos a preguntar sobre lo que comes.

9. ¿Qué comidas haces todos los días? Por favor, marca las opciones que correspondan:

- Desayuno (antes de empezar las clases)
- Desayuno a media mañana. Recreo
- Comida del mediodía
- Merienda
- Cena
- Antes de acostarte

10. Cuando te saltas el desayuno, ¿Te cuesta atender en la clase? Por favor, marca sólo una:

- Sí
- No

11. ¿Con quién sueles desayunar normalmente? Por favor, marque las opciones que correspondan:

- Madre
 Pareja de la madre
 Padre
 Pareja del padre
 Hermanos/as
 Abuelo/a
 Compañeros de escuela o de comedor escolar
 Amigos
 Nadie
 Otro:

12. ¿Con quién sueles comer a mediodía normalmente? Por favor, marque las opciones que correspondan:

- Madre
 Pareja de la madre
 Padre
 Pareja del padre
 Hermanos/as
 Abuelo/a
 Compañeros de escuela o de comedor escolar
 Amigos
 Nadie
 Otro:



13. ¿Con quién sueles merendar normalmente? Por favor, marque las opciones que correspondan:

- Madre
 Pareja de la madre
 Padre
 Pareja del padre
 Hermanos/as
 Abuelo/a
 Compañeros de escuela o de comedor escolar
 Amigos
 Nadie
 Otro:

14. ¿Con quién sueles cenar normalmente? Por favor, marque las opciones que correspondan:

- Madre
 Pareja de la madre
 Padre
 Pareja del padre
 Hermanos/as
 Abuelo/a
 Compañeros de escuela o de comedor escolar
 Amigos
 Nadie
 Otro:

15. ¿Cenas viendo la televisión o de una pantalla (móvil, ordenador, Nintendo®, PlayStation®, Xbox®, GameBoy®, etc.)? Por favor, seleccione sólo una de las siguientes opciones:

- Siempre o casi siempre
 Muchas veces (3 o más veces a la semana)
 Pocas veces (menos de 3 veces a la semana)
 Nunca o casi nunca



16. ¿Sueles beber agua mientras comes y cenas? Por favor, marca sólo una respuesta:

- Siempre o casi siempre
 Muchas veces (3 o más veces a la semana)
 Pocas veces (menos de 3 veces a la semana)
 Nunca o casi nunca



Desayuno

17. ¿Desayunas sentado o sentada en la mesa? Por favor, marca sólo una respuesta:

- Siempre o casi siempre
- Muchas veces (3 o más veces a la semana)
- Pocas veces (menos de 3 veces a la semana)
- Nunca o casi nunca



18. Todos o casi todos los días, ¿Desayunas antes de ir a la escuela? Por favor, marca sólo una respuesta:

- Sí
- No

19. Señala todos los alimentos que sueles desayunar, aunque no comas todos cada día.

Por favor, marca las opciones que correspondan:

- Leche sola
- Leche con cacao, descafeinado, café, batidos
- Yogur, yogur líquido, Actimel®
- Pan, bocadillo, tostada
- Pan de molde (Bimbo®, pan árabe, tortitas)
- Cereales de desayuno
- Bollería o Pastas (galletas, croissants, suizos, donuts®, magdalenas, ensaimadas)
- Fruta (manzana, pera, naranja, mandarina, plátano etc.)
- Zumo
- Refrescos (Coca-cola®, Fanta®, Seven Up®, Sunny Delight®, Nestea®, etc.)
- Otros alimentos, indica cuáles:



20. ¿Qué alimentos sueles llevar para el recreo la mayoría de los días? Por favor, marca las opciones que correspondan:

- Leche sola
- Leche con cacao, descafeinado, café, batidos
- Yogur, yogur líquido, Actimel®
- Pan, bocadillo, tostada
- Pan de molde (Bimbo®, pan árabe, tortitas)
- Cereales de desayuno
- Bollería o pastas (galletas, croissants, suizos, donuts®, magdalenas, ensaimadas)
- Fruta (manzana, pera, naranja, mandarina, plátano etc.)
- Zumo
- Refrescos (Coca-cola®, Fanta®, Seven Up®, Sunny Delight®, Nestea®, etc.)
- Otros alimentos, indica cuáles:

Alimentos que comes y que te gustan

Ahora te vamos a preguntar por diferentes alimentos y te pedimos que nos digas *cuándo comes cada uno* y *si te gustan algunos de ellos*. No importa si no te acuerdas bien.

21. ¿Cuándo comes pan (barra, tostada, bocadillo)? Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

22. ¿Cuándo comes pan de molde (pan Bimbo®, pan de pita, tortitas, picos etc.)? Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca



23. ¿Cuándo comes cereales de desayuno? Por favor, marca solo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

24. ¿Cuándo comes patatas (sin contar las patatas de bolsa o fritas)? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

25. ¿Cuándo comes arroz o pasta (macarrones, espaguetis, fideos, cuscús, etc.)?

Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

26. ¿Cuándo comes verduras crudas o ensalada (lechuga, tomate, zanahoria, pepino, etc.)? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca



27. ¿Cuántas veces al día comes verduras crudas o ensalada? Por favor, marca sólo una:

- Una vez al día
- Dos veces al día
- Más de dos veces al día

28. ¿Te gustan las verduras crudas o la ensalada (lechuga, tomate, zanahoria, pepino, etc.)? Por favor, selecciona sólo una respuesta:

- Sí
- No

29. ¿Cuándo comes verduras cocinadas (espinacas, berenjenas, calabacín, judías verdes, etc.)? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca



30. ¿Cuántas veces al día comes verduras cocinadas? Por favor, marca sólo una:

- Una vez al día
- Dos veces al día
- Más de dos veces al día

31. ¿Te gustan algunas verduras cocinadas (espinacas, berenjena, calabacín, etc.)?

Por favor marca sólo una:

- Sí
- No

32. ¿Cuándo comes fruta (manzana, pera, naranja, plátano, etc.)? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

33. ¿Cuántas veces al día comes fruta? Por favor, marca sólo una:

- Una vez al día
- Dos veces al día
- Más de dos veces al día



34. ¿Te gusta la fruta? Por favor, marca sólo una de las siguientes opciones:

- Sí
- No



35. ¿Cuándo bebes leche sola? Selecciona una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca



36. ¿Cuándo bebes leche con cacao, batidos, descafeinado? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

37. ¿Cuándo comes yogurt, yogurt líquido o Actimel®? Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

38. ¿Cuándo comes queso? Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

39. ¿Cuándo comes pescado (merluza, sardinas, etc.)? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

40. ¿Cuándo comes carne roja (ternera, cerdo, cordero, hamburguesas...)?

Por favor, marca sólo una respuesta:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

41. ¿Cuándo comes carne blanca (pollo, pavo, conejo)? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

42. ¿Cuándo comes huevos? Por favor, selecciona sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca



43. ¿Cuándo comes legumbres (judías o alubias, garbanzos, lentejas, guisantes, habas)?

Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

44. ¿Cuándo comes frutos secos (almendras, avellanas, nueces, pistachos, cacahuets, etc.)?

Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

45. ¿Cuándo comes postres lácteos (flan, natillas, arroz con leche, helados, etc.)?

Selecciona sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

46. ¿Cuándo comes bollería o dulces (galletas, croissants, magdalenas, donuts ®)?

Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

47. ¿Cuándo comes chucherías dulces (caramelos, chicles, gominolas, chocolatinas, etc.)?

Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca



48. ¿Cuándo comes patatas de bolsa, gusanitos, Doritos®, etc.? Por favor, marca sólo una:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

49. ¿Cuándo comes embutido (jamón serrano, salchichón, chorizo, salchicha, mortadela, beicon, etc.)? Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

50. ¿Cuándo bebes zumo de fruta envasado? Por favor, selecciona sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

51. ¿Cuándo bebes refrescos (Fanta®, Sunny Delight®, Coca-Cola®, Nestea®, Aquarius®, Seven Up®)? Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o 4 veces a la semana)
- Pocas veces (1 o 2 veces a la semana)
- Casi nunca (alguna vez al mes)
- Nunca

Comer fuera de casa

52. Si comes en el comedor ¿Te acabas la comida que sirven en la escuela? Por favor, marca sólo una de las siguientes opciones:

- Siempre
- Muchas veces
- Pocas veces
- Nunca

53. Si comes en el comedor, ¿Te gusta la comida que sirven en la escuela? Por favor, seleccione sólo una de las siguientes opciones:

- Sí
- No

54. ¿Cuántas veces vas a un establecimiento de comida rápida? (McDonalds®, Burger King®, Kentucky®, Telepizza®, Doner Kebab, Frankfurt, etc.). Por favor, marca sólo una de las siguientes opciones:

- Todos los días
- Muchas veces (3 o más veces a la semana)
- Pocas veces (menos de 3 veces a la semana)
- Nunca



55. ¿Cuántas veces vas a comer a un restaurante? No tengas en cuenta los establecimientos de comida rápida de la pregunta anterior. Elige una respuesta.

- Todos los días
- Muchas veces (3 o más veces a la semana)
- Pocas veces (menos de 3 veces a la semana)
- Nunca

56. ¿Te gusta probar nuevos alimentos? Por favor, seleccione sólo una de las siguientes opciones:

- Sí
- No

¿Qué piensas sobre los alimentos?

Las preguntas que hacemos ahora son sobre lo que sientes y piensas, aunque no sea lo que haces siempre.

57. De todos estos grupos de alimentos, ¿De cuáles deberías comer MÁS raciones cada día?

Por favor, selecciona sólo una de las siguientes opciones:

- Pan, cereales, arroz, pasta
- Productos lácteos (leche, yogur, queso)
- Bollería (galletas, croissants, etc.), Golosinas
- Fruta
- Carne, pescado, huevos, frutos secos
- Verduras
- No lo sé

58. De todos estos grupos de alimentos, ¿De cuáles deberías comer MENOS raciones cada día? Marca sólo una:

- Pan, cereales, arroz, pasta
- Productos lácteos (leche, yogur, queso)
- Bollería (galletas, croissants, etc.), Golosinas
- Fruta
- Carne, pescado, huevos, frutos secos
- Verduras
- No lo sé

59. ¿Cuántas veces al día deberías comer fruta y verduras? Por favor, marca sólo una:

- Ninguna vez
- 1 vez
- 2 veces
- 3 veces
- 4 veces
- 5 veces
- No lo sé



60. Lo que comes ¿Puede hacer que tengas una enfermedad cuando seas mayor? (del corazón, cáncer, etc.) Por favor, marca sólo una:

- Sí
- No
- No lo sé

61. La gente que pesa más de lo que debería ¿Puede tener más problemas de salud que otras personas? Por favor, marca sólo una:

- Sí
- No
- No lo sé

¿Qué opinas sobre la comida?

62. ¿Piensas que los alimentos que comes son buenos para tu salud? Por favor, marca sólo una:

- Todos
- Muchos
- Pocos
- Ninguno



63. En nuestros barrios y pueblos hay recursos o actividades que nos dan bienestar y facilitan mantener una alimentación saludable.

Indica un recurso de tu barrio o pueblo que facilita mantener una alimentación saludable.

Situaciones especiales

64. Si tu alimentación es distinta a la de tus compañeros y compañeras por alguna de éstas razones, márcalas por favor. Puedes elegir varias:

- Soy vegetariano (no como carne ni pescado)
- No como carne de cerdo
- Tengo alergia al gluten (no puedo comer pan o pasta)
- Soy intolerante a la lactosa (no puedo beber leche)
- Tengo alergia a los frutos secos
- Otras. ¿Cuáles?:

¡Ya has terminado!



¡Saludos y gracias por completar esta encuesta!

ANNEX V: Questionnaire “How we move and feel”



Universidad de Cádiz



Escuela Andaluza de Salud Pública
CONSEJERÍA DE SALUD



JUNTA DE ANDALUCÍA
CONSEJERÍA DE EDUCACIÓN



JUNTA DE ANDALUCÍA



UNIÓN EUROPEA

Andalucía se mueve con Europa

Como nos movemos y nos sentimos

¡Hola!

Desde la **Universidad de Cádiz** y la **Escuela Andaluza de Salud Pública** estamos estudiando la **alimentación de los niños y las niñas de tu edad en la provincia de Cádiz**. Te vamos a preguntar sobre la actividad física que haces y cómo te sientes.

No se trata de un examen, no hay respuestas buenas ni malas. Sólo tienes que dar tu opinión y contestar sobre lo que haces. Como **es anónimo**, nadie va a saber cuáles son tus respuestas.

¿Qué tienes que hacer?

- ✓ Lee atentamente cada pregunta y pregúntanos si no la entiendes bien.
- ✓ Responde la verdad, es importante.
- ✓ Si te equivocas puedes cambiar la respuesta. ¿Cómo? Táchala y marca la nueva.

Son 31 preguntas en esta encuesta.

¡Muchas gracias por participar!

CÓDIGO: Antes de empezar, **escribe el código que te han dado** para ésta encuesta. **Es el mismo que el utilizado en la encuesta de Alimentación.**

Por favor, escribe aquí: **Código:**

Actividad física

Te preguntamos sobre la actividad física que haces y algunos momentos de tu tiempo libre.

1. Ahora nos gustaría que nos contestaras. Por favor, selecciona la respuesta apropiada para cada concepto:

	Caminando	En bicicleta	En transporte público (bus)	En coche	Otros
¿Cómo vas a la escuela?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
¿Cómo vuelves de la escuela?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



2. ¿Qué haces durante el recreo? *Puedes elegir más de una respuesta.*

- Estoy sentado/a (hablando, leyendo, jugando a muñecas, jugando videojuegos)
- Juego en los columpios u otros juegos de moverse que hay en el patio de la escuela
- Juego a pelota, correr, cuerda, bailar, etc.
- Juego fútbol, baloncesto, etc.
- Otro:



3. ¿Cuántos días a la semana tienes clase de Educación Física?

Por favor, marca **sólo una** de las siguientes opciones:

- Ningún día
- 1 día
- 2 días
- 3 días o más

4. Durante los días de semana y una vez terminadas las clases, ¿Participas en actividades deportivas con entrenador o monitor? (por ejemplo: natación, fútbol, danza, etc.).

Por favor, selecciona **sólo una**:

- Sí
- No

5. ¿En qué actividades deportivas con entrenador o monitor participas (una vez terminadas las clases)? (por ejemplo: natación, fútbol, danza, etc.).

Puedes elegir varias.

- Atletismo
- Baloncesto
- Danza
- Esquí
- Fútbol
- Gimnasia (rítmica, acrobática etc.)
- Natación
- Rugby
- Tenis
- Voleibol
- Otro:

6. ¿Cuántos días a la semana practicas esa actividad? (por ejemplo: natación, fútbol, danza, etc.). Por favor, selecciona la respuesta apropiada para cada concepto:

	Atletismo	Baloncesto	Danza	Esquí	Fútbol	Gimnasia	Natación	Rugby	Tenis	Voleibol	Otros
1 día	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 días	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 días	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4 o más días	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. ¿Y podrías decir cuántas horas cada día practicas esa actividad? (por ejemplo: natación, fútbol, danza, etc.). Por favor, selecciona la respuesta apropiada para cada concepto:

	Atletismo	Baloncesto	Danza	Esquí	Fútbol	Gimnasia	Natación	Rugby	Tenis	Voleibol	Otros
1 hora	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1 hora y media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 horas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2 horas y media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 horas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3 horas y media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4 horas o más	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. ¿Qué zonas hay cerca de tu casa para poder ir a jugar? *Puedes señalar más de una respuesta:*

- No hay ninguna
 Parque con juegos infantiles (columpios, etc.)
 Espacio amplio (plaza, parque, etc.) donde se puede ir en bicicleta, jugar a pelota, etc.
 Pabellón deportivo
 Otro:



9. ¿Haces deporte, corres en bicicleta, patinas, vas a la montaña, etc., con tu familia? *Marca una respuesta.*

- Sí
 No

10. ¿Cuántos días de la semana haces deporte, montas en bicicleta, patinas, vas a la montaña, etc., con tu familia?

Por favor, selecciona sólo una:

 1 2 3 4 5 6 7

11. ¿Juegas o practicas algún deporte con tus amigos durante el fin de semana?

Por favor, selecciona sólo una:

- Todos los fines de semanas del mes
 Dos o tres fines de semana al mes
 Un fin de semana al mes
 Nunca

12. ¿Haces deporte o juegas con tu familia por las tardes durante la semana?

Por favor, selecciona sólo una de las siguientes opciones:

- Todos los días de la semana
 Dos o tres días a la semana
 Un día a la semana
 Nunca

13. En nuestros barrios y pueblos hay recursos o actividades que nos dan bienestar y facilitan realizar actividad física.

Indica un recurso de tu barrio o pueblo que facilite que realices actividad física.

TV y Videojuegos



14. De lunes a jueves, sumando todo el tiempo que dedicas a estas actividades ¿cuántas horas al día ves la televisión, DVD, Nintendo®, PlayStation®, Xbox®, GameBoy®, Nintendo DS®, etc.? Elige una respuesta.

- Ninguna vez
- Menos de 2 horas al día
- Entre 2 a 4 horas al día
- Más de 4 horas al día

15. De viernes a domingo y festivos, ¿cuántas horas al día ves la televisión, DVD, Nintendo®, PlayStation®, Xbox®, GameBoy®, Nintendo DS®, etc.? Elige una respuesta

- Ninguna vez
- Menos de 2 horas al día
- Entre 2 a 4 horas al día
- Más de 4 horas al día

16. De lunes a jueves, ¿cuántas horas al día pasas delante de un ordenador o móvil navegando por internet, chateando con amigos, etc., una vez terminadas las clases? Marca una respuesta:

- Ninguna vez
- Menos de 2 horas al día
- Entre 2 a 4 horas al día
- Más de 4 horas al día

17. De viernes a domingo y los festivos ¿cuántas horas al día pasas delante de un ordenador o móvil navegando por internet, chateando con amigos, etc., una vez terminadas las clases? Marca una respuesta:

- Ninguna vez
- Menos de 2 horas al día
- Entre 2 a 4 horas al día
- Más de 4 horas al día

¿Cómo me siento?

Ahora te vamos a preguntar sobre ¿Cómo te sientes?



18. Dirías que tu salud es... Elige una respuesta.

- Muy buena
- Buena
- Regular
- Mala
- No lo sé

19. En la última semana, ¿Te has sentido bien?

Por favor, selecciona **sólo una** de las siguientes opciones:

- Nunca o casi nunca
 Pocas veces (1 vez a la semana)
 Algunas veces (2-3 veces a la semana)
 Muchas veces (4-5 veces a la semana)
 Siempre o casi siempre

20. ¿Eres feliz? Por favor, selecciona sólo una de las siguientes opciones:

- Si
 No

21. Durante la última semana, ¿Cuántas veces...

Por favor, selecciona la respuesta apropiada para cada concepto:

	¿Te ha costado respirar?	¿Has sentido picor en la piel?
Nunca o casi nunca	<input type="radio"/>	<input type="radio"/>
Pocas veces (1 vez a la semana)	<input type="radio"/>	<input type="radio"/>
Algunas veces (2-3 veces a la semana)	<input type="radio"/>	<input type="radio"/>
Muchas veces (4-5 veces a la semana)	<input type="radio"/>	<input type="radio"/>
Siempre o casi siempre	<input type="radio"/>	<input type="radio"/>

22. Durante la última semana, ¿Cuántas veces...

Por favor, selecciona la respuesta apropiada para cada concepto:

	¿Has llorado mucho?	¿Has estado preocupado o preocupada?	¿Has estado enfadado o enfadada?	¿Has sentido miedo?
Nunca o casi nunca	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pocas veces (1 vez a la semana)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Algunas veces (2-3 veces a la semana)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Muchas veces (4-5 veces a la semana)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Siempre o casi siempre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23. Durante la última semana, ¿Cuántas veces te has encontrado tan mal que no has tenido ganas de jugar en casa? Marca una respuesta:

- Nunca o casi nunca
 Pocas veces (1 vez a la semana)
 Algunas veces (2-3 veces a la semana)
 Muchas veces (4-5 veces a la semana)
 Siempre o casi siempre

24. Durante la última semana, ¿Cuántas veces te has sentido tan mal que no has podido salir de casa? Marca una respuesta:

- Nunca o casi nunca
 Pocas veces (1 vez a la semana)
 Algunas veces (2-3 veces a la semana)
 Muchas veces (4-5 veces a la semana)
 Siempre o casi siempre

25. ¿Estás contento o contenta con tu forma de ser? Por favor, marca sólo una respuesta:

- Sí
- No

26. En la última semana, ¿Cuántas veces te sentiste muy orgulloso de ti mismo/orgullosa de ti misma? Marca una respuesta:

- Nunca o casi nunca
- Pocas veces (1 vez a la semana)
- Algunas veces (2-3 veces a la semana)
- Muchas veces (4-5 veces a la semana)
- Siempre o casi siempre

27. En la última semana, ¿Cuántas veces sentiste que te querían? Marca una respuesta:

- Nunca o casi nunca
- Pocas veces (1 vez a la semana)
- Algunas veces (2-3 veces a la semana)
- Muchas veces (4-5 veces a la semana)
- Siempre o casi siempre

28. En la última semana, ¿Cuántas veces te lo pasaste muy bien? Marca una respuesta:

- Nunca o casi nunca
- Pocas veces (1 vez a la semana)
- Algunas veces (2-3 veces a la semana)
- Muchas veces (4-5 veces a la semana)
- Siempre o casi siempre

29. En la última semana, ¿Cuántas veces te viste muy guapo o guapa? Elige una respuesta

- Nunca o casi nunca
- Pocas veces (1 vez a la semana)
- Algunas veces (2-3 veces a la semana)
- Muchas veces (4-5 veces a la semana)
- Siempre o casi siempre

30. En la última semana, ¿Cuántas veces te sentiste sano o sana? Marca una respuesta:

- Nunca o casi nunca
- Pocas veces (1 vez a la semana)
- Algunas veces (2-3 veces a la semana)
- Muchas veces (4-5 veces a la semana)
- Siempre o casi siempre

31. Cuando quiero algo, estoy seguro o segura que lo conseguiré. Marca sólo una respuesta:

- Siempre
- Frecuentemente
- Algunas veces
- Nunca
- No sé/No contesto

¡Ya has terminado!

¡Gracias por completar esta encuesta!



ANNEX VI: Questionnaire “Families. How we eat and move”



Universidad
de Cádiz



Escuela Andaluza de Salud Pública
CONSEJERÍA DE SALUD



JUNTA DE ANDALUCÍA
CONSEJERÍA DE EDUCACIÓN
Investigación e Innovación



Andalucía
se mueve con Europa

Familias. Como comemos y nos movemos

¡Hola!

Desde la **Universidad de Cádiz y la Escuela Andaluza de Salud Pública** estamos estudiando los hábitos de alimentación, actividad física y horas de descanso de los niños, las niñas y sus familias en la provincia de Cádiz.

Para ello os pedimos vuestra colaboración. Se trata de un cuestionario para conocer estos hábitos. No le llevará más de 10/15 minutos y esta información es de una enorme importancia para nuestro estudio.

No se trata de un examen, no hay respuestas buenas ni malas. Sólo tiene que dar su opinión y contestar sobre lo que hace. Como es **anónimo**, nadie va a saber cuáles son sus respuestas.

¿Qué tiene que hacer?:

- Leer atentamente cada pregunta.
- Responder la verdad, es importante.
- Si se equivoca puede cambiar la respuesta. ¿Cómo? Táchela y marque la nueva.

¡Muchas gracias por participar!

Hay 55 preguntas en esta encuesta.

Antes de empezar, **por favor escriba el código que se le ha facilitado:**

Código:

Quién realiza el cuestionario

1. Por favor, indique quién realiza el cuestionario. Por favor, seleccione **sólo una** de las siguientes opciones:

- Madre
- Padre
- Ambos
- Otra persona:

Alimentación adultos

2. ¿Desayuna en las primeras horas de la mañana? Marque una respuesta. Por favor, seleccione **sólo una** de las siguientes opciones:

- Nunca o casi nunca (menos de 1 vez a la semana)
- Algunas veces (menos de 3 veces a la semana)
- Muchas veces (de 3 a 5 veces a la semana)
- Siempre o casi siempre (6 o 7 veces a la semana)

3. Si desayuna entre semana (de lunes a viernes) en las primeras horas de la mañana

¿Dónde lo hace más frecuentemente? Marque una respuesta. Por favor, seleccione **sólo una** de las siguientes opciones:

- En casa
- En el trabajo
- En una cafetería
- Otro lugar. Diga cuál:

4. ¿Toma el desayuno sentado/a? Marque una respuesta. Por favor, seleccione **sólo una** de las siguientes opciones:

- Nunca o casi nunca (menos de 1 vez a la semana)
- Algunas veces (menos de 3 veces a la semana)
- Muchas veces (de 3 a 5 veces a la semana)
- Siempre o casi siempre (6 o 7 veces a la semana)

5. Señale los alimentos que normalmente toma para desayunar (sin tener en cuenta los que tome a media mañana). Puede señalar más de una respuesta. Por favor, marque las opciones que correspondan:

- Leche sola
- Leche con cacao, café, batidos
- Yogurt o yogurt líquido o Actimel ®
- Pan (bocadillo, tostada)
- Cereales de desayuno
- Pastas (galletas, croissants, ensaimadas, donuts ®, magdalenas, etc.)
- Pieza de fruta (manzana, pera, naranja, mandarinas, plátano, etc.)
- Zumo de fruta
- Refrescos (Coca-cola®, Pepsi®, Fanta ®, Seven up®, SunnyDeligth®, Nestea ®, etc.)
- Otros alimentos, diga cuáles:

6. Señale lo que come frecuentemente a media mañana. Puede señalar más de una respuesta. Por favor, marque las opciones que correspondan:

- Nada
- Leche sola
- Leche con cacao, café, batidos
- Yogurt o yogurt líquido o Actimel ®
- Pan (bocadillo, tostada)
- Cereales de desayuno
- Pastas (galletas, croissants, ensaimadas, donuts ®, magdalenas, etc.)
- Pieza de fruta (manzana, pera, naranja, mandarinas, plátano, etc.)
- Zumo de fruta
- Refrescos (Coca-cola®, Pepsi®, Fanta ®, Seven up®, SunnyDeligth®, Nestea ®, etc.)
- Otros alimentos, diga cuáles:

7. ¿Qué bebe normalmente durante las comidas (almuerzo, cena etc.)? Puede señalar más de una respuesta. Por favor, marque **las opciones que correspondan**:

- Nada
- Agua
- Zumos de fruta
- Refrescos (Coca-cola®, Pepsi®, Fanta ®, Seven up®, SunnyDeligth®, Nestea ®, etc.)
- Vino, cerveza etc.
- Otros. Cuales:

8. A continuación le pedimos que nos conteste cual es la frecuencia con que consume los siguientes alimentos, señalando con una cruz en el espacio que corresponda:

	Menos de una vez al mes	1 vez al mes	2-3 veces al mes	1 día a la semana	2-4 días a la semana	5-6 días a la semana	1 vez al día	2 veces al día	Más de 2 veces al día
Pan (pan de barra, pan tostado, bocadillos)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pan de molde	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cereales de desayuno	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patatas (todas menos las patatas de bolsa)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arroz, pasta (macarrones, espagueti, pasta en sopas, cuscús)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verduras crudas o ensalada (lechuga, tomate, zanahoria, pimiento, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verduras cocinadas (espinacas, berenjenas, calabacín, judía tierna, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruta (manzana, pera, naranja, plátano, melón, papaya, dátiles, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leche sola	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leche con cacao, café, batidos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Yogur, yogur líquido, Actimel®	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Queso	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Legumbres (judías, lentejas, garbanzos, guisantes, habas, frijoles, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carne blanca (pollo, pavo, conejo)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carne roja (hamburguesa, cerdo, ternera, cordero, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pescado (merluza, bacalao, dorada, salmón, atún, sardina, boquerones)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Menos de una vez al mes	1 vez al mes	2-3 veces al mes	1 día a la semana	2-4 días a la semana	5-6 días a la semana	1 vez al día	2 veces al día	Más de 2 veces al día
Huevos (tortilla, huevo frito, huevo hervido, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frutos secos (almendras, avellanas, nueces, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Postres lácteos (flan, natillas, crema catalana, helados, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bollería (galletas, croissants, donuts®, magdalenas)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chucherías (caramelos, chicles, chocolate, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patatas de bolsa, ganchitos, palomitas de bolsa, Bocabits®, Doritos®	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Embutidos (jamón serrano, butifarra, salami, mortadela, beicon, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Zumo de fruta	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Refrescos (Coca-cola®, Pepsi®, Fanta®, Seven up®, SunnyDelight®, Nestea®, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vino, cerveza	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Whisky, ginebra, vodka, ron, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Alimentación hijos/as

Ahora le pedimos que conteste a unas preguntas sobre lo que comen sus hijos/as.

9. ¿Su hijo/a desayuna antes de empezar las clases? (Tanto si desayuna en casa, como si lo hace en la escuela). Por favor, seleccione **sólo una** de las siguientes opciones:

- Nunca o casi nunca (menos de 1 vez a la semana)
 Algunas veces (menos de 3 veces a la semana)
 Muchas veces (de 3 a 5 veces a la semana)
 Siempre o casi siempre (6 o 7 veces a la semana)

10. ¿Su hijo o hija toma el desayuno sentado/a y en la mesa antes de empezar las clases? Por favor, seleccione **sólo una** de las siguientes opciones:

- Nunca o casi nunca (menos de 1 vez a la semana)
 Algunas veces (menos de 3 veces a la semana)
 Muchas veces (de 3 a 5 veces a la semana)
 Siempre o casi siempre (6 o 7 veces a la semana)

11. Señale los alimentos que él o ella normalmente come para desayunar. Puede señalar más de una respuesta. Por favor, marque **las opciones que correspondan**:

- Leche sola
 Leche con cacao, café, batidos
 Yogur o yogur líquido o Actimel®
 Pan (bocadillo, tostada)
 Cereales de desayuno
 Pastas (galletas, croissants, ensaimadas, donuts®, magdalenas, etc.)
 Pieza de fruta (manzana, pera, naranja, mandarinas, plátano, etc.)
 Zumo de fruta
 Pan de molde
 Refrescos (Coca-cola®, Pepsi®, Fanta®, Seven up®, SunnyDeligth®, Nestea®, etc.)
 Otros alimentos, diga cuáles:

12. Señale lo que él o ella come a media mañana. Puede señalar más de una respuesta. Por favor, marque **las opciones que correspondan**:

- Nada
 Leche sola
 Leche con cacao, café, batidos
 Yogur o yogur líquido o Actimel®
 Pan (bocadillo, tostada)
 Pan de molde
 Cereales de desayuno
 Bollería (galletas, croissants, ensaimadas, donuts®, magdalenas, etc.)
 Pieza de fruta (manzana, pera, naranja, mandarinas, plátano, etc.)
 Zumo de fruta
 Refrescos (Coca-cola®, Pepsi®, Fanta®, Seven up®, SunnyDeligth®, Nestea®, etc.)
 Otros alimentos, diga cuáles:

13. ¿Qué bebe su hijo o hija normalmente durante las comidas (almuerzo, cena etc.)? Puede señalar más de una respuesta. Por favor, marque las opciones que correspondan:

- Nada
- Agua
- Zumos de fruta
- Refrescos (Coca-cola®, Pepsi®, Fanta®, Seven up®, SunnyDeligth®, Nestea®, etc.)
- Otros. Cuales:

14. A continuación le pedimos que nos conteste cual es la frecuencia con que su hijo o hija consume los siguientes alimentos:

	Menos de una vez al mes	1 vez al mes	2-3 veces al mes	1 día a la semana	2-4 días a la semana	5-6 días a la semana	1 vez al día	2 veces al día	Más de 2 veces al día
Pan (pan de barra, pan tostado, bocadillos)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pan de molde	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cereales de desayuno	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patatas (todas menos las patatas de bolsa)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arroz, pasta (macarrones, espagueti, pasta en sopas, cuscús)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verduras crudas o ensalada (lechuga, tomate, zanahoria, pimiento, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verduras cocinadas (espinacas, berenjenas, calabacín, judía tierna, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fruta (manzana, pera, naranja, plátano, melón, papaya, dátiles, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leche sola	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leche con cacao, café, batidos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Yogur, yogur líquido, Actimel®	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Queso	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Legumbres (judías, lentejas, garbanzos, guisantes, habas, frijoles, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carne blanca (pollo, pavo, conejo)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Menos de una vez al mes	1 vez al mes	2-3 veces al mes	1 día a la semana	2-4 días a la semana	5-6 días a la semana	1 vez al día	2 veces al día	Más de 2 veces al día
Carne roja (hamburguesa, cerdo, ternera, cordero, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pescado (merluza, bacalao, dorada, salmón, atún, sardina, boquerones)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Huevos (tortilla, huevo frito, huevo hervido, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frutos secos (almendras, avellanas, nueces, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Postres lácteos (flan, natillas, crema catalana, helados, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bollería (galletas, croissants, donuts®, magdalenas)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chucherías (caramelos, chicles, chocolate, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patatas de bolsa, ganchitos, palomitas de bolsa, Bocabits®, Doritos®	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Embutidos (jamón serrano, butifarra, salami, mortadela, beicon, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Zumo de fruta	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Refrescos (Coca-cola®, Pepsi®, Fanta®, Seven up®, SunnyDelight®, Nestea®, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vino, cerveza	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Whisky, ginebra, vodka, ron, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hábitos familiares

En las siguientes cuestiones le preguntamos sobre la forma de cocinar en casa, y como se suelen hacer las comidas.

15. ¿Utilizan aceite de oliva en casa, como principal grasa? Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
- No

16. Normalmente ¿Su hijo o hija mira la televisión o está delante de alguna pantalla (ordenador, móvil, Nintendo®, PlayStation®, Xbox®, Gameboy®, etc.) durante las comidas? Por favor, seleccione **sólo una** de las siguientes opciones:

- Nunca o casi nunca (menos de 1 vez a la semana)
- Algunas veces (menos de 3 veces a la semana)
- Muchas veces (de 3 a 5 veces a la semana)
- Siempre o casi siempre (6 o 7 veces a la semana)

17. ¿Con qué frecuencia su hijo o hija va a un establecimiento de comida rápida? (McDonals®, Burger King®, Kentucky®, Telepizza®, Doner Kebab, Frankfrut, etc.). Por favor, seleccione **sólo una** de las siguientes opciones:

- Nunca o casi nunca (hasta una vez al mes)
- Algunas veces (de 2 a 3 veces al mes a 1 día a la semana)
- Muchas veces (de 2 a 4 días a la semana)
- Siempre o casi siempre (más de 4 días a la semana)

18. ¿Con qué frecuencia su hijo o hija va a comer en un restaurante? No tenga en cuenta los establecimientos de comida rápida. Por favor, seleccione **sólo una** de las siguientes opciones:

- Nunca o casi nunca (hasta una vez al mes)
- Algunas veces (de 2 a 3 veces al mes a 1 día a la semana)
- Muchas veces (de 2 a 4 días a la semana)
- Siempre o casi siempre (más de 4 días a la semana)

19. ¿Dónde acostumbran a hacer la compra de alimentos preferentemente? Por favor, seleccione la respuesta apropiada para cada concepto:

	Productos frescos	Productos NO Perecederos
Grandes Superficies (Carrefour®, Alcampo®, etc.)	<input type="radio"/>	<input type="radio"/>
Supermercado (Mercadona®, Caprabo®, etc.)	<input type="radio"/>	<input type="radio"/>
Mercado	<input type="radio"/>	<input type="radio"/>
Pequeño comercio (tiendas del barrio)	<input type="radio"/>	<input type="radio"/>
Otros	<input type="radio"/>	<input type="radio"/>

Conocimientos sobre los alimentos

Conteste a las siguientes preguntas **según lo que usted cree o piensa**, independientemente de que lo haga o no:

20. De todos estos grupos de alimentos, ¿De qué grupo considera que su hijo o hija debería comer el MAYOR número de raciones cada día? Por favor, seleccione **sólo una** de las siguientes opciones:

- Pan, arroz, pasta
- Productos lácteos (leche, queso, yogurt)
- Bollería (galletas, croissants, etc.), golosinas
- Fruta
- Carne
- Pescado
- Huevos
- Frutos secos
- Verduras y hortalizas
- No lo sé

21. De todos estos grupos de alimentos, ¿De qué grupo considera que su hijo o hija debería comer el MENOR número de raciones cada día? Por favor, seleccione **sólo una** de las siguientes opciones:

- Pan, arroz, pasta
- Productos lácteos (leche, queso, yogurt)
- Bollería (galletas, croissants, etc.), golosinas
- Fruta
- Carne
- Pescado
- Huevos
- Frutos secos
- Verduras y hortalizas
- No lo sé

22. ¿Cuántas raciones en total de frutas, verduras y hortalizas debería comer su hijo o hija CADA DÍA? Por favor, seleccione **sólo una** de las siguientes opciones:

- 2 raciones
- 3 raciones
- 4 raciones
- 5 raciones como mínimo
- No lo sé

23. En nuestros barrios y pueblos hay recursos o actividades que nos dan bienestar y facilitan mantener una alimentación saludable.

Indique **un recurso** de su barrio o pueblo que facilite mantener una alimentación saludable para su familia.

24. Ahora le pedimos que conteste sobre lo que piensa acerca de la alimentación de SU HIJO O HIJA. ¿Hasta qué punto está de acuerdo con éstas afirmaciones?

	Totalmente en desacuerdo	Bastante en desacuerdo	Ni de acuerdo ni en desacuerdo	Bastante de acuerdo	Totalmente de acuerdo
Algunos alimentos deben estar fuera del alcance de los niños y niñas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los niños y niñas deben comer muchos dulces (golosinas, caramelos, helados, pasteles o bollería)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los padres y madres deben estar atentos a que sus hijos o hijas estén por encima del peso que les correspondería	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es importante que los niños y niñas coman los alimentos que les gustan cuando lo quieran	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los niños y niñas deben comer muchos alimentos como bollería, chuchería, patatas de bolsa, embutidos, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los padres y madres deben preocuparse si su hijo o hija tiene que hacer dieta para mantenerse en un peso deseable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los zumos comerciales son saludables para sus hijos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cuando los niños y niñas se portan bien, deben recompensarse con helados, bollería, caramelos, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los niños y niñas deben de terminarse la comida que tienen en el plato	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Si no presto atención, mi hijo o hija come mucho de sus alimentos preferidos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Si no presto atención mi hijo o hija come mucho más de lo que debería	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cuando puedo, ofrezco a mi hijo o hija sus alimentos preferidos como recompensa por haberse portado bien conmigo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
He de estar especialmente pendiente para asegurarme de que mi hijo o hija come lo suficiente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Si mi hijo o hija dice: "No tengo hambre", igualmente intento que coma	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Creo que mi hijo o hija come adecuadamente	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Actividad física

A continuación, le pedimos que conteste a unas preguntas sobre **la actividad física y el tiempo de descanso** de su hijo o hija:

Trayecto CASA - ESCUELA - CASA

25. ¿Cómo va su hijo o hija a la escuela normalmente? Por favor, seleccione la respuesta apropiada para cada concepto:

	Casa – Escuela	Escuela – Casa
Caminando	<input type="radio"/>	<input type="radio"/>
En transporte público (autobús, tren, etc.)	<input type="radio"/>	<input type="radio"/>
En coche o moto	<input type="radio"/>	<input type="radio"/>
En bicicleta	<input type="radio"/>	<input type="radio"/>
Otros	<input type="radio"/>	<input type="radio"/>

ENTORNO

26. ¿Qué zonas hay cerca de su casa para que su hijo o hija juegue? Puede señalar más de una respuesta. Por favor, marque las opciones que correspondan:

- Nada
 Parque infantil (columpios, etc.)
 Espacio amplio (plaza, parque etc.), donde se puede ir en bicicleta, jugar a la pelota etc.
 Pabellón o pista deportiva
 Otro:

DEPORTE Y JUEGO ACTIVO

27. ¿Su hijo o hija participa en actividades deportivas con entrenador o monitor una vez terminadas las clases? (por ejemplo: natación, fútbol, danza, baloncesto, etc.). Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
 No

28. En caso afirmativo, ¿En qué actividades deportivas con entrenador o monitor participa su hijo o hija, una vez terminadas las clases? (ejemplo: natación, fútbol, danza, etc.). Por favor, marque las opciones que correspondan:

	Número de veces <u>por semana</u>	Número de horas <u>por actividad</u>
Atletismo		
Baloncesto		
Fútbol		
Balonmano		
Danza, baile		
Judo		
Natación		
Rugby		
Tenis		
Vela		
Surf		
Voleibol		
Otros		

29. Durante la SEMANA PASADA, ¿Cuántos días su hijo o hija practicó otras actividades SIN entrenador o monitor, al menos una hora, en su tiempo libre? (por ejemplo: caminar rápido, ir en bicicleta, patinar, jugar en el parque, ir de excursión etc.) Por favor, seleccione **sólo una** de las siguientes opciones:

- Ninguna vez
- 1 día
- 2 días
- 3 días
- 4 días
- 5 o más días

30. ¿Normalmente salen en familia a hacer actividades como caminar, pasear, ir en bicicleta, ir al parque etc.? Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
- No

31. En caso afirmativo, ¿Cuántos días de la semana hacen deporte, montan en bicicleta, patinan o van a la montaña, en familia? Por favor, seleccione **sólo una** de las siguientes opciones:

- 1 día
- 2 días
- 3 días
- 4 días
- 5 días
- 6 días
- 7 días

32. En general, ¿Piensa que su hijo o hija hace suficiente actividad física? Por favor, seleccione **sólo una** de las siguientes opciones:

- No, en absoluto
- No, probablemente no
- Sí, probablemente si
- Sí, seguro

33. De media, ¿Cuánto tiempo PIENSA que tendría que practicar actividad física un niño o niña en edad escolar, ya sea jugando o haciendo deporte? Por favor, seleccione **sólo una** de las siguientes opciones:

- Nada de actividad física. Menos de 1 h a la semana
- Poco tiempo. 1-2h a la semana
- Algún tiempo. 3-4 h a la semana
- Mucho tiempo. 5-6h a la semana

34. En nuestros barrios y pueblos hay recursos o actividades que nos dan bienestar y facilitan realizar actividad física. Indique un recurso de su barrio o pueblo que facilite realizar actividad física para su familia.

35. ¿Para usted es importante que su hijo o hija haga actividades extraescolares? Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
- No

36. Numere por orden de importancia las siguientes actividades extraescolares según su criterio: "1" la que elige primero y "4" la que elige en último lugar.

- Actividades como ludoteca, manualidades, cerámica, teatro, música, ajedrez etc.
- Actividades deportivas (fútbol, natación, danza, baloncesto etc.)
- Estudio de idiomas (inglés, francés, alemán, etc.)
- Repaso - estudio (academia, profesor de refuerzo en casa, etc.)

37. ¿Cuántas horas al día dedica su hijo o hija a hacer los deberes?

	Lunes a jueves	Viernes a domingo y festivos
Ninguna		
Hasta 30 min		
Entre 30 min y 1 hora		
De 1 a 2 horas		
Más de 2 horas		

38. De LUNES A JUEVES, ¿Cuántas horas al día, su hijo o hija... Por favor, seleccione la respuesta apropiada para cada concepto:

	Nunca o casi nunca	Algunas horas (Hasta 2 horas al día)	Muchas horas (Entre 2 y 4 horas al día)	Siempre o casi siempre (más de 4 horas al día)
¿Ve la televisión, DVD?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
¿Juega a videojuegos (Nintendo®, PlayStation®, Xbox®, Gameboy®, Nintendo DS®, etc.?)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
¿Está delante de un ordenador /móvil fuera del horario escolar (Internet, jugando, chateando?)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

39. De VIERNES A DOMINGO Y FESTIVOS, ¿Cuántas horas al día, su hijo o hija... Por favor, seleccione la respuesta apropiada para cada concepto:

	Nunca o casi nunca	Algunas horas (Hasta 2 horas al día)	Muchas horas (Entre 2 y 4 horas al día)	Siempre o casi siempre (más de 4 horas al día)
¿Ve la televisión, DVD?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
¿Juega a videojuegos (Nintendo®, PlayStation®, Xbox®, Gameboy®, Nintendo DS®, etc.?)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
¿Está delante de un ordenador /móvil fuera del horario escolar (Internet, jugando, chateando?)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

HORAS DE SUEÑO

40. En las últimas 4 semanas, ¿Cuántas veces su HIJO o HIJA... Por favor, seleccione la respuesta apropiada para cada concepto:

	Nunca	Algún día	Muchos días	Todos los días
... ha tenido dificultad para dormirse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... se ha despertado varias veces mientras dormía?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... se ha despertado demasiado pronto?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

41. ¿A qué hora se va a dormir su hijo o hija de lunes a jueves?

42. ¿A qué hora se va a dormir su hijo o hija de viernes a domingo y festivos?

43. ¿A qué hora se levanta su hijo o hija de lunes a jueves?

44. ¿A qué hora se levanta su hijo o hija de viernes a domingo y festivos?

Datos sociodemográficos

Para terminar, le pedimos algunos datos personales.

45. ¿Cuántas personas viven en su casa? Sólo se pueden introducir **números** en este campo. Por favor, escriba su respuesta:

Personas - número

46. De ellos son:

Niñas - número

Niños - número

Adultos - número

Mayores de 65 años - número

47. Persona/s que contesta/n el cuestionario:

Mujer Edad - número Mujer Edad - número

Mujer Edad - número Mujer Edad - número

Hombre Edad - número Hombre Edad - número

Hombre Edad - número Hombre Edad - número

48. ¿Cuál es el lugar de nacimiento del padre y de la madre del niño o niña que participa en el proyecto? Por favor, seleccione la respuesta apropiada para cada concepto:

	Padre	Madre
Andalucía (España)	<input type="radio"/>	<input type="radio"/>
Otra comunidad autónoma (España)	<input type="radio"/>	<input type="radio"/>
Argentina	<input type="radio"/>	<input type="radio"/>
Alemania	<input type="radio"/>	<input type="radio"/>
Bolivia	<input type="radio"/>	<input type="radio"/>
China	<input type="radio"/>	<input type="radio"/>
Colombia	<input type="radio"/>	<input type="radio"/>
Ecuador	<input type="radio"/>	<input type="radio"/>
Francia	<input type="radio"/>	<input type="radio"/>
Marruecos	<input type="radio"/>	<input type="radio"/>
Reino Unido	<input type="radio"/>	<input type="radio"/>
Rumanía	<input type="radio"/>	<input type="radio"/>
Rusia	<input type="radio"/>	<input type="radio"/>
Otro país Europa	<input type="radio"/>	<input type="radio"/>
Otro país América del Sur	<input type="radio"/>	<input type="radio"/>
Otro país América del Norte	<input type="radio"/>	<input type="radio"/>
Otro país Asia	<input type="radio"/>	<input type="radio"/>
Otro país África	<input type="radio"/>	<input type="radio"/>

49. Para los padres y /o madres que no nacieron en España. ¿Cuál es su tiempo de residencia aquí? Por favor, seleccione la respuesta apropiada para cada concepto:

	Padre	Madre
Menos de 1 año	<input type="radio"/>	<input type="radio"/>
Entre 1 y 5 años	<input type="radio"/>	<input type="radio"/>
Entre 6 y 10 años	<input type="radio"/>	<input type="radio"/>
Más de 10 años	<input type="radio"/>	<input type="radio"/>

50. ¿Cuál es el nivel más alto de estudios que han finalizado? Por favor, seleccione la respuesta apropiada para cada concepto:

	Padre	Madre
No sabe leer o escribir	<input type="radio"/>	<input type="radio"/>
No ha estudiado pero sabe leer y escribir	<input type="radio"/>	<input type="radio"/>
Estudios primarios (hasta 5º EGB, ingreso)	<input type="radio"/>	<input type="radio"/>
EGB completa (8º) o similar (bachiller elemental)	<input type="radio"/>	<input type="radio"/>
ESO (Educación Secundaria Obligatoria)	<input type="radio"/>	<input type="radio"/>
Estudios de FPI	<input type="radio"/>	<input type="radio"/>
Estudios de FPPII	<input type="radio"/>	<input type="radio"/>
Estudios Secundarios (BUP, B. Superior)	<input type="radio"/>	<input type="radio"/>
Estudios universitarios de grado medio (Diplomatura)	<input type="radio"/>	<input type="radio"/>
Estudios universitarios de grado superior (Licenciatura)	<input type="radio"/>	<input type="radio"/>
Otros	<input type="radio"/>	<input type="radio"/>

51. ¿Cuál es su situación laboral actual? Por favor, seleccione la respuesta apropiada para cada concepto:

	Padre	Madre
Trabaja	<input type="radio"/>	<input type="radio"/>
Está en paro y ha trabajado antes	<input type="radio"/>	<input type="radio"/>
Busca primer empleo	<input type="radio"/>	<input type="radio"/>
Jubilado/a (trabajó anteriormente)	<input type="radio"/>	<input type="radio"/>
No trabaja fuera de casa	<input type="radio"/>	<input type="radio"/>
Estudiante	<input type="radio"/>	<input type="radio"/>
Incapacidad/invalidez permanente	<input type="radio"/>	<input type="radio"/>
Otros. Especificar	<input type="radio"/>	<input type="radio"/>

52. ¿Cuál es la ocupación que desempeña en la actualidad o la última que ha desempeñado?

53. ¿Cuál es su situación laboral actual, o en la última ocupación que ha desempeñado?

	Padre	Madre
Trabajador/a por cuenta ajena	<input type="radio"/>	<input type="radio"/>
Trabajador/a por cuenta propia, autónomo/a	<input type="radio"/>	<input type="radio"/>
Empresario/a o empleador/a de 10 o más asalariados/as	<input type="radio"/>	<input type="radio"/>
Empresario/a o empleador/a de menos de 10 asalariados/as	<input type="radio"/>	<input type="radio"/>
Gerente de empresa de 10 o más asalariados/as	<input type="radio"/>	<input type="radio"/>
Gerente de empresa de menos de 10 asalariados/as	<input type="radio"/>	<input type="radio"/>

54. Con los ingresos de su hogar, ¿Cómo suele llegar usted o en su caso, usted y su familia en la actualidad a fin de mes? Por favor, seleccione sólo una de las siguientes opciones:

- Con mucha dificultad
 Con dificultad
 Con cierta/alguna dificultad
 Con cierta alguna facilidad
 Con facilidad
 Con mucha facilidad

55. Por favor, indique el intervalo en el que están comprendidos los ingresos totales netos de su hogar, sumando todas las fuentes (si existe más de una) y deduciendo las retenciones a cuenta por impuestos, cotizaciones sociales y otros pagos asimilados. Por favor, seleccione sólo una de las siguientes opciones:

- Hasta 300 €
 De 301 € a 499 €
 De 500 € a 999 €
 De 1.000 € a 1.499 €
 De 1.500 € a 1.999 €
 De 2.000 € a 2.499 €
 De 2.500 € a 2.999 €
 De 3.000 € a 4.999 €
 Más de 5.000 €
 No sabe, no está seguro/a

¡Muchas gracias por completar esta encuesta!

ANNEX VII: IFIS (children version)

IFIS



Cuestionario de autoevaluación de la condición física

International Fitness Scale

Es muy importante que contestes a estas preguntas tú solo, sin tener en cuenta las respuestas de tus compañeros/as. Tus respuestas sólo son útiles para el progreso de la ciencia. Por favor, contesta todas las preguntas y no las dejes en blanco. Y aún más importante, se sincero. Gracias por tu cooperación con la ciencia.

Por favor, piensa sobre tu nivel de condición física (comparado con tus amigos/as) y elige la opción más adecuada.

1. Mi condición física general es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

2. Mi condición física cardio-respiratoria (capacidad para hacer ejercicio, por ejemplo, correr durante mucho tiempo) es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

3. Mi fuerza muscular es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

4. Mi velocidad / agilidad es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

5. Mi flexibilidad es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

IFIS has been developed by the PROFITH research group, Granada, Spain. Versions of IFIS in different languages and for different age groups are available at: <http://profith.ugr.es/IFIS> IFIS was originally design and validated under the umbrella of the HELENA study, original reference: Ortega et al. The International Fitness Scale (IFIS): usefulness of self-reported fitness in youth. *Int J Epidemiol* 2011;40:701-1. IFIS has also been validated in adults: Ortega et al. *Scand J Med Sci Sports*, 2013;23:749-57; in children: Sanchez-Lopez et al. *Scand J Med Sci Sports*, 2015;25:543-51, and in women with fibromyalgia: Alvarez-Gallardo et al. *Arch Phys Med Rehabil*. 2016;97:395-404.

ANNEX VIII: IFIS (adults' version)

IFIS



Cuestionario de autoevaluación de la condición física

International Fitness Scale

Es muy importante que contestes a estas preguntas tú solo, sin tener en cuenta las respuestas de otras personas. Tus respuestas sólo son útiles para el progreso de la ciencia. Por favor, contesta todas las preguntas y no las dejes en blanco. Y aún más importante, se sincero. Gracias por tu cooperación con la ciencia.

Por favor, piensa sobre tu nivel de condición física (comparado con tus amigos) y elige la opción más adecuada.

1. Mi condición física general es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

2. Mi condición física cardio-respiratoria (capacidad para hacer ejercicio, por ejemplo, correr durante mucho tiempo) es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

3. Mi fuerza muscular es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

4. Mi velocidad / agilidad es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

5. Mi flexibilidad es:

- Muy mala (1)
- Mala (2)
- Aceptable (3)
- Buena (4)
- Muy buena (5)

IFIS has been developed by the PROFITH research group, Granada, Spain. Versions of IFIS in different languages and for different age groups are available at: <http://profith.ugr.es/IFIS> IFIS was originally design and validated under the umbrella of the HELENA study, original reference: Ortega et al. The International Fitness Scale (IFIS): usefulness of self-reported fitness in youth. *Int J Epidemiol* 2011;40:701-1. IFIS has also been validated in adults: Ortega et al. *Scand J Med Sci Sports*, 2013;23:749-57; in children: Sanchez-Lopez et al. *Scand J Med Sci Sports*, 2015;25:543-51, and in women with fibromyalgia: Alvarez-Gallardo et al. *Arch Phys Med Rehabil*. 2016;97:395-404.

ANNEX IX: PREVIENE-CÁDIZ Questionnaire—Breastfeeding, childbirth, and birth weight



Por favor, lea con atención las siguientes preguntas y luego contéstelas:

- ¿Le dio usted Lactancia Materna a su hijo/a? (Si responde No, pase a la pregunta 4).
 - Sí
 - No
- ¿Cuánto tiempo le dio usted Lactancia materna? Ya sea sola o combinada.
 - Menos de un mes. Especifique por favor en días o semanas
Días: _____
Semanas: _____
 - Un mes
 - Dos meses
 - Tres meses
 - Cuatro meses
 - Cinco meses
 - Seis meses
 - Siete meses
 - Ocho meses
 - Nueve meses
 - Diez meses
 - Once meses
 - Un año
 - Más de un año: Para este caso especifique por favor: 1 año y _____ meses
 - Dos años
 - Más de dos años: Para este caso especifique por favor: 2 años y _____ meses
 - Tres años
 - Más de tres años: Para este caso especifique por favor: 3 años y _____ meses
 - Cuatro años
 - Más de cuatro años: Para este caso especifique por favor: 4 años y _____ meses
- ¿Cuánto tiempo le dio usted SOLO lactancia materna? Es decir, indíquenos por favor cuanto tiempo (días, semanas o meses) que su hijo/a se alimentó solamente con leche materna.
- ¿Cuándo introdujo usted por primera vez un alimento diferente a la leche (zumo, galletas, cereales...)?
 - Antes del primer mes
 - A partir del primer mes
 - A partir del segundo mes
 - A partir del tercer me
 - A partir del cuarto mes
 - A partir del quinto mes
 - A partir del sexto mes
 - No lo recuerdo
- Su hijo/a nació
 - Por parto natural
 - Por cesárea
- Indique por favor si lo recuerda, el peso de su hijo/a al nacer:
- Su hijo/a nació:
 - A término (es decir, entre la semana 37 y 42)
 - Prematuramente (antes de la semana 37)

¡¡MUCHAS GRACIAS POR SU PARTICIPACIÓN!!

ANNEX X: PREVIENE-CÁDIZ Program Evaluation Questionnaire. Intervention group. Directors—Management teams



Cuestionario de Evaluación del Programa *PREVIENE CÁDIZ*.

Directores/as – Equipos directivos



Gracias por participar en este proyecto. Su opinión es muy importante.

Por favor cumplimente este formulario que nos permitirá evaluar el funcionamiento del Programa y mejorarlo con sus propuestas.

La duración prevista es de 5 minutos.

Hay 14 preguntas en la encuesta.

Nombre del centro

Localidad

Persona que responde la encuesta:

Director/a del centro	<input type="checkbox"/>	
Otra persona	<input type="checkbox"/>	Indicar quien:

1. ¿Considera interesante incluir en el Programa *PREVIENE CÁDIZ* alguna otra actividad relacionada con los contenidos abordados?

Por favor seleccione **sólo una** de las siguientes opciones:

- Sí
 No

Descríbala brevemente. (Sólo conteste esta pregunta si la respuesta fue "Sí" en la pregunta anterior).

Por favor, escriba su respuesta aquí:

2. Valore la implicación de las familias con el desarrollo del programa.

Valore con una escala del 1 al 5 la implicación de las familias en el programa, donde 1 significa que *no se han implicado nada* y 5 que *se han implicado mucho*.

Por favor seleccione **sólo una** de las siguientes opciones:

- No se han implicado nada 1 2 3 4 5 Se han implicado mucho

3. ¿Cree que el profesorado necesita más recursos para llevar a cabo el programa PREVIENE-Cádiz en las áreas que se especifican a continuación?

Por favor, marque las opciones que correspondan:

- Formación
 Materiales
 Apoyo de profesionales externos/as
 Tiempo para desarrollar las sesiones
 Otro:

4. ¿Volvería a participar en este programa el próximo curso escolar?

Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
 No

5. ¿Recomendaría este programa a otros centros?

Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
 No

6. ¿Se han aplicado los recreos activos en su centro?

Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
 No

7. Señale el motivo principal por el que no se llevaron a cabo los recreos activos.

Sólo conteste esta pregunta si la respuesta fue 'No' en la pregunta 25. Por favor, seleccione **sólo una** de las siguientes opciones:

- No sabía cómo aplicar la propuesta de recreos activos.
 Creo que la propuesta de recreos activos no es eficaz.
 Considero que el alumnado ya es lo suficientemente activo durante los recreos.
 No estaba dispuesto/a a dedicar más tiempo al programa.

Otro. Indíquelo:

8. ¿Podría aportar alguna sugerencia que, desde su punto de vista, contribuyera a mejorar el programa?

Por favor, escriba su respuesta aquí:

9. ¿Se ha desarrollado en su centro este año el programa “Creciendo en salud”? Sí No No lo sé

10. En caso negativo ¿nos podría indicar cuales son las causas de no haberlo desarrollado?

11. En caso afirmativo, indicar qué líneas del mismo se han desarrollado: (en 3er curso)

Educación emocional.	
Estilos de vida Saludable.	
Autocuidados y Accidentalidad.	
Uso Positivo de las Tecnologías de la Información y la Comunicación	
Prevención del Consumo de Sustancias Adictivas.	

12. En el caso de que se haya desarrollado alguna/s de las líneas anteriores, indicar qué bloques temáticos se han trabajado: (en 3er curso)

Educación emocional.	
- Conciencia Emocional.	
- Regulación Emocional.	
- Autonomía Emocional.	
- Competencia Social.	
- Competencias para la Vida y el Bienestar.	
Estilos de vida Saludable.	
- Actividad Física.	
- Alimentación Equilibrada.	
Autocuidados y Accidentalidad.	
- Autocuidados	
- Accidentalidad:	
o Educación Vial	
o Seguridad en el Hogar	
Uso Positivo de las Tecnologías de la Información y la Comunicación	
- Estilos de Vida Saludable en una Sociedad digital.	
- Adicciones a las TIC.	
- Buenas Prácticas y Recomendaciones.	
Prevención del Consumo de Sustancias Adictivas.	
- Hábitos que contribuyen a una vida sana.	
- Consumo de Alcohol y Tabaco.	
- Publicidad y Drogas: mitos y creencias.	

13. ¿Disponéis en el Centro de un equipo de Promoción y Educación para la Salud? (Consejo de Salud Escolar o similar, grupo de personas encargados de estas actividades) Si No

En caso afirmativo,

¿Quién lo ha coordinado? _____

¿Quién lo compone? (indicar las personas que lo componen, sus cargos y/o colectivos a los que representan, no es necesario indicar nombres y apellidos)

14. Actividades realizadas este curso académico en el centro educativo con el alumnado de 3º curso, relacionadas con la alimentación y/o el ejercicio físico saludables, además de las incluidas en el programa PREVIENE.

Plan Escolar de Consumo de Frutas y Hortalizas (reparto de frutas / hortalizas)	
Desayuno saludable.	
Concurso de recetario infantil.	
Huertos escolares.	
Frutibus	
Otras:	

Indicar qué otras actividades se han realizado:

Muchas gracias por completar el cuestionario.

ANNEX XI: PREVIENE-CÁDIZ Program Evaluation Questionnaire. Intervention group. Teachers



Cuestionario de Evaluación del Programa *PREVIENE CÁDIZ*.

Docentes



Gracias por participar en este proyecto. Su opinión es muy importante.

Por favor cumplimente este formulario que nos permitirá evaluar el funcionamiento del Programa y mejorarlo con sus propuestas.

La duración prevista es de 15 minutos.

Hay 35 preguntas en la encuesta.

Nombre del centro

Localidad

Señale con una X la que corresponda.

Línea 1 2 3 4

Persona que responde la encuesta:

Profesor/a tutor/a de la línea	<input type="checkbox"/>
Profesor/a de Educación Física	<input type="checkbox"/>
Otro/a:	Indicar quien:

1. Indique la fecha aproximada en la que comenzó la primera actividad o primera sesión del programa *PREVIENE* (fecha en que comenzó el programa) ___/___/___

2. Indique la fecha aproximada en la que terminó la última actividad o última sesión del programa *PREVIENE* (fecha en que terminó el programa) ___/___/___

3. ¿Considera interesante incluir en el Programa *PREVIENE CÁDIZ* alguna otra actividad relacionada con los contenidos abordados?

Por favor seleccione **sólo una** de las siguientes opciones:

Sí

No

Descríbala brevemente.

(Sólo conteste esta pregunta si la respuesta fue "Sí" en la pregunta anterior).

Por favor, escriba su respuesta aquí:

4. Señale si ha desarrollado el programa según la Guía Didáctica.

Por favor, seleccione con una X la respuesta apropiada para cada concepto:

	Realizada según programa	No realizada	Realizada de forma alternativa
Sesión 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sesión 9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Foto y Voz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. En el caso de que en la pregunta 4 haya indicado que la sesión 1 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 1. Por favor, escriba su respuesta aquí:

6. En el caso de que en la pregunta 4 haya indicado que la sesión 2 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 2. Por favor, escriba su respuesta aquí:

7. En el caso de que en la pregunta 4 haya indicado que la sesión 3 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 3. Por favor, escriba su respuesta aquí:

8. En el caso de que en la pregunta 4 haya indicado que la sesión 4 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 4. Por favor, escriba su respuesta aquí:

9. En el caso de que en la pregunta 4 haya indicado que la sesión 5 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 5. Por favor, escriba su respuesta aquí:

10. En el caso de que en la pregunta 4 haya indicado que la sesión 6 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 6. Por favor, escriba su respuesta aquí:

11. En el caso de que en la pregunta 4 haya indicado que la sesión 7 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 7. Por favor, escriba su respuesta aquí:

12. En el caso de que en la pregunta 4 haya indicado que la sesión 8 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 8. Por favor, escriba su respuesta aquí:

13. En el caso de que en la pregunta 4 haya indicado que la sesión 9 la ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Sesión 9. Por favor, escriba su respuesta aquí:

14. En el caso de que en la pregunta 4 haya indicado que el Foto y Voz lo ha desarrollado de forma alternativa, indique las modificaciones realizadas (material de apoyo, técnicas empleadas, tiempo dedicado, etc.).

Foto y Voz. Por favor, escriba su respuesta aquí:

15. Valoración de las sesiones:

Señale con una X aquellas contestaciones afirmativas (Sí).

	Sesión 1	Sesión 2	Sesión 3	Sesión 4	Sesión 5	Sesión 6	Sesión 7	Sesión 8	Sesión 9	FotoVoz
La participación del alumnado fue buena	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Los contenidos fueron comprendidos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Los materiales fueron usados satisfactoriamente	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Valore la implicación de las familias con el desarrollo del programa.Valore con una escala del 1 al 5 la implicación de las familias en el programa, donde 1 significa que *no se han implicado nada* y 5 que *se han implicado mucho*.Por favor seleccione **sólo una** de las siguientes opciones:

No se han implicado nada 1 2 3 4 5 Se han implicado mucho

17. De los materiales del programa, indique cuáles ha usado.

Por favor, seleccione con una X la respuesta apropiada para cada concepto:

	Sí	No
Guía didáctica del profesorado	<input type="radio"/>	<input type="radio"/>
Material alumnado	<input type="radio"/>	<input type="radio"/>
Material familias	<input type="radio"/>	<input type="radio"/>

18. Valore los siguientes aspectos de la Guía didáctica destinada al profesorado:

Valore dichos aspectos con una escala del 1 al 5, donde 1 se corresponde con una puntuación muy baja y 5 con una puntuación muy alta.

	Sesión 1	Sesión 2	Sesión 3	Sesión 4	Sesión 5	Sesión 6	Sesión 7	Sesión 8	Sesión 9	FotoVoz*
Claridad, comprensión y legibilidad del contenido por parte del docente	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Idoneidad de la metodología propuesta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coherencia entre los objetivos, contenidos y actividades	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Sesión 1	Sesión 2	Sesión 3	Sesión 4	Sesión 5	Sesión 6	Sesión 7	Sesión 8	Sesión 9	Foto Voz*
Calidad del diseño y las imágenes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ajuste de la sesión al tiempo programado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Información aportada de manera complementaria a la Guía Didáctica

19. Valore los siguientes criterios del material para el alumnado.

Por favor, seleccione con una X la respuesta apropiada para cada concepto, donde 1 se corresponde con una puntuación muy baja y 5 con una puntuación muy alta.

	1	2	3	4	5
Claridad, comprensión y legibilidad por parte del alumnado	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calidad del diseño y las imágenes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. Valore los siguientes criterios del material para las familias.

Por favor, seleccione con una X la respuesta apropiada para cada concepto, donde 1 se corresponde con una puntuación muy baja y 5 con una puntuación muy alta.

	1	2	3	4	5
Claridad, comprensión y legibilidad por parte de las familias	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calidad del diseño y las imágenes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. ¿Cree que el profesorado necesita más recursos para llevar a cabo el programa en las áreas que se especifican a continuación?

Por favor, marque las opciones que correspondan:

- Formación
- Materiales
- Apoyo de profesionales externos/as
- Tiempo para desarrollar las sesiones
- Otro:

22. Identifique las principales dificultades que ha encontrado para desarrollar las sesiones.

Por favor, marque las opciones que correspondan:

- Falta de tiempo para desarrollar la intervención completa (9 sesiones)
- El tiempo previsto para cada sesión no se ajusta a la duración de una clase
- Realización paralela de otros programas
- Algunos contenidos ya se han trabajado en otras materias
- Otro:

23. ¿Volvería a participar en este programa el próximo curso escolar?

Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
 No

24. ¿Recomendaría este programa a otros/as docentes?

Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
 No

25. ¿Se han aplicado los recreos activos en su centro?

Por favor, seleccione **sólo una** de las siguientes opciones:

- Sí
 No

26. ¿En qué nivel se llegó a aplicar?

Sólo conteste esta pregunta si la respuesta fue 'Sí' en la pregunta 25. Por favor, seleccione **sólo una** de las siguientes opciones:

1. El/la docente imprimió y colocó la hoja de control en un lugar visible y accesible al alumnado.
2. El maestro o maestra, además de lo anterior, controló que el alumnado anotase en la hoja de control cada día que realizaban actividad física durante el recreo.
3. El/la docente, además de lo anterior (1+2) informó al alumnado sobre lo que significa ser activo/a durante el recreo y les animó a participar.
4. El/la docente, además de todo lo anterior (1+2+3) hizo que el alumnado propusiese al menos tres actividades o juegos activos para realizar en los recreos.
5. El maestro o maestra, además de todo lo anterior (1+2+3+4), colocó en la pared de la clase un póster o cartel modelo con una frase y dibujo saludable.

27. En caso de que el alumnado elaborase póster o carteles o alguna actividad, indíquela por favor.

Sólo conteste esta pregunta si la respuesta fue 'Sí' en la pregunta 25. Por favor, marque las opciones que correspondan:

- Cada alumno/a realizó un póster o cartel en el aula o en casa con la familia, y lo mostró en clase.
- Se realizó un concurso con los posters o carteles realizados por el alumnado, eligiendo entre ellos/as los mejores.
- Se realizó un Collage saludable entre el alumnado, aportando cada uno/a una frase o un dibujo de contenido de salud.
- Se realizó algún tipo de representación (rap, teatro,...) de contenido saludable en grupos reducidos.
- Se realizó alguna actividad que logró implicar a todo el centro (profesorado y alumnado) (p.e. un Lipdub, Flashmob).
- Otra propuesta. Indíquela:

28. Señale el motivo principal por el que no se llevaron a cabo los recreos activos.

Sólo conteste esta pregunta si la respuesta fue 'No' en la pregunta 25. Por favor, seleccione sólo una de las siguientes opciones:

- No sabía cómo aplicar la propuesta de recreos activos.
- Creo que la propuesta de recreos activos no es eficaz.
- Considero que el alumnado ya es lo suficientemente activo durante los recreos.
- No estaba dispuesto/a a dedicar más tiempo al programa.

Otro. Indíquelo:

29 ¿Podría aportar alguna sugerencia que, desde su punto de vista, contribuyera a mejorar el programa?

Por favor, escriba su respuesta aquí:

30. ¿Se ha desarrollado en tu centro este año el programa “Creciendo en salud”? Sí No No lo sé

31. En caso negativo ¿nos podrías indicar cuales son las causas de no haberlo desarrollado?

32. En caso afirmativo, indicar qué líneas del mismo se han desarrollado: (en 3^{er} curso)

Educación emocional.	
Estilos de vida Saludable.	
Autocuidados y Accidentalidad.	
Uso Positivo de las Tecnologías de la Información y la Comunicación	
Prevención del Consumo de Sustancias Adictivas.	

33. En el caso de que se haya desarrollado alguna/s de las líneas anteriores, indicar qué bloques temáticos se han trabajado: (en 3er curso)

Educación emocional.	
- Conciencia Emocional.	
- Regulación Emocional.	
- Autonomía Emocional.	
- Competencia Social.	
- Competencias para la Vida y el Bienestar.	
Estilos de vida Saludable.	
- Actividad Física.	
- Alimentación Equilibrada.	
Autocuidados y Accidentalidad.	
- Autocuidados	
- Accidentalidad:	
o Educación Vial	
o Seguridad en el Hogar	
Uso Positivo de las Tecnologías de la Información y la Comunicación	
- Estilos de Vida Saludable en una Sociedad digital.	
- Adicciones a las TIC.	
- Buenas Prácticas y Recomendaciones.	
Prevención del Consumo de Sustancias Adictivas.	
- Hábitos que contribuyen a una vida sana.	
- Consumo de Alcohol y Tabaco.	
- Publicidad y Drogas: mitos y creencias.	

34. ¿Disponéis en el Centro de un equipo de Promoción y Educación para la Salud? (Consejo de Salud Escolar o similar, grupo de personas encargados de estas actividades) Si No

En caso afirmativo,

¿Quién lo ha coordinado? _____

¿Quién lo compone? (indicar las personas que lo componen, sus cargos y/o colectivos a los que representan, no es necesario indicar nombres y apellidos)

35. Actividades realizadas este curso académico en el centro educativo con el alumnado de 3º curso, relacionadas con la alimentación y/o el ejercicio físico saludables, además de las incluidas en el programa PREVIENE.

Plan Escolar de Consumo de Frutas y Hortalizas (reparto de frutas / hortalizas)	
Desayuno saludable.	
Concurso de recetario infantil.	
Huertos escolares.	
Frutibus	
Otras:	

Indicar qué otras actividades se han realizado:

Muchas gracias por completar el cuestionario.

ANNEX XII: PREVIENE-CÁDIZ Program Evaluation Questionnaire. Control group. Managers—Management teams—Teachers



Cuestionario - Programa PREVIENE CÁDIZ.

Previene Cádiz

Directores/as – Equipos directivos - Docentes

Gracias por participar en este proyecto. Su opinión es muy importante.

Hay 6 preguntas en la encuesta.

Nombre del centro

Localidad

Persona que responde la encuesta:

Director/a del centro						
Profesor/a de la línea		Indicar la línea	1	2	3	4
Profesor/a de Educación Física						
Otra persona		Indicar quien:	<input type="text"/>			

1. ¿Se ha desarrollado en su centro este año el programa “Creciendo en salud”? Sí No No lo sé

2. En caso negativo ¿nos podría indicar cuales son las causas de no haberlo desarrollado?

3. En caso afirmativo, indicar qué líneas del mismo se han desarrollado: (en 3^{er} curso)

Educación emocional	
Estilos de vida Saludable	
Autocuidados y Accidentalidad	
Uso Positivo de las Tecnologías de la Información y la Comunicación	
Prevención del Consumo de Sustancias Adictivas	

4. En el caso de que se haya desarrollado alguna/s de las líneas anteriores, indicar qué bloques temáticos se han trabajado: (en 3^{er} curso)

Educación emocional.	
- Conciencia Emocional.	
- Regulación Emocional.	
- Autonomía Emocional.	
- Competencia Social.	
- Competencias para la Vida y el Bienestar.	
Estilos de vida Saludable.	
- Actividad Física.	
- Alimentación Equilibrada.	
Autocuidados y Accidentalidad.	
- Autocuidados	
- Accidentalidad:	
o Educación Vial	
o Seguridad en el Hogar	

Uso Positivo de las Tecnologías de la Información y la Comunicación	
- Estilos de Vida Saludable en una Sociedad digital.	
- Adicciones a las TIC.	
- Buenas Prácticas y Recomendaciones.	
Prevención del Consumo de Sustancias Adictivas.	
- Hábitos que contribuyen a una vida sana.	
- Consumo de Alcohol y Tabaco.	
- Publicidad y Drogas: mitos y creencias.	

5. ¿Disponéis en el Centro de un equipo de Promoción y Educación para la Salud? (Consejo de Salud Escolar o similar, grupo de personas encargados de estas actividades) Si No

En caso afirmativo,

¿Quién lo ha coordinado? _____

¿Quién lo compone? (indicar las personas que lo componen, sus cargos y/o colectivos a los que representan, no es necesario indicar nombres y apellidos)

6. Actividades realizadas este curso académico en el centro educativo con el alumnado de 3º curso, relacionadas con la alimentación y/o el ejercicio físico saludables.

Plan Escolar de Consumo de Frutas y Hortalizas (reparto de frutas / hortalizas)	
Desayuno saludable.	
Concurso de recetario infantil.	
Huertos escolares.	
Frutibus	
Otras:	

Indicar qué otras actividades se han realizado:

Muchas gracias por completar el cuestionario.

ANNEX XIII: Healthy educational program, activity book for students and family activity book



PREVIENE
Programa de
"Alimentación y Actividad
Física Saludables"



CRÉDITOS

Material elaborado por los equipos del proyecto de investigación:

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SESIONES DIDÁCTICAS



Sesión 1

Nuestro crecimiento

1 Resumen de la sesión

Comparar fotos personales de diferentes edades fijándose que el peso y la altura han ido cambiando a lo largo del tiempo. Incorporar actividades físicas que favorezcan el reconocimiento y aceptación del propio cuerpo y el de los demás.

2 Objetivo

Reconocer el peso y la altura como expresión del crecimiento.

3 Ideas clave

- El peso y la altura van variando con el crecimiento.
- Una alimentación saludable influye favorablemente en el peso y la altura.
- El ejercicio físico saludable influye favorablemente en el crecimiento.
- Otros aspectos (genéticos, ambientales, económicos) pueden influir en el crecimiento de cada persona.

4 Actividades de aprendizaje

4.1. EN EL AULA

Unos días antes de realizar la actividad en el aula, se entrega la ficha para la familia y se informa sobre los materiales que deben llevar a clase: fotos de diferentes momentos de su crecimiento (p.ej. a los pocos días de nacer, a los dos o tres años y una actual). El alumnado pedirá a su familia las fotos y también información sobre el peso y la altura aproximados de cada uno de los momentos fotografiados (véase la ficha para la familia). A medida en que el alumnado va trayendo las fotos al aula, se van colocando en un mural en el aula. Se recomienda que debajo de cada foto figuren su nombre y la edad, y el peso y altura correspondiente a cada foto. Tener en cuenta que puede haber alumnado que no aporte fotos.

Sesión 2

Valorémonos

1 Resumen de la sesión

Se realizan actividades físicas destinadas a valorar rasgos positivos del aspecto físico de cada compañero y compañera de clase.

2 Objetivo

Reconocer y aceptar el aspecto físico propio y el de los demás.

3 Ideas clave

- La valoración del aspecto físico de cada persona depende sobre todo de la valoración de uno mismo y de la que tienen los demás.
- Todos y todas tenemos aspectos físicos positivos y otros mejorables.
- Todos y todas somos diferentes y podemos disfrutar de las diferencias.
- Hay que respetar el aspecto físico propio y el de los demás, tal como queremos que respeten el nuestro.

4 Actividades de aprendizaje

4.1. EN EL AULA

Se organiza la sesión con grupos homogéneos en base a perímetros, peso y altura. Se realizan actividades dirigidas a valorar mediante la actividad física las diferencias individuales mediante diferentes formas de desplazamiento y transporte. Tras la vivencia de la actividad el alumnado anota rasgos positivos de los demás en una ficha (véase la ficha para el alumnado).

Con el nombre en la ficha, el alumnado sabrá sobre quién ha de escribir el rasgo positivo del aspecto físico. Todas las hojas deben ir pasando por el alumnado para conseguir

Sesión 3

Nuestra digestión

1 Resumen sesión

Completar el aparato digestivo con los nombres de las diferentes partes indicando la función de cada una.

2 Objetivo

- Conocer el aparato digestivo y sus funciones.
- Practicar hábitos de higiene relacionados con la alimentación.

3 Ideas clave

1. La digestión comienza en la boca. Es importante masticar bien los alimentos para que se mezclen con la saliva y puedan empezar a ser digeridos.
2. La higiene bucal es muy importante. Hay que cepillarse los dientes después de cada comida.
3. Es aconsejable comer con tranquilidad.
4. Es recomendable reposar al menos unos 20 minutos después de comer para no interrumpir el proceso digestivo.
5. Comer alimentos como frutas, verduras y alimentos integrales ayuda a los intestinos a funcionar mejor.
6. Importancia de lavarse las manos antes y después de comer.

4 Actividades de aprendizaje

4.1. EN EL AULA

Como previo a la actividad en el aula el alumnado ha elaborado carteles con las partes del aparato digestivo (se sugiere aprovechar la clase de plástica). Con la base fundamental de practicar actividad física, el alumnado se dirige alternativamente a los pósters pegados a la pared, previamente elaborados, con dibujos o nombres de las once partes

Sesión 4

Los grupos de alimentos

1 Resumen de la sesión

La sesión propuesta tiene dos partes: actividad en la que se combina agrupaciones y dispersiones en base al trabajo con grupos de alimentos, dieta completa, completando alimentos, caloría vacía, hidratando el cuerpo. Y, para terminar, clasificar los envases que hayan llevado según el grupo de alimentos al que pertenecen.

2 Objetivos

Conocer los diferentes grupos de alimentos y diferenciarlos.

3 Ideas clave

1. Los alimentos se pueden clasificar en los siguientes grupos: lácteos, carne-pescados-huevos, féculas (cereales, patatas, legumbres), frutas-verduras, grasas, azúcares. Incluir el agua como elemento esencial en la alimentación.
2. Los alimentos también se pueden clasificar según su origen: animal, vegetal, mineral.
3. En las tiendas de alimentación podemos encontrar diferentes presentaciones de cada uno de los alimentos: frescos, congelados, cocinados, etc.

4 Actividades de aprendizaje

4.1. EN EL AULA

Unos días antes de esta sesión, el profesorado pide al alumnado que traiga de casa diferentes envases alimentarios (botellas de leche y otras bebidas, envase de yogur, bolsas de productos congelados, etc.), dibujos o fotografías de alimentos y actividades físicas. Este material servirá para construir, en sesiones posteriores, una pirámide de la alimentación y la actividad física.

Sesión 5

Los nutrientes y sus funciones

1 Resumen de la sesión

La sesión consiste en relacionar los nutrientes y sus funciones mediante actividades físicas en las que impera el juego y la cooperación entre el alumnado.

2 Objetivos

Conocer los nutrientes y sus funciones.

3 Ideas clave

1. Los nutrientes son sustancias indispensables para la vida que el organismo aprovecha de los alimentos.
2. En cada alimento predomina un nutriente u otro, y por eso tiene tanta importancia seguir una alimentación variada y equilibrada.
3. Los nutrientes se pueden clasificar según la función principal que tienen en:
 - **Formadores o plásticos:** construyen los músculos y los huesos y renuevan las partes que crecen constantemente.
 - **Energéticos:** proporcionan la energía necesaria para desarrollar las tareas diarias.
 - **Reguladores:** regulan el funcionamiento del cuerpo.
4. Hay que comer proteínas dos o tres veces al día.
5. Las proteínas pueden ser de origen animal o vegetal.
6. Hay que comer verduras dos o tres veces al día.

4 Actividades de aprendizaje

4.1. EN EL AULA

Utilizando las tarjetas de colores de la sesión 4, se proponen nuevas actividades y tareas:

Sesión 6

La pirámide de la alimentación y el ejercicio

1 Resumen de la sesión

Construir una pirámide de los hábitos saludables (alimentación y ejercicio físico) con los envases, dibujos y fotos de alimentos y actividad física que el alumnado ha aportado desde casa. Diseñar dietas saludables.

2 Objetivos

- Conocer las principales recomendaciones alimentarias y sobre ejercicio físico.
- Mostrar habilidades asociadas a estas recomendaciones.

3 Ideas clave

ALIMENTACIÓN:

- **Dulces, bollería, embutidos, aperitivos (snacks, piscoalabis) y carne roja (cerdo, ternera, buey, cordero):** sólo algunas veces al mes.
- **Pescado y marisco:** 3-4 a la semana.
- **Legumbres:** 3-4 a la semana.
- **Huevos:** 3-4 a la semana.
- **Carne blanca (pollo, pavo, conejo):** 3-4 a la semana.
- **Lácteos:** 3 veces al día.
- **Aceite:** 3-5 cucharadas al día.
- **Frutos secos:** 3-7 puñados a la semana.
- **Pan, patatas, arroz, pasta y otros cereales:** 4-6 al día.
- **Verduras, hortalizas y fruta:** 5 al día o más.
- **Agua:** De 4 a 8 vasos al día (1 litro).

Hay diferentes presentaciones de cada alimento y que éste, por tanto, se puede consumir de diferentes maneras. Se sugiere hacer mención a dietas específicas (por ej. comentar si en la familia hay diabéticos, celíacos, etc.) que no incorporan algunos de los alimentos que desde el programa se recomiendan, ya se a por motivos de salud (alergias alimentarias) o por la diversidad cultural y étnica presente en Andalucía.

Incorporar las recomendaciones sobre Actividad física (hacer deporte, actividades dirigidas, caminar, subir escaleras): mínimo, 30 minutos al día.

Sesión 7

El mejor desayuno

1 Resumen actividad

Desarrollo de un taller de desayuno saludable andaluz, donde estén representados los alimentos más importantes para lograr que sea equilibrado, variado, divertido.

2 Objetivos

- Identificar el contenido y la cantidad de un desayuno saludable.
- Experimentar que el desayuno puede ser atractivo y deseable.

3 Ideas clave

1. El desayuno saludable incluye: fruta, lácteos y pan, galletas o cereales.
2. El desayuno se reparte entre lo que comemos en casa por la mañana, y lo que tomamos en la escuela (merienda / tentempié).
3. Es tan importante la clase de alimentos que tomamos para desayunar, como la cantidad de comida.
4. Un buen desayuno tiene como principales ventajas:
 - Recuperar la energía perdida después de haber dormido durante horas sin haber ingerido ningún alimento.
 - Contribuir al equilibrio alimentario y a una asimilación más regular y más eficaz de los nutrientes.
 - Evitar el golpe de cansancio a media mañana.
 - Asegurar una buena forma y mejorar la atención y la eficacia en clase.
 - Controlar el peso, gracias a una alimentación más equilibrada y regular.
 - Favorecer un buen nivel de azúcar en sangre y la mejora del rendimiento.

Sesión 8

Actividad física y descanso

1 Resumen de la sesión

Practicar/simular las distintas recomendaciones de la actividad física, propuestas por la pirámide.

Como contenidos:

Los hábitos de la actividad física y el descanso.

La relación entre actividad física, descanso, alimentación y nutrición.

2 Objetivos

Mejorar los hábitos saludables de actividad y descanso.

3 Ideas clave

1. A los nueve o diez años se debe dormir nueve o diez horas diarias para poder recuperar fuerzas y rendir mejor al día siguiente.
2. El tiempo máximo dedicado a ver la TV, jugar al ordenador o videojuegos y, en general, al uso de pantallas o juegos sedentarios, no debe superar las dos horas diarias. Si un día dedicamos más de dos horas, quiere decir que utilizamos menos tiempo para movernos, y entonces nuestro cuerpo acumula energía que no se quema.
3. Se recomiendan 60 minutos al día de actividad física (juego movido, caminar, bajar y subir escaleras, correr por el patio, parque o jardín, etc.).
4. Para que el ejercicio físico tenga efectos en nuestro cuerpo (refuerce el corazón, fortalezca los músculos y huesos, permita obtener metas comunes en equipo, etc.), es recomendable hacer seis horas a la semana de actividad física (educación física, deporte, juego, actividades de la vida diaria...) (2+2+2).
5. Para rendir de manera equilibrada se necesitan tres elementos:
 - a. Actividad física suficiente.
 - b. Descanso adecuado.
 - c. Una alimentación saludable.

Sesión 9

Recapitulación y síntesis

1 Resumen de la sesión

- Resumen de las ideas clave de las sesiones precedentes.
- Revisión de las propuestas de mejora de hábitos.
- Valoración final y cierre del programa.

2 Objetivos

Revisar las propuestas para integrar la actividad física, el descanso y la alimentación saludables como hábitos.

3 Ideas clave

1. Hay que respetar nuestro propio aspecto físico y también el de los demás, como queremos que hagan con el nuestro.
2. Para rendir de manera equilibrada se necesitan varios elementos:
 - a. Actividad física suficiente (30 minutos mínimo al día).
 - b. Descanso adecuado (9-10 horas al día de sueño y un máximo de 2 horas al día de actividades con uso de pantallas).
 - c. Una alimentación saludable.
 - d. Una hidratación saludable basada en agua.
3. Una alimentación saludable debe ser variada (presencia de todos los alimentos) y equilibrada (para obtener la energía adecuada).
4. **RECOMENDACIONES:**
 - **CADA DÍA:** 30 minutos de actividad física, beber un total de 2 litros de agua y comer féculas, cereales, verduras, frutas y lácteos.
 - **ALGUNAS VECES A LA SEMANA:** carnes blancas, huevos, pescado y legumbres.
 - **ALGUNAS VECES AL MES:** carnes rojas, jamón, embutidos y dulces, pastelería y snacks.
5. Un desayuno saludable incluye, entre lo que comemos en casa y lo que tomamos en la escuela: cereales, fruta y lácteos.

Recreos Activos

El recreo es uno de los momentos de la jornada escolar en el que un niño o una niña tiene la oportunidad de divertirse, hacer ejercicio, relajarse, relacionarse y aprender jugando. Por participar en estos tipos de actividades no estructuradas, los niños pueden desarrollar habilidades sociales, emocionales, físicas y cognitivas que necesitan para tener éxito en la escuela y en la sociedad (Clements, 2000).

La National Association for Sport and Physical Education (Asociación Nacional para el Deporte y la Educación Física) declara que el recreo provee a niños un tiempo discrecional y oportunidades de participar en actividades físicas que les ayuda a desarrollar un cuerpo sano y el placer del movimiento. También permite practicar habilidades de vida como la resolución de conflictos, la cooperación, el respeto por las reglas, turnarse, compartir, utilizar el lenguaje para comunicarse y la resolución de problemas en situaciones reales. Además, podría facilitar mayor atención y enfoque en el aprendizaje en el programa académico (Council on Physical Education for Children [Consejo de la Educación Física para Niños], 2001).

Este apartado es una propuesta al profesorado para mejorar la adherencia a la actividad física del alumnado durante los recreos, con lo cual se pretende sea activo en el mismo y de este modo genere unos hábitos saludables que a su vez puedan extrapolar a su rutina diaria.

Por otra parte, en el momento de los recreos es habitual el consumo de alimentos, y en muchos casos es frecuente sustituir el bocadillo por bollería industrial, golosinas, etc., cargadas de calorías vacías, grasas saturadas, colorantes, etc., y sustituir el agua por bebidas azucaradas (colas, limonadas, etc). Además los envoltorios de los alimentos no suelen ser los más adecuados, utilizando plásticos, aluminios, etc. Por todo ello, este es un buen momento para la observación y análisis y favorecer cambios positivos que pueden tratarse en la sesión sobre el desayuno del programa.

El papel del profesor o profesora será facilitar que los alumnos/as dispongan de los materiales mínimos para que participen de forma activa en los recreos. Como por ejemplo: cuerdas, aros, pelotas, elásticos, rayuelas, etc. Dependiendo del papel de implicación, su papel será diferente.

Se valora positivamente la regularidad con la que los alumnos y alumnas intervengan en esta iniciativa.

A continuación se presenta la dinámica y progresión dependiendo de la implicación que el profesorado valore y decida asumir.

Esta progresión oscila entre los niveles uno y diez, siendo el nivel uno, el de mínima implicación y el diez el que requiere una mayor participación tanto del profesorado como del centro en su totalidad.

PREVIENE
ACTIVIDADES
PARA EL
ALUMNADO



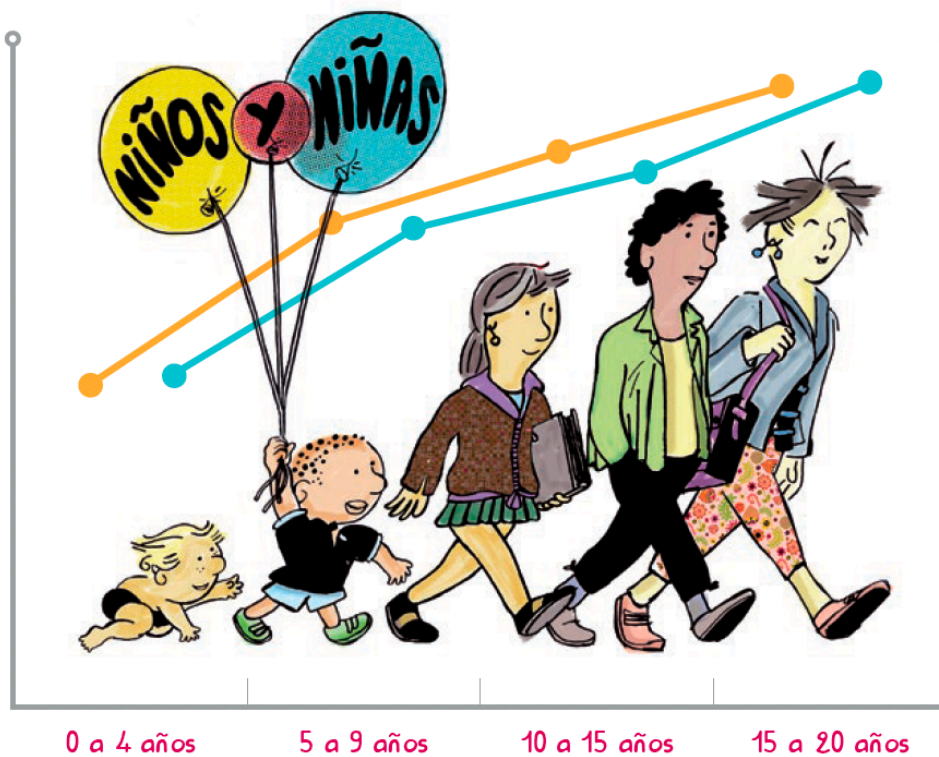
Sesión 1

Nuestro crecimiento

Cómo crecemos

1

El crecimiento que tenemos durante la infancia y la adolescencia es la causa de los cambios en el peso, la altura y las proporciones de nuestro cuerpo.



Un cálculo aproximado de crecimiento de una persona desde la infancia se obtiene de medir su altura cada cinco años. Las líneas que unen los puntos en la imagen señalan cuánto has crecido cada cinco años.

Sesión 2

Valorémonos

Los rasgos positivos de mi aspecto físico

En la lista siguiente, tus compañeros y compañeras escribirán rasgos positivos de tu aspecto físico.

Tú también debes escribir aspectos positivos de ellos y ellas. Observa la altura, cabello, ojos, cara, cuerpo, piernas, manos, mirada, expresión, voz, etc.

Te darás cuenta que todos y todas tenemos aspectos positivos que no habíamos pensado que teníamos.

¡Los resultados te sorprenderán!



Sesión 3

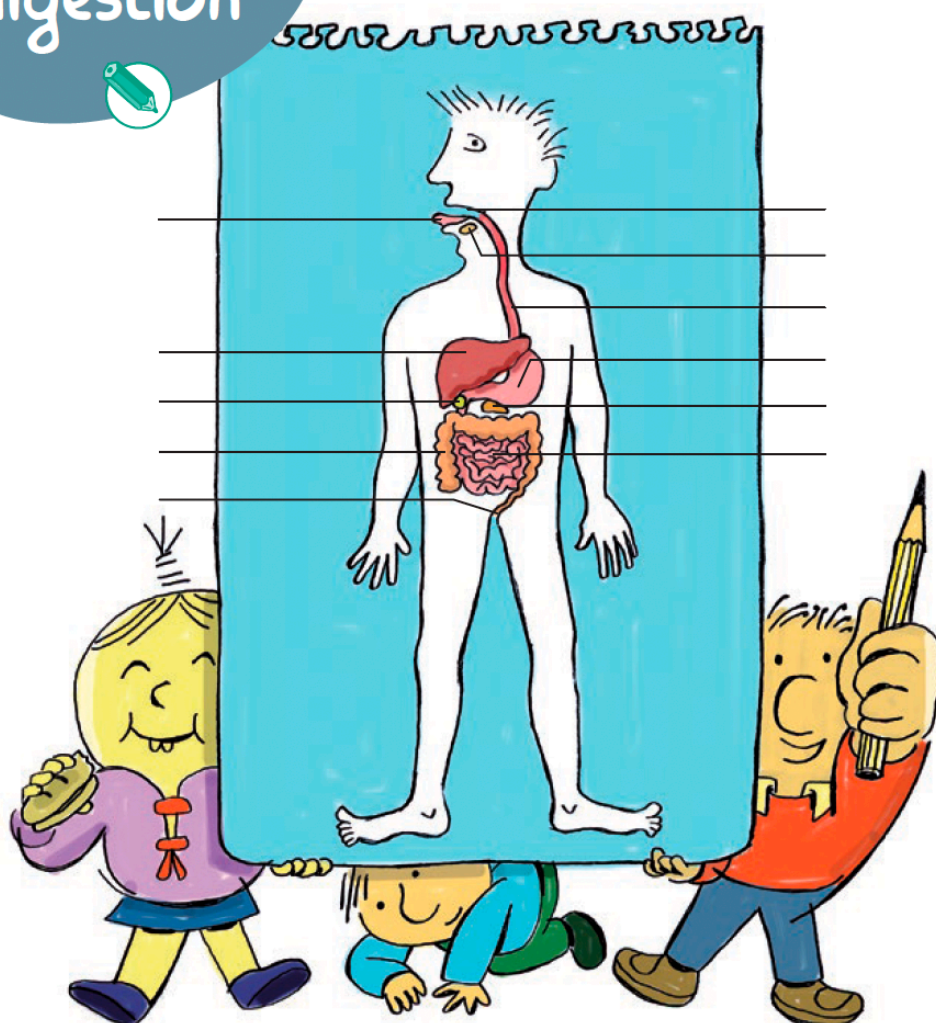
Nuestra digestión

Cómo
hacemos la
digestión



1

Escribe en el sitio correcto cada una de las partes del aparato digestivo.



Sesión 4

Los grupos de alimentos

Diferentes grupos de alimentos

1

Relaciona con flechas los alimentos con el grupo al que corresponden. Puede haber más de un alimento relacionado con un grupo determinado.

Grupos de alimentos



LÁCTEOS

CARNE,
PESCADO
Y HUEVOS

FÉCULAS
(cereales, patatas,
legumbres)

FRUTAS Y
VERDURAS
(frutas, verduras,
hortalizas)

ACEITES
Y GRASAS

AZÚCARES

AGUA



Sesión 5

Los nutrientes y sus funciones

¿Qué son los nutrientes?

Son las sustancias indispensables para la vida que el organismo aprovecha de los alimentos.

¿Qué alimentos contienen nutrientes?

En cada alimento predomina un nutriente u otro, por eso tiene tanta importancia seguir una dieta variada y equilibrada.

¿Hay diferentes tipos de nutrientes?

Sí. Y esto nos ha llevado a clasificar a los alimentos según la función principal que tiene cada uno.

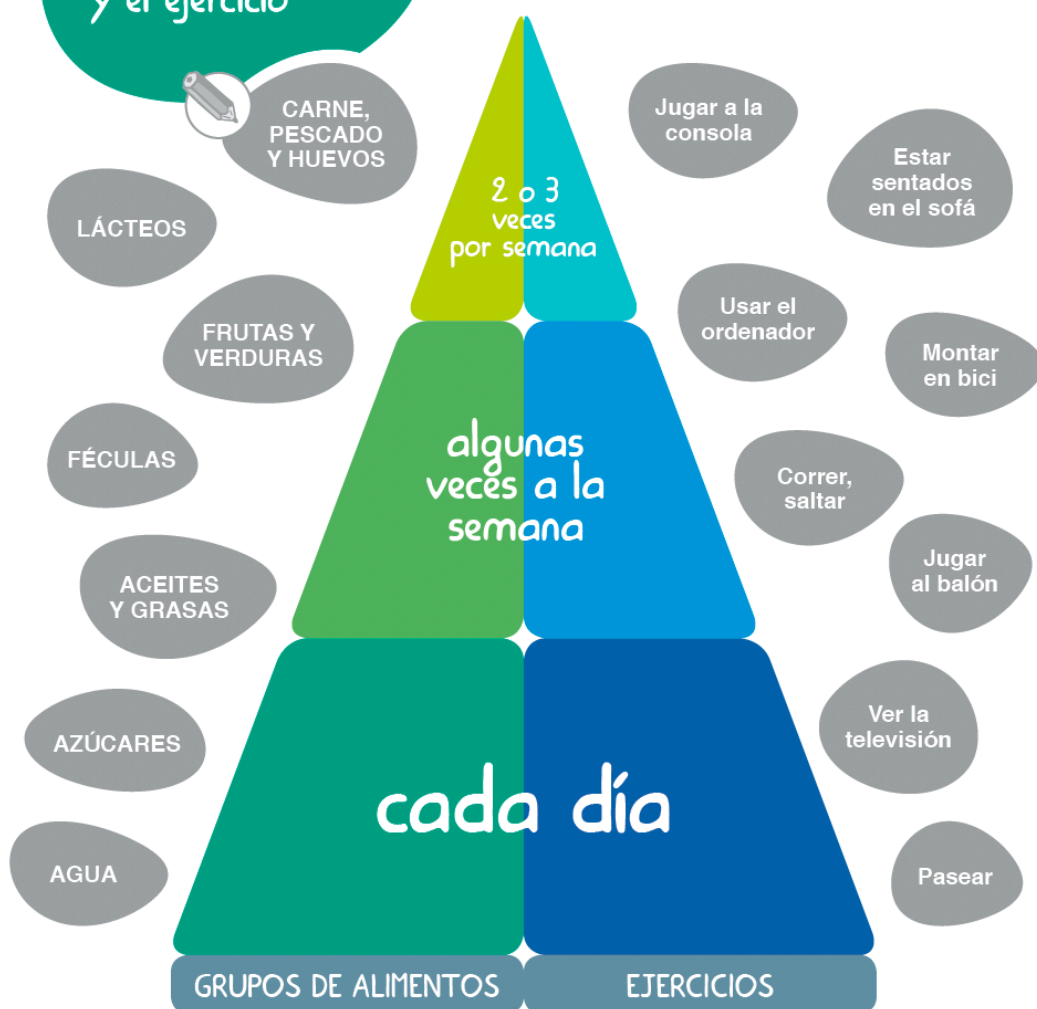


Sesión 6

La pirámide de la alimentación y el ejercicio

Construyamos nuestra pirámide de la alimentación y el ejercicio

Coloca con flechas los alimentos y ejercicios en la zona de la pirámide que le corresponda.



Sesión 7

El mejor desayuno

¿Qué incluye un desayuno saludable?

Por favor lee atentamente la información que te proponemos y trae de casa algunos de estos alimentos:

CEREALES

pan, cereales,
galletas

LÁCTEOS

queso, yogurt,
leche

FRUTAS

fruta fresca,
zumos naturales



Por favor, contesta las siguientes preguntas:



Durante la semana

- 1 • ¿A qué hora te levantas?
- 2 • ¿A qué hora sales de casa?
- 3 • ¿Cómo vas a la escuela? (caminando, en coche, en transporte público, otros)
.....
- 4 • A la hora del recreo, ¿qué sueles hacer? Por ejemplo, estar sentado/a hablando o leyendo, hacer algún deporte, jugar moviéndote (corriendo, saltando...).
.....
.....
- 5 • ¿Comes en la escuela?
- 6 • ¿Cómo vuelves de la escuela?
- 7 • Después de clase, ¿haces alguna actividad extraescolar? ¿Cuál o cuales?
.....
.....
.....
- 8 • ¿Cuánto tiempo/horas le dedicas?
- 9 • ¿Cuánto tiempo dedicas cada día a ver la televisión?
- 10 • ¿Cuánto tiempo dedicas cada día a jugar con el ordenador, la consola, etc.?

ALIMENTACIÓN Y
ACTIVIDAD FÍSICA
SALUDABLES
EN FAMILIA



Introducción

Estimada familia

Como parte de la comunidad del centro educativo al que acude su/s hijo/a, le hacemos llegar este material del proyecto que se va a desarrollar, pidiéndole su implicación en el mismo por el hecho de ser transmisora fundamental de las conductas y estilos de vida de sus hijos e hijas.

Se trata de un proyecto a realizar durante el año académico, y consiste en realizar 9 sesiones de actividades en la clase de educación física y/o en tutoría, para prevenir el sobrepeso y la obesidad entre escolares de 8 a 9 años de edad.

Para poder realizar algunas de ellas les pedimos su colaboración de forma detallada dentro de esta Guía, que consiste básicamente en facilitar información, tratar y hablar sobre el tema en casa y hacer alguna actividad en común.

Reiterar que su implicación en este proyecto es fundamental para que juntos logremos los objetivos del mismo.

Aprovechamos además para informarle de que en el servicio de salud de su zona (centro de salud) dispone de programas para la mejora de hábitos de alimentación y actividad física (Consejo Dietético), por lo que podrá acudir al mismo si lo considera necesario.

Gracias.

A continuación les facilitamos las recomendaciones básicas para una alimentación equilibrada y para una saludable vida activa.



Nuestro crecimiento

Querida familia

Para realizar una actividad en clase sobre el crecimiento del alumnado a lo largo de los años, os pedimos que le faciliteis a vuestro hijo o hija algunas fotos suyas. Por ejemplo, de pocos días después de nacer, con dos o tres años y una actual. Si no disponéis de fotos, comentar cómo fue su crecimiento y animarle a hacer dibujos sobre ello en la página siguiente. También os pedimos que rellenéis la siguiente tabla, al menos de forma estimada. Muchas gracias.

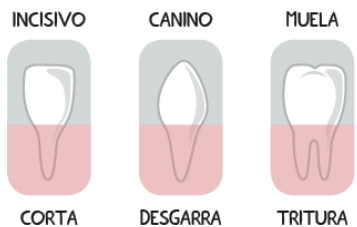
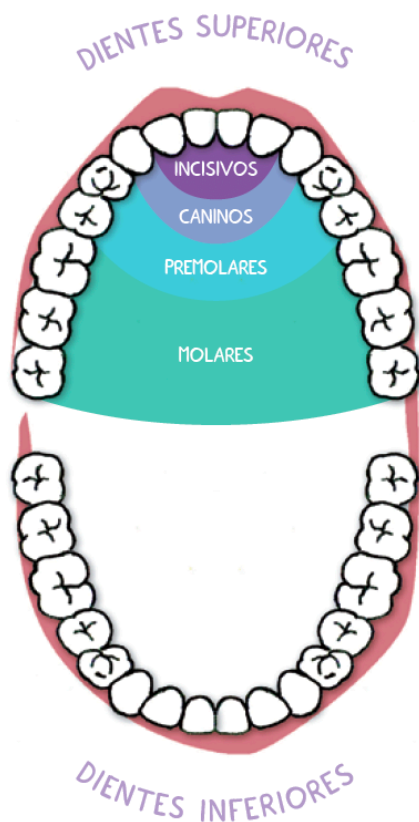
Tabla de datos

Edad	Altura	Peso	Comentarios

Nuestra digestión

Querida familia

Para redondear una actividad que hacemos en clase dedicada al aparato digestivo y sus funciones, os pedimos que ayude a su hijo o hija a observar el esquema que presentamos y tratéis sobre las funciones de los dientes. Gracias.



Completar punto a su hijo/a del esquema que sigue:



Tienes dientes sanos.
Coloréalos en azul.

Te faltan dientes.
Marcalos con una cruz.

Tienes dientes picados.
Coloréalos en rojo.

La pirámide de la alimentación y el ejercicio

Querida familia

Hemos construido en clase una pirámide de la alimentación y el ejercicio físico, con los envases, fotos y dibujos que ha aportado el alumnado. Una vez terminada la actividad, para reforzar el aprendizaje, facilitamos la información por medio de esta pirámide y os pedimos que tratéis sobre el contenido de la misma y sobre cómo la lleváis a la práctica.



El mejor desayuno

- 1 Para realizar en el aula un taller sobre desayuno saludable, le pedimos a su hijo/a que traiga al colegio algunos de los alimentos que él/ella le indicarán:



- 2 También analizaremos los desayunos que normalmente se realizan en casa y cómo lo completamos con el que toman en el recreo.



Actividad física y descanso

- 1 Revisar la actividad que ha traído su hijo o hija de clase y leer a continuación las siguientes recomendaciones:



1 Dormir diariamente nueve horas.

2 Practicar una hora de actividad física cada día (ir caminando al colegio, jugar en los recreos, hacer deporte, colaborar en tareas del hogar,...)



3 Es recomendable limitar a un máximo de dos horas al día el tiempo delante de las pantallas (televisión, ordenador, consolas, etc.) fuera de la escuela, y hasta un máximo de quince horas a la semana.

SHORT CURRICULUM VITAE

SHORT CURRICULUM VITAE

Personal information

Rubén Aragón Martín

(Signature on articles: Rubén Aragón-Martín)

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Education

- | | |
|-----------|--|
| 2011-2015 | Bachelor's degree in Sport Sciences. University of Granada, Spain. |
| 2017-2018 | Master's degree in Physical Activity and Health. University of Cádiz, Spain. |
| 2019-2024 | PhD Student in Health Sciences. University of Cadiz, Spain. |

Previous and current positions

- | | |
|--------------|---|
| 2017-2018 | Research technician. Department of Physical Education, Faculty of Education Sciences, University of Cádiz, Spain. |
| 2018-2021 | Predoctoral FPI fellow. Department of Biomedicine, Biotechnology and Public Health, Faculty of Nursing and Physiotherapy, University of Cádiz, Spain. |
| 2021-Present | Professor. Department of Physical Education, Faculty of Education Sciences, University of Cádiz, Spain. |

Research stay

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| 2021 | UCD School of Public Health, Physiotherapy and Sports Science, University College Dublin, Ireland.
Responsible researcher: Dr Celine Murrin.
Duration: 21/09/2021 to 21/12/2021 (3 months) |
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Research projects (team member)

- A holistic approach to rocking your health. RYHEALTH Project. European Union. 2022-062 / PE / EU4Health / PR. 2022-2025. 178,348.62 €.
- Actividades físicas en el medio natural en personas con depresión. Efectos sobre el bienestar psíquico y social. Estudio SONRÍE. Program for the financing of biomedical and health sciences i+D+I in health sciences in Andalusia. (PI0068-2018). 2019-2021. 60,174 €.
- Prevención del sobrepeso y la obesidad infantil en escolares de la provincia de Cádiz. Estudio cuasiexperimental de la efectividad de una intervención multicomponente. PREVIENE-CÁDIZ Project. Andalusian progress and health public foundation (FPS-SSPA). (PI-0007-2017). 2018-2021. 171,141.00 €.
- Effect of supervised physical exercise at the cerebral, cognitive and metabolomic level in older adults with mild cognitive impairment. EFICCOM study. Spanish Ministry Science and Innovation, The Government of Spain. (DEP2016-76123-R). 2017-2020. 120,000 €.
- Evaluación de los efectos del dispositivo de restricción al flujo nasal (Feelbreathe) mediante oximetría muscular y electromiografía de los músculos respiratorios. Association of Pulmonology and Thoracic Surgery of the South (NEUMOSUR) (4/2017). 2017-2018. 8,915 €.
- Validación y estudio clínico de los efectos de la patente P200902402/P201700269 dispositivo de restricción del flujo ventilatorio nasal Feel-Breathe en ciclistas. Funded by the University of Cádiz, OTRI (20DGUE1696). 2017-2018. 2,998 €.
- Efecto mediador de la actividad física, condición física y la nutrición sobre la influencia del polimorfismo FTO y PPARGC1A en la adiposidad y la capacidad de oxidar grasas durante el ejercicio: estudio NutAF. Funded by the University of Cádiz (PR2016-051). 2017. 1,600 €.
- Prototipo: Sistema portátil para la evaluación y entrenamiento de la fuerza isométrica mediante guía. Funded by the University of Cádiz. (AT2016-038). 2016-2017. 3,000 €.
- Evaluación de un programa de entrenamiento de la musculatura respiratoria mediante restricción al flujo ventilatorio nasal con dispositivo FeelBreathe en pacientes con EPOC. Spanish Society of Pulmonology and Thoracic Surgery (SEPAR) (099/2015). 2016-2017. €18,000.
- Bicicleta terapéutica instrumentada con sensorización avanzada (BRISA). Ministry of Economy and Competitiveness and Center for Industrial Technological Development (CDTI) (OT2016/129). 2015-2017. 21,000 €.

Scientifics Publications

Gómez-Sánchez, M.D.M.; **Aragón-Martín, R.**; Martínez-Nieto, J.M.; Hernán-García, M.; Segundo-Iglesias, C.; Jiménez-Pavón, D.; Novalbos-Ruiz, J.P.; Santi-Cano, M.J.; Piñero, J.C.; Lineros-González, C.; Schwarz-Rodríguez, M.; Rodríguez-Martín, A. (2024). Assessment of an intervention for preventing pediatric overweight and obesity through the World Café technique: A qualitative study. *Journal of Pediatric Nursing*, Vol. 75, pp. 164-172.

Ponce-González, J.G.; España-Domínguez, C.; González-Montesinos, J.L.; Casals, C.; Corral-Pérez, J.; Velázquez-Díaz, D.; Fernández-Santos, J.R.; **Aragón-Martín, R.**; Vaz-Pardal, C.; Arnedillo-Muñoz, A. (2022). Evaluación de los efectos de un dispositivo de entrenamiento de los músculos inspiratorios sobre la oxigenación muscular y la activación neuromuscular de los músculos respiratorios. *Revista española de patología torácica*, Vol. 34, Núm. 2, pp. 115-120.

Aragón-Martín, R.; Gómez-Sánchez, M.M.; Martínez-Nieto, J.M.; Novalbos-Ruiz, J.P.; Segundo-Iglesias, C.; Santi-Cano, M.J.; Castro-Piñero, J.; Lineros-González, C.; Hernán-García, M.; Schwarz-Rodríguez, M.; Jiménez-Pavón, D.; Rodríguez-Martín, A. (2022). Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. *Nutrients*, Vol. 14, Núm. 6.

Aragón-Martín, R.; Gómez-Sánchez, M.M.; Jiménez-Pavón, D.; Martínez-Nieto, J.M.; Schwarz-Rodríguez, M.; Segundo-Iglesias, C.; Novalbos-Ruiz, J.P.; Santi-Cano, M.J.; Castro-Piñero, J.; Lineros-González, C.; Hernán-García, M.; Rodríguez-Martín, A. (2021). A multimodal intervention for prevention of overweight and obesity in schoolchildren. A protocol study “previene-Cádiz”. *International Journal of Environmental Research and Public Health*, Vol. 18, Núm. 4, pp. 1-20.

Gonzalez-Montesinos, J.L.; Fernandez-Santos, J.R.; Vaz-Pardal, C.; **Aragon-Martin, R.**; Arnedillo-Muñoz, A.; Reina-Novo, J.; Orantes-Gonzalez, E.; Heredia-Jimenez, J.; Ponce-Gonzalez, J.G. (2021). Chronic effects of a training program using a nasal inspiratory restriction device on elite cyclists. *International Journal of Environmental Research and Public Health*, Vol. 18, Núm. 2, pp. 1-13.

Book's chapters

Marín-Galindo, A.; Montes-de-Oca-García, A.; Román-Malo, C.; Palma-Ruge, B. M.; Costilla-Macías, M. J.; Ortega-Gómez, S.; Ezomo-Gervilla, M.; **Aragón-Martín, R.**; González-Mariscal, A. M.; & Velázquez-Díaz, D. (2022). Asociación entre el perfil de la microbiota intestinal con la capacidad de oxidar grasas durante el ejercicio y la sensibilidad a la leptina en pacientes con Diabetes Mellitus tipo 2 (Proyecto

Edugation). Avances de investigación en salud: búsqueda de soluciones a retos emergentes (pp. 495-502). Asociación Universitaria de Educación y Psicología (ASUNIVEP).

Pérez-Pérez, A.; Velázquez-Díaz, D.; Rebollo-Ramos, M.; Ortega-Gómez, S.; Costilla-Macías, M. J.; González-Mariscal, A. M.; **Aragón-Martín, R.**; Montes de Oca-García, A.; Casals-Vázquez, C.; & Ponce-González, J. G. (2022). Asociación entre la oxidación de grasas en reposo y diferentes test de campo con la oxidación máxima de grasas durante el ejercicio. Avances de investigación en salud: búsqueda de soluciones a retos emergentes (pp. 487-494). Asociación Universitaria de Educación y Psicología (ASUNIVEP).

Ponce-González, J. G.; Rebollo-Ramos, M.; Velázquez-Díaz, D.; **Aragón-Martín, R.**; Ávila-Cabeza de Vaca, L.; Palma-Ruge, B. M.; Costilla-Macías, M. J.; Román-Malo, C.; Ezomo-Gervilla, M.; & Pérez-Pérez, A. (2022). Influencia del gen FTO (Fatt Mass and Obesity Associated) sobre la composición corporal y la sensibilidad a la insulina en pacientes con DM2. Avances de investigación en salud: búsqueda de soluciones a retos emergentes (pp. 415-422). Asociación Universitaria de Educación y Psicología (ASUNIVEP).

Aragón-Martín, R.; Marín-Galindo, A.; Costilla-Macías, M. J.; Velázquez-Díaz, D.; Pérez-Pérez, A.; Rebollo-Ramos, M.; Ávila-Cabeza de Vaca, L.; Montes-de-Oca-García, A.; & Ponce-González, J. G. (2022). Recuperación activa vs crioterapia para la recuperación post fatiga en jugadores de baloncesto de élite: diseño cruzado aleatorizado. Cuidados, aspectos psicológicos y actividad física en relación con la salud: propuestas para el desarrollo positivo (pp. 77-84). Asociación Universitaria de Educación y Psicología (ASUNIVEP).

Casals-Vázquez, C.; Santotoribio-Camacho, J. D.; Román-Malo, C.; Marín-Galindo, A.; Ávila-Cabeza de Vaca, L.; Rebollo-Ramos, M.; **Aragón-Martín, R.**; González-Mariscal, A. M.; Corral-Pérez, J.; & Ponce-González, J. G. (2022). Regulation of inflammatory profile, oxidative stress and mitochondrial metabolism according to the type of physical exercise and nutritional counseling in type 2 Diabetes Mellitus. Acercamiento multidisciplinar a la salud: implicaciones prácticas hacia el bienestar (pp. 311-318). Asociación Universitaria de Educación y Psicología (ASUNIVEP).

Velázquez-Díaz, D.; Pérez-Pérez, A.; Corral-Pérez, J.; Rebollo-Ramos, M.; **Aragón-Martín, R.**; Marín-Galindo, A.; Montes de Oca-García, A.; González-Mariscal, A. M.; Martín-Cano, J. M.; & Ponce-González, J. G. (2022). Role of post-exercise ventilatory recovery on blood pressure and heart rate in young adults. Conocimientos, investigación y prácticas en el campo de la salud: enfoques metodológicos

renovados (pp. 305-314). Asociación Universitaria de Educación y Psicología (ASUNIVEP).

Rebollo-Ramos, M.; **Aragón-Martín, R.**; Román-Malo, C.; Montes de Oca-García, A.; Ortega-Gómez, S.; Costilla-Macías, M. J.; Palma-Ruge, B. M.; Marín-Galindo, A.; Rendón-Marín, R. M.; & Casals, C. (2022). ¿Existe asociación entre el perfil de exosomas con la salud y los hábitos de actividad física y alimentación en personas con diabetes mellitus tipo 2? Avances de investigación en salud: búsqueda de soluciones a retos emergentes (pp. 517-524). Asociación Universitaria de Educación y Psicología (ASUNIVEP).

Ávila-Cabeza de Vaca, L.; de Cosa-Navarro, A.; Bustelo-Bueno, P.; Palma-Ruge, B. M.; Ortega-Gómez, S.; Marín-Galindo, A.; **Aragón-Martín, R.**; González-Mariscal, A. M.; Pérez-Chanivet, G.; & Casals, C. (2021). Exosomas como biomarcadores mediadores de la comunicación intercelular e interórgano modulados por el ejercicio físico. Revisando la evidencia de los retos en salud (pp. 371-382). Dykinson.

González-Mariscal, A. M.; Santotoribio-Camacho, J. D.; Pérez-Pérez, A.; Costilla-Macías, M. J.; Palma-Ruge, B. M.; Rebollo-Ramos, M.; Corral-Pérez, J.; **Aragón-Martín, R.**; Ortega-Gómez, S.; & Casals, C. (2021). Menopausia y oxidación de grasas: una revisión narrativa. Revisando la evidencia de los retos en salud (pp. 317-332). Dykinson.

Participation as speaker in conferences

Aragón Martín, R. (2022, October 20-22). Speaker in the roundtable session titled "Retos para mejorar la salud pediátrica", with the presentation "Prevención del sobrepeso y obesidad infantil en escolares. Estudio Previene-Cádiz", at the XIV Congreso de la Sociedad Española de Nutrición Comunitaria and V Congreso Iberoamericano de Nutrición y Salud Pública del Grupo Latinoamericano de Nutrición Comunitaria, Segovia, España.

Contributions to international conferences

Aragón-Martín, R., Gómez-Sánchez, M. del M., Martínez-Nieto, J. M., Schwarz-Rodríguez, M., Jiménez-Pavón, D., & Rodríguez-Martín, A. (2024, June 10-12). Evaluating a school-based intervention's impact on lifestyle habits among children from the province of Cádiz: A quasi-experimental study. PREVIENE-CÁDIZ study. Oral communication presented at the I BEING SEA-EU Conference, Valletta, Malta.

Aragón Martín, R., Gómez Sánchez, M. del M., Martínez Nieto, J. M., Novalbos Ruiz, J. P., Segundo Iglesias, C., Schwarz Rodríguez, M., Jiménez Pavón, D., & Rodríguez

Martín, A. (2023, November 2-3). Un programa educativo saludable mejora los conocimientos de alimentación y niveles de actividad física de escolares de la provincia de Cádiz. Previene-Cádiz. Oral communication presented at the II Congreso Internacional, XI Jornadas Nacionales de Profesorado de la CNDE, and the II Encuentro Nacional de Estudiantes de Enfermería de la CNDE, organized by the Conferencia Nacional de Decanos de Enfermería, Cádiz, Spain.

Aragón-Martín, R., Gómez-Sánchez, M. M., Martínez-Nieto, J. M., Novalbos-Ruiz, J. P., Segundo-Iglesias, C., Santi-Cano, M. J., Castro-Piñero, J., Lineros-González, C., Hernán-García, M., Schwarz-Rodríguez, M., Jiménez-Pavón, D., & Rodríguez-Martín, A. (2022, September 20-21). Independent and Combined Association of Lifestyle Behaviours and Physical Fitness with Body Weight Status in Schoolchildren. Oral communication presented at the IX Congreso Internacional de Investigación en Salud y Envejecimiento & VII Congreso Internacional de Investigación en Salud (online).

Aragón-Martín, R., Gómez-Sánchez, M. M., Martínez-Nieto, J. M., Novalbos-Ruiz, J. P., Segundo-Iglesias, C., Santi-Cano, M. J., Castro-Piñero, J., Schwarz-Rodríguez, M., Jiménez-Pavón, D., & Rodríguez-Martín, A. (2021, October 31 - November 4). Association between body weight status and eating prepared food of 8 and 9 years old schoolchildren from the province of Cádiz. Previene-Cádiz: Oral communication presented at the XIX Congreso Latinoamericano de Nutrición: Congreso Virtual SLAN 2021.

Aragón-Martín, R., Gómez-Sánchez, M. M., Jiménez-Pavón, D., Schwarz-Rodríguez, M., Martínez-Nieto, J. M., Rodríguez-Martín, A. (2021, April 20-22). Does breakfast influence the body weight status of 8 and 9 years old schoolchildren from the province of Cádiz? Previene-Cádiz. Oral communication presented at the XXV Jornadas Internacionales de Nutrición Práctica and XIV Congreso Internacional, Madrid, Spain. Organized by the Sociedad Española de Dietética y Ciencias de la Alimentación (SEDCA).

Contributions to national conferences

Aragón Martín, R., Gómez Sánchez, M. del M., & Rodríguez Martín, A. (2023, September 21). Evaluación preliminar de la efectividad de un programa educativo saludable para la prevención de la obesidad infantil en colegios de la provincia de Cádiz. Estudio Previene-Cádiz. Oral communication presented at the III Jornada de Investigación en Enfermería y Fisioterapia, Facultad de Enfermería y Fisioterapia, Universidad de Cádiz, Cádiz, Spain.

Aragón-Martín, R., Gómez-Sánchez, M. M., Martínez-Nieto, J. M., Novalbos-Ruiz, J. P., Schwarz-Rodríguez, M., Rodríguez-Martín, A., & Jiménez-Pavón, D. (2023,

January 12-13). Efecto de un programa educativo saludable sobre los estilos de vida y la condición física auto-percibida de escolares de tercer curso de primaria de la provincia de Cádiz. Previene-Cádiz. Oral communication presented at the symposium “Estilos de vida, condición física, salud cardiovascular y salud mental en escolares” organised by ISFOOD, Universidad Pública de Navarra, Navarra, Spain.

Aragón-Martín, R. (2022, October 27). Prevalencia de sobrepeso y obesidad tras un programa educativo saludable llevado a cabo en escolares de la provincia de Cádiz. estudio Previene-Cádiz. Oral communication presented at the II Jornada de Investigación en Enfermería y Fisioterapia, Facultad de Enfermería y Fisioterapia, Universidad de Cádiz, Cádiz, Spain.

Aragón-Martín, R., Gómez-Sánchez, M.M., Martínez-Nieto, J.M., Novalbos-Ruiz, J.P., Segundo-Iglesias, C., Schwarz-Rodríguez, M., Jiménez-Pavón, D., & Rodríguez-Martín, A. (2022, October 20-22). Efecto de un programa educativo saludable para prevenir la obesidad infantil sobre la composición corporal de escolares de tercer curso de primaria de la provincia de Cádiz. Oral communication presented at the XIV Congreso de la Sociedad Española de Nutrición Comunitaria and V Congreso Iberoamericano de Nutrición y Salud Pública del Grupo Latinoamericano de Nutrición Comunitaria, Segovia, Spain.

Aragón Martín, R., Gómez Sánchez, M. M., Rodríguez Martín, A., Schwarz-Rodríguez, M., Castro-Piñero, J., Lineros-González, C., Hernán-García, M., Jiménez-Pavón, D., Novalbos-Ruiz, J. P. (2020, November 3-6). ¿Consumen los escolares de 8 y 9 años de la provincia de Cádiz suficiente cantidad de frutas y verduras? Previene-Cádiz. Oral communication presented at the IV Congreso Virtual FESNAD 2020, Zaragoza, Spain.

Aragón-Martín, R., Gómez-Sánchez, M., Vega-Zájara, M., Cruz-Cobo, C., Román-Lorenzo, P. (2019, June 26-29). Niveles de sobrepeso y obesidad en escolares de 8 a 9 años de la provincia de Cádiz. Previene-Cádiz. Poster presented at the II Congreso / IV Jornadas de Investigadores en Formación: Fomentando la Interdisciplinariedad (JIFFI), Universidad de Granada, Granada, Spain.

Gómez-Sánchez, M., **Aragón-Martín, R.,** Cruz-Cobo, C., Atienza Pavón, L., Salguero-Cintado, J., Cabaña-Sánchez, M. (2019, June 26-29). Aproximación al sobrepeso y a la obesidad infantil en escolares. Previene-Cádiz. Poster presented at the II Congreso / IV Jornadas de Investigadores en Formación: Fomentando la Interdisciplinariedad (JIFFI), Universidad de Granada, Granada, Spain.

Aragón-Martín, R., Gómez-Sánchez, M. M., Schwarz-Rodríguez, M., Jiménez-Pavón, D., Martínez-Nieto, J. M., Rodríguez-Martín, A. (2019, October 18-19).

¿Influye el estilo de vida en la condición física de escolares de 8 y 9 años de la provincia de Cádiz? Previene-Cádiz. Oral communication presented at the Jornadas Nacionales de Medicina y Ciencias del Deporte, Universidad de Almería, Almería, Spain.

Aragón-Martín, R., Ponce-González, J. G., Velázquez-Díaz, D., Álvarez-Rey, G., López, J., Sánchez-Delgado, A., Jiménez-Pavón, D. (2028, October 19-20). Influence of a concurrent training program on body composition and maximal fat oxidation in obese adults. BRISA Study. Poster presented at the VI Simposio EXERNET. Investigación en Ejercicio, Salud y Bienestar. "Exercise is Medicine", Pamplona, Spain.

Sánchez-Delgado, A., Carbonell-Baeza, A., Grao-Cruces, A., Castro-Piñero, J., **Aragón-Martín, R.**, Sáenz-Carrasco, JA., Velázquez-Díaz, D., Jiménez-Pavón, D. (2028, October 19-20). Physical fitness and cognitive function in older adults. EFICCOM Study. Poster presented at the VI Simposio EXERNET. Investigación en Ejercicio, Salud y Bienestar. "Exercise is Medicine", Pamplona, Spain.

Velázquez-Díaz, D., Sánchez-Delgado, A., Pérez-Bey, A., **Aragón-Martín, R.**, Corral-Pérez, J., Ponce-González, J. G. (2017, October 27-28). Resting and Maximal Fat Oxidation. Role of body composition and cardiorespiratory fitness in adults. Oral communication presented at the Jornadas Nacionales de Medicina y Ciencias del Deporte. Los deportes de ultra-resistencia. Jornadas SAMEDE, Seville, Spain.

Awards

2023 Award for the third best oral communication. **Rubén Aragón-Martín**, María del Mar Gómez-Sánchez, José Manuel Martínez-Nieto, José Pedro Novalbos-Ruiz, Carmen Segundo-Iglesias, Mónica Schwarz-Rodríguez, David Jiménez-Pavón, Amelia Rodríguez-Martín. Un programa educativo saludable mejora los conocimientos de alimentación y niveles de actividad física de escolares de la provincia de Cádiz. PREVIENE-CÁDIZ. II Congreso Internacional XI Jornadas Nacionales de Profesorado de la CNDE. II Encuentro Nacional de Estudiantes de Enfermería de la CNDE, Cádiz, Spain.

2019 Award for the best oral communication. **Rubén Aragón-Martín**, María del Mar Gómez-Sánchez, Mónica Schwarz-Rodríguez, David Jiménez-Pavón, José Manuel Martínez-Nieto, Amelia Rodríguez-Martín. ¿Influye el estilo de vida en la condición física de escolares de 8 y 9 años de la provincia de Cádiz? PREVIENE-CÁDIZ. Jornadas Nacionales de Medicina y Ciencias del Deporte SAMEDE, Almería, Spain.

2017 Award for the best oral communication. Daniel Velázquez-Díaz, Alejandro Sánchez-Delgado, Alejandro Pérez-Bey, **Rubén Aragón-Martin**, Juan Corral-Pérez, Jesús Gustavo Ponce-González. Resting and maximal fat oxidation. Role of body composition and cardiorespiratory fitness in adults. Jornadas Nacionales de Medicina y Ciencias del Deporte SAMEDE, Seville, Spain.

Dissemination of research activities

- Scientific outreach event "Café con Ciencia". November 5, 2019. 2 hours. University of Cádiz, Cádiz, Spain.
- Noche Europea de los Investigadores 2019. September 27, 2019. 8 hours. University of Cádiz, Cádiz, Spain.

Collaboration in the organization of scientific events

- Member of the Organizing Committee of the 1st International Virtual Congress "Exercise, Aging and Health", The INTERMAE Project, held online from May 13th to 14th 2021.

Additional training courses

- "Mendeley como gestor de referencias bibliográficas y red social para investigadores", organized by the training plan of the University of Cádiz, Cádiz, Spain, from January 24, 2019, to February 7, 2019, with a total duration of 15 hours.
- "Trabajo colaborativo en el campus virtual con Wikis", organized by the training plan of the University of Cádiz, Cádiz, Spain, on February 8, 2019, with a total duration of 5 hours.
- "Salas virtuales para teledocencia con Big Blue Button en el campus virtual", organized by the training plan of the University of Cádiz, Cádiz, Spain, from February 13, 2019, to February 27, 2019, with a total duration of 5 hours.
- "Cómo seleccionar adecuadamente la revista donde publicar. Taller práctico", organized by the training plan of the University of Cádiz, Cádiz, Spain, on February 14, 2019, with a total duration of 4 hours.
- "Tu perfil de autor en ORCID", organized by the training plan of the University of Cádiz, Cádiz, Spain, on February 21, 2019, with a total duration of 3 hours.
- "Búsqueda, gestión y comunicación de la información científica", organized by EDUCA, School of Doctoral Studies, University of Cádiz, Cádiz, Spain, from April 1, 2019, to May 22, 2019, with a total duration of 35 hours.

- "Iniciación a los Estudios de Doctorado (Modalidad no presencial)", organized by EDUCA, Escuela de Doctorado, University of Cádiz, Cádiz, Spain, from April 23, 2019, to June 4, 2019, with a total duration of 25 hours.
- "Coaching Educativo", organized by the training plan of the University of Cádiz, Cádiz, Spain, on February 27, 2019, with a total duration of 4 hours.
- "Iniciación a la Creación de Pósteres Científicos. Contenido y Diseño.", organized by the training plan of the University of Cádiz, Cádiz, Spain, on March 14, 2019, with a total duration of 3 hours.
- "3 Herramientas Web Útiles en el Aula: Kahoot, Socrative y SurveyAnyplace", organized by the training plan of the University of Cádiz, Cádiz, Spain, from March 18, 2019, to April 11, 2019, with a total duration of 25 hours.
- "Claves para Mejorar tu Capacidad de Comunicación en el Aula", organized by the training plan of the University of Cádiz, Cádiz, Spain, on April 3, 2019, with a total duration of 4 hours.
- "Técnicas de Comunicación Verbal", organized by the training plan of the University of Cádiz, Cádiz, Spain, from April 29, 2019, to May 23, 2019, with a total duration of 25 hours.
- "Comunicación Eficiente con Presentaciones", organized by the training plan of the University of Cádiz, Cádiz, Spain, on June 11, 2019, with a total duration of 5 hours.
- "Taller de Análisis de Datos en la Universidad", organized by the training plan of the University of Cádiz, Cádiz, Spain, on June 12, 2019, with a total duration of 5.5 hours.
- "Deontología profesional y ética de la investigación", organized by EDUCA, Escuela de Doctorado, University of Cádiz, Cádiz, Spain, from June 17, 2019, to June 25, 2019, with a total duration of 30 hours.
- "La ciencia en la gastronomía y la salud en los fogones. Retos de una nueva alimentación", organized by 70th edition of Summer Courses at the University of Cádiz, Cádiz, Spain, from July 8, 2019, to July 10, 2019, with a total duration of 25 hours.
- "Profundizando en la utilización del software NVivo 12 para el análisis de Grupos Focales y Discusión; Cuestionarios Abiertos y Redes Sociales", organized by Centro de Estudios Andaluces, Cádiz, Spain, from January 20, 2020, to January 23, 2020, with a total duration of 16 hours.
- "Herramientas para el control de la alimentación en estudios de Ciencias de la Actividad Física y del Deporte", organized by the research group MOVE-IT and the Vice-deanship of Orientation, Tutoring and Training of the Faculty of Education Sciences, directed to students, teaching and research staff (PDI), administrative staff (PAS), and graduates of the University of Cádiz, Puerto Real, Spain, in November 2019, with a total duration of 1 hour.

- "Soporte vital y Electrografía básica. De la teoría a la vida real", organized by the research group MOVE-IT and the Vice-deanship of Orientation, Tutoring and Training of the Faculty of Education Sciences, directed to students, teaching and research staff (PDI), administrative staff (PAS), and graduates of the University of Cádiz, Puerto Real, Spain, in December 2019, with a total duration of 5 hours.
- "Mecanismos para financiar la I D i", organized by EDUCA, School of Doctoral Studies, University of Cádiz, Cádiz, Spain, from April 17, 2020, to May 9, 2020, with a total duration of 12 hours.
- "Desarrollo fácil y rápido de aplicaciones (APP) para dispositivos móviles Android (nivel inicial)", organized by the training plan of the University of Cádiz, Cádiz, Spain, on January 22, 2020, with a total duration of 5 hours.
- "Estadística aplicada para investigadores con SPSS", organized by the training plan of the University of Cádiz, Cádiz, Spain, from November 3, 2020, to November 27, 2020, with a total duration of 25 hours.
- "Iniciación a la labor docente en la UCA", organized by the training plan of the University of Cádiz, Cádiz, Spain, from November 23, 2020, to December 17, 2020, with a total duration of 25 hours.
- "Curso inicial de Soporte Vital Básico y DESA", organized by the training plan of the University of Cádiz, Cádiz, Spain, from July 12, 2023, to July 13, 2023, with a total duration of 8 hours.
- "Iniciación al Meta-análisis en R", organized by the training plan of the University of Cádiz, Cádiz, Spain, from May 30, 2024, to May 31, 2024, with a total duration of 4 hours.

Teaching activity

2021-Present	Lecturer in the degrees of Sport Sciences and Primary Education. Department of Physical Education, Faculty of Education Sciences, University of Cádiz. A total of 559 hours.
2020-2021	Teaching collaboration project while serving as a Predoctoral Researcher. Department of Biomedicine, Biotechnology, and Public Health, University of Cádiz, Spain.
2018-2019	Teaching at another university center. Anthropometry Workshop. University Nursing Center "Salud Infirmorum", affiliated with the University of Cádiz, Spain.
2022-2023	Participation as a collaborator in the Teaching Innovation Project "UCA-NEWS: EL CANAL PARA ESTAR INFORMADO DE MANERA RIGUROSA E INTELIGENTE".

2022-2023

Participation as a collaborator in the Teaching Innovation Project "UCAST: EL PODCAST DE LA UCA".

Languages

- English: Cambridge English: Preliminary (PET) Certificate, B1 level.

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Gracias también a **Pili**, mi cuñada. Pili, gracias por haber sido partícipe de casi todo este proceso y haber estado ahí cada vez que lo hemos celebrado, como por ejemplo en la barbacoa que hicimos hace poco para celebrar el depósito de la tesis, donde los niños, debido a que son todavía muy pequeñitos, no paraban de llorar y de formarla, y lo que iba a ser supuestamente un ambiente tranquilo y distendido, se convirtió casi en una jungla. Pero a pesar de todas esas dificultades, haces el esfuerzo y vienes y estás presente. Gracias por ello y por todos esos momentos.

Una de las mejores cosas que me han dejado mi hermano y mi cuñada es a mi sobrina **Lucía**, que nos tiene locos a todos. Sobri, ahora tienes 11 meses y no te enteras de mucho, pero, aunque llegué tarde a tu bautizo, debido a que tu primito Ian la formó en el coche, quiero que sepas que te quiero con locura. Tengo muchas ganas de seguir viéndote crecer y de que aprendas a correr para, tanto Ian como yo, hartarnos de jugar contigo. Espero que sigas creciendo así de feliz y que lo seas el resto de tu vida.

Seguidamente, me gustaría continuar con **Ezequiel**, mi segundo hermano. Titi, como siempre nos decimos, aunque no seas mi hermano de sangre, sabes que para mí eres un hermano y te quiero y te aprecio como tal. Me has demostrado más que muchos hermanos. Eres de las personas que más me han apoyado en este largo y duro proceso de la tesis. No tengo palabras para agradecerte todo lo que te preocupas y te has preocupado siempre por mí, estando siempre encima, llamándome, escribiéndome, preguntándome. Aunque no seas de este campo de la universidad ni de la investigación, aunque esto te coja muy lejos y muchas veces te pierdas con todo lo que te cuento acerca de lo que hago, sigues preguntándome y preocupándote, queriendo saber y entender qué es lo que tengo entre manos en ese momento, con el fin de brindarme siempre tu apoyo infinito. Eres un pilar fundamental en mi vida y espero que lo sigas siendo siempre. Es un gusto tenerte y tener tu compañía. Gracias por las inacabables risas que nos hemos echado y nos echamos siempre juntos, y como no, por los miles de momentos y experiencias que hemos vivido a lo largo de nuestras vidas, que darían para escribir unos cuantos libros. Titi, de verdad, gracias una y otra vez por ser como eres y por estar siempre ahí. Quiero que sepas, aunque ya lo

sabes, que me tienes aquí para todo, para lo bueno y para lo malo, para las duras y las maduras. Espero que sigamos siempre juntos y veamos a nuestros hijos crecer y ser felices como lo hemos sido nosotros siempre. Te quiero muchísimo. De verdad, mil gracias por todo.

No quiero pasar por alto a mis amigos, la familia que uno elige. **Jose**, o Jose el rubio como te hemos llamado siempre. Nos hemos criado juntos y fuiste un apoyo incondicional para mí durante muchísimos años. Es verdad que ahora, por las vueltas que da la vida, no nos vemos ni mucho menos con la frecuencia que nos veíamos antes, que era prácticamente a diario, pero quiero que sepas que te quiero mucho y que te agradezco enormemente todo el apoyo y el calor que me brindaste durante tantos años. Sé que estás orgulloso de mis pasos y de lo que soy hoy en día. Yo también estoy orgulloso de ti y de la familia que has formado. Espero que todo te siga yendo genial y que esté yo ahí para verlo. **Juanillo**, amigo, gracias por haberme apoyado tanto siempre, tanto en lo personal como en lo profesional. Eres de los amigos que más me han apoyado durante la tesis. Siempre estás y has estado ahí cada vez que te he necesitado, mucho antes incluso de que empezara la tesis, mucho antes incluso de que empezara mis estudios. Llevamos toda una vida juntos, desde que éramos niños. Hemos vivido miles de momentos juntos, momentos tan bonitos y divertidos que me emociono nada más que de recordarlos. Y lo mejor de todo es que hoy en día seguimos viviéndolos, quedando a menudo, haciendo miles de planes y viendo a nuestros hijos crecer juntos, como también lo hicimos nosotros. La verdad es que es una pasada. Gracias por ser como eres y por todo lo que haces y has hecho por mí siempre. **Ana**, gracias a ti también por apoyarme, preguntarme y preocuparte desde que nos conocemos. Y gracias también por seguir teniendo ganas, a pesar de las dificultades, de seguir quedando y haciendo planes para que podamos seguir estando todos juntos. Otra ni por asomo haría ese esfuerzo. Gracias también por eso. **Jesús y Lore**, mil gracias a ambos por vuestra amistad, lealtad y por estar ahí siempre. Sé que puedo contar con vosotros para lo que sea, y eso hace que os considere amigos de verdad. Hace ya muchos años que os fuisteis a vivir fuera, pero aun así seguimos manteniendo el contacto y quedando cada vez que venís. Nunca olvidaré lo que hicisteis por mí, que erais amigos de mi primera pareja y, viendo lo mal que se portó conmigo, lejos de darme de lado y seguir la amistad con ella, le disteis de lado a ella y seguisteis la amistad conmigo. Eso dice mucho de vosotros, de las buenas personas que sois y del gran corazón

que tenéis. Son tantos años ya siendo amigos que hemos vivido multitud de momentos juntos. Momentos a cuál más bonito y divertido que me quedo para mí para siempre. Gracias por preocuparos siempre tanto por mí y por el apoyo incondicional que me brindáis. Os quiero muchísimo y estoy muy feliz de que sigamos siendo amigos, porque vuestra compañía es un regalo. **Carmen**, eres sin duda de las que más me han apoyado y me apoya en esto de la tesis. Dándome ánimos continuamente, haciéndome ver que queda menos y que merece la pena. Pues tenías razón, al final todo llega y el fin ya está a la vuelta de la esquina. Muchísimas gracias por tus ánimos, por tu apoyo y por tu calor incondicional que nos das siempre tanto a María como a mí. Gracias también por poner tanto en valor lo que hacemos. Eso es algo que no hace todo el mundo y se agradece mucho. La labor que tú haces también tiene un valor incalculable. Eres, después de nuestras madres, la persona que más te preocupas por nosotros. Es un placer tenerte en nuestras vidas. Gracias por ser como eres y espero que estés presente siempre. **Rolo y Rola**, amijitos, como nos llamamos. Muchísimas gracias por vuestro apoyo incondicional, por estar ahí siempre pendientes de nosotros, por tener siempre esas ganas tan fuertes de vernos, de quedar y de echar un rato juntos. Gracias también por valorarnos tanto y por hacernos ver el talento que tenemos, que a veces es importante que te lo recuerden. Sé que no nos vemos todo lo que nos gustaría, pero a pesar de eso en cuanto podemos organizamos algo, quedamos y nos ponemos al día. He de deciros que sois geniales y que me encanta pasar tiempo con vosotros. Me divierto muchísimo con ustedes y me alegro enormemente de que hayáis aparecido en mi vida. Espero que continuéis en ella siempre. **Gabi y Lu**, amigos recientes pero que nos habéis demostrado que venís con muchas ganas de quedaros. Quiero que sepáis que nosotros también tenemos muchas ganas de quedarnos y de formar parte de vuestras vidas. Siento que no quedemos todo lo que nos gustaría, y que os digamos que no a planes en más de una ocasión, pero ya sabéis que las circunstancias de vida muchas veces no son todo lo favorable que nos gustaría para poder ir a todo. Espero que lo entendáis. Muchísimas gracias por vuestro apoyo, por vuestro calor y vuestra presencia. Nos encanta como sois y nos encanta pasar tiempo con ustedes. Tenéis ambos un gran corazón. Espero que sigan yendo genial los preparativos de la boda y que pasemos un día en grande durante la celebración, apoyándoos a muerte en vuestro gran día celebrando vuestro amor.

Tampoco podía pasar por alto a **Leyre**, la que fue mi compañera de vida durante tantos años. Leyre, aunque ya no estemos juntos y no formes parte de mi vida, fuiste un pilar fundamental en ella y un apoyo increíble en todo este proceso de la tesis, sufriendo mucho a mi lado para que todo esto saliese adelante. Por todo eso y mucho más, no podías faltar en estos renglones. Quiero darte las gracias una vez más por todo lo que hiciste por mí, por el apoyo tan grande que me brindaste siempre, por el calor que me diste y por todo lo que me cuidaste. Quiero que sepas que a pesar de todo te quiero mucho y te aprecio enormemente como persona. Vales muchísimo y eres de las personas que valen la pena tener en tu vida. Siento en el alma que nuestra relación al final acabase así. Me encantaría que fuera de otra forma y que pudiésemos ser amigos, pero entiendo que tu dolor no te lo permita. Espero que te vaya genial en la vida y que seas muy feliz, que es justo lo que te mereces.

A continuación, me gustaría dedicar unas palabras de agradecimiento a **David** y a **Carmen**, mis suegros. David y Carmen, muchísimas gracias por haberme acogido en la familia de la forma que lo habéis hecho. Dándome mi lugar y haciéndome sentir como uno más. Gracias también, aunque os lo decimos a menudo, por toda la ayuda que nos brindáis con Ian, recogéndolo a diario de la guardería y llevándolo a vuestra casa, cuidándolo como unos padres para que nosotros podamos seguir trabajando y avanzando con nuestras carreras profesionales, porque sin vuestra ayuda, ya os digo yo que esto no hubiese sido posible. Os debemos muchísimo. Gracias por preocuparos tanto por nosotros. Y gracias también por todos los momentos que vivimos juntos en familia, y por querer quedar con nosotros siempre para ir a cualquier sitio para pasar un día en familia. Quiero que sepáis que me gusta mucho vuestra compañía y que me lo paso muy bien con vosotros. Me encanta ver como Ian disfruta de ustedes y ustedes de Ian. Sois unos abuelos increíbles.

Por fin llega el ansiado turno de mis padres, **Juan y Dioni**. Papi y mami, quiero que sepáis que sois los mejores padres que un niño pueda desear. Os debo todo en la vida, todo lo que soy, todo lo que tengo y todo lo que sé. Ahora que soy padre, me doy cuenta de muchas cosas que antes pasaba por alto, y quiero pedir os disculpas por todos esos momentos en los que no estuve a la altura y no me porté como hubiese debido con ustedes. Por todos esos momentos en los que de algún modo os hice sufrir, sabiendo, hoy en día, que no os lo merecíais en absoluto. Quiero que sepáis que, a pesar de no tener

grandes estudios, ni a priori, grandes conocimientos sobre crianza, lo hicisteis muy pero que muy bien. Estoy tremendamente orgulloso de vosotros y quiero que sepáis, aunque no os lo digo mucho, que os quiero con locura y os amo con todo mi corazón. Os aprecio como a nadie en esta vida. No tengo palabras para agradecer todo lo que habéis hecho por mí, para agradecer todo lo que habéis sacrificado por mí, ni para agradecer todo lo que habéis dado por mí, que no ha sido menos que vuestra vida entera. Quiero que sepáis que sois unos padres increíbles, y como no, unos abuelos inmejorables. Gracias también por querer a Ian como lo queréis y por cuidarlo como lo cuidáis, que no es menos que como a un hijo. Sois unos abuelos increíbles y estoy seguro de que, dentro de unos años, Ian estará igual de orgulloso de ustedes, o más incluso, de lo que lo estoy yo. **Papi**, quiero que sepas que has sido siempre y sigues siendo un referente para mí y un ejemplo a seguir. Gracias por meterme siempre de lleno en el mundo del deporte, por enseñarme sus valores y por inculcarme siempre esos hábitos de vida tan sanos y saludables. Fíjate hasta qué punto me hicieron mella, que estudié la carrera de Ciencias del Deporte, estudié un Máster en Actividad Física y Salud, enfoqué mi vida laboral y gran parte de mi vida personal al deporte y a los hábitos de vida saludables, y hoy en día, estoy a punto de defender una tesis sobre eso y me dedico profesionalmente a eso. Te estaré eternamente agradecido, ya que ha hecho que enfoque mi vida, para bien, en ese sentido. Gracias también por inculcarme tu bondad hacia las demás personas, por enseñarme que no hay que ser egoísta, que hay que ayudar a los demás y dar lo que uno tiene. Tú eres justo así y estoy muy orgulloso de ti. Das todo por los demás sin pedir nada a cambio. Eso demuestra la gran persona que eres y el gran corazón que tienes. Gracias una y otra vez por todo lo que has hecho y haces siempre por mí, por brindarme siempre el apoyo, el calor y el cariño incondicional que me brindas, respaldándome siempre en cada decisión que he tomado, aunque algunas de ellas no fuesen del todo de tu agrado. Quiero que sepas que te quiero con el alma y que estoy tremendamente orgulloso de ti. No pierdas nunca esas ganas de superarte y de ser el viejo más fuerte de la historia, que para mí ya lo eres. Gracias también por querer y cuidar tanto a Ian. Me encanta verte disfrutar con él como lo hacías conmigo de pequeño. **Mami**, quiero que sepas que has sido la mejor madre que uno pueda desear. No tengo palabras, ni tendré nunca, para agradecer todo lo que has hecho y haces siempre por mí. Me has dado la vida, que es lo más grande que tengo, pero es que, además, has dado la tuya propia por mí y por todos tus seres queridos, estando siempre ahí, por y

para nosotros, sacrificando todo tu tiempo y todo tu ser para que todo vaya bien y hacia delante. Eres una luchadora nata, subiéndotelo todo a la espalda y afrontándolo todo tu sola, con fuerza y coraje para que todo saliera siempre bien y hacia delante. No has hecho otra cosa en la vida que cuidar siempre a todos tus seres queridos. A tus hermanos, que cuidabas desde pequeña y sigues cuidando a día de hoy sesenta años después. A tus padres y a mis abuelos, que los cuidaste siempre hasta el último día, y a tus hijos y a tu marido, a los que nos sigues cuidando día a día. Ojalá te tomaras un descanso y empezaras a cuidar un poco de ti, que ya has hecho más que suficiente por todos. Me encanta charlar contigo y ver lo orgullosa que estás de mí, de lo que he conseguido en la vida, de lo que tengo, de lo que soy y de donde estoy. Me siento muy satisfecho sabiendo que, después de todo lo que has luchado y el esfuerzo que has invertido, estás contenta conmigo y estás orgullosa de mí. Creo que conmigo has conseguido tu propósito, un hijo fuerte, feliz y totalmente independiente, que sabe bien lo que quiere en la vida y que es capaz de afrontarla por sí sólo y con coraje. Puedes estar tranquila por mí. Quiero darte las gracias profundamente por el apoyo incondicional que me has brindado siempre durante todo este proceso de la tesis, preocupándote siempre por mí, preguntándome siempre acerca de lo que tengo entre manos, intentando entender qué es lo que hago, preocupándote por los plazos, sufriendo como siempre por mí y deseando que todo saliera bien. Respira tranquila que estamos ya en la recta final y va a salir todo genial. Quiero que sepas que te quiero con locura y que eres un pilar fundamental de mi vida. Y, por último, quiero darte las gracias también por la gran abuela que eres, que cuidas de tu nieto como la que más. Me encanta con los ojos que lo miras, llenitos de amor, como con los que me mirabas a mí de pequeño. Sé que él, al igual que yo, en un futuro te querrá y te valorará tanto como lo hago yo, y sé que estará tan orgulloso de ti como lo estoy yo.

Llega ahora uno de los momentos más esperados para mí, el momento de dedicarle unas palabras de agradecimiento al amor de mi vida, a mi compañera de vida, de lucha y de aventuras, **María**. Amor, como siempre nos llamamos, eres sin duda la persona que más me ha apoyado y me apoya en este largo y duro camino, estando siempre ahí, dispuesta a cuidar de mí y de todo mientras que yo estoy en el despacho escribiendo y escribiendo. No tengo ni tendré nunca palabras para agradecerte todo lo que has hecho y estás haciendo por mí. Me has demostrado en multitud de ocasiones que

tienes un corazón enorme, tan grande que no te cabe en el pecho. Rebasas de bondad y amor para todos tus seres queridos, y sobre todo para Ian y para mí. Una vez que yo acabe, te toca a ti, y espero estar a la altura y apoyarte tanto como lo has hecho tú por mí. Quiero que sepas que eres el amor de mi vida, que tienes todo lo que he deseado siempre de una compañera de vida. Me encantas en todos los sentidos. Me encanta como eres, física y mentalmente. Me encanta como piensas, lo inteligente que eres, como actúas, lo cariñosa que eres, tanto conmigo como con Ian y con todos tus seres queridos. Lo aventurera que eres, que estás siempre dispuesta a montarte en la furgo e ir conmigo y con Ian al fin del mundo, pese a todas las adversidades. Lo cuidadora que eres conmigo, con Ian y con todos. Lo educada que eres, que sabes comportarte siempre en todas partes como es debido. Lo amable que eres, lo buena que eres y un sinfín de cualidades positivas que tienes. Quiero que sepas que te quiero y te amo con todo mi corazón y que estoy profundamente enamorado de ti. Quiero que sepas también que estoy muy contento y que me alegro enormemente de que aparecieras en mi vida, y que, aunque eso supusiese un vuelco enorme en mi pasado, tengas claro que, sin dudas, mereció la pena. Estoy muy feliz y contento de tenerte, tanto a ti como a nuestro polluelo. Siento que con vosotros tengo el corazón llenito. Sois actualmente las dos figuras más importantes de mi vida. Quiero darte las gracias por todo el esfuerzo que has invertido y estás invirtiendo en ayudarme y en apoyarme para que pueda seguir adelante con mi carrera profesional, porque sin tu ayuda, todo esto, sin duda alguna, no hubiese sido posible. De verdad, gracias. Como digo, espero estar a la altura cuando te toque a ti. Quiero darte las gracias también por preocuparte siempre por mí, preguntándome día a día cómo voy, ayudándome con cada paso que se me traba, aconsejándome siempre para afrontar la situación de la mejor manera posible. Y así ha sido, con tu ayuda, he podido ir superando, pasito a pasito, todos los escalones que se han ido poniendo en el camino. Estoy muy orgulloso de ti. Mil gracias de verdad por todo, y también, gracias por cuidar tan bien de Ian y por ser tan buena madre, dispuesta siempre a tirarte al suelo o subirte por las paredes para jugar con él y verlo feliz. Estoy seguro de que no hay nadie en el mundo que lo cuide mejor y que lo quiera más que tú. No sabe todavía la suerte que tiene, la misma que tengo yo. Seguro que se dará cuenta en el futuro y estará tan orgulloso de ti como lo estoy yo. No puedo acabar sin desearte que te vaya genial en lo que te queda de tesis y sin darte todos los ánimos del mundo y brindarte mi apoyo incondicional, que ya te digo que no va a ser fácil, pero

con tu actitud y nuestro apoyo serás más que capaz de conseguirlo, ya que puedes con todo lo que te propones. Mucho ánimo y espero que pronto te proclames doctora al igual que estoy a punto de hacerlo yo. Te quiero.

Por último, no puedo despedirme sin dedicarle unas palabras de agradecimiento a mi polluelo **Ian**. Vida, como casi siempre te digo, lo que tengo contigo es un amor incondicional e inexplicable, porque a efectos prácticos, más que ayudar en todo este proceso, lo que has hecho ha sido más bien todo lo contrario, por lo pequeño que eres y por los cuidados que requieres. Pero fíjate, que no es eso en absoluto lo que siento. Lo que siento es que has estado ahí día tras día desde que naciste, apoyándome de forma incondicional, siempre con una gran sonrisa en la cara y una actitud tan positiva, que lejos de retrasarme, siento que me has dado fuerzas y alas para continuar y para terminar con todo este proceso. Siento que lo que has hecho es motivarme para buscar un futuro mejor para ti y para nuestra familia, y que eso ha hecho que incluso acelere el proceso. Quiero decirte que me encanta como eres. Me encanta lo pillo, activo, inteligente y cariñoso que eres. Quiero que sepas que, aunque muchas veces me digas “no, con mami”, sé que en el fondo me quieres y me amas casi tanto como a ella. Lo que pasa es que claro, yo en tu lugar también la preferiría a ella en vez de a mí, por eso te entiendo. Quiero que sepas que estoy enormemente contento de que hayas llegado a nuestras vidas. Aunque las hayas ajetreado un poco, lo que has hecho es darle intensidad, energía y alegría. Eres el niño más lindo que he conocido nunca. Quiero que sepas que te quiero profundamente con toda mi alma y con todo mi corazón. Espero que sigas siendo siempre el niño y la persona tan feliz que eres hoy en día, con esa sonrisa en la cara y con esa bondad que te rebosa por los cuatro costados. Espero que aproveches la oportunidad que tienes, que aprendas a valorar las cosas tanto como mamá y papá y que seas una persona feliz y plena. Espero que algún día sepas valorar lo que mamá y papá hacemos cada día por ti, y espero que algún día estés orgulloso de nosotros. Te amo.



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