Is physical activity or diet more effective in increasing weight loss in teenagers living with obesity in the UK?

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ABSTRACT

INTRODUCTION: Obesity is a major epidemic in the United Kingdom (UK) which leads to various health, economic, and social concerns. The teenage group has the highest and fastest growth of obesity prevalence compared to other age groups in the United Kingdom. Physical activity and dietary intervention enhance weight loss among people living with obesity. This study compares the effectiveness of physical activity and diet in increasing weight loss among teenagers living with obesity in the United Kingdom.

METHODS: A comprehensive and systematic search was conducted across five academic databases. Studies considered for inclusion were published between 2014 and 2024 and they focused on physical activity or diet and weight loss among teenagers living with obesity in the United Kingdom.

RESULTS: The adolescent population generally shows a higher prevalence of obesity when compared to other age group populations. This study finds relevant factors such as lack of environmental support, social and demographic disadvantages and emotional influences that have contributed to this prevalence. The contribution of these factors presents a psychosocial problem that reduces the potential effectiveness of both physical activity and dietary interventions.

DISCUSSION: Evaluating the effectiveness of dietary or physical activity interventions is challenging due to various psychosocial factors. Physical activity and dietary intervention are helpful in weight loss but one cannot be considered more effective than the other. This study highlights the need for multicomponent interventions including diet and physical activity. Digital tools can also improve the effectiveness of intervention delivery and overall weight loss outcomes among teenagers.

CONCLUSION: A multicomponent intervention is considered more effective than engaging in physical activity or diet alone. Both interventions play a role in a bigger intervention that is tailored to adolescents' lifestyle. Future research should improve on intervention designs that address psychosocial challenges.

KEYWORDS: Adolescent, Teenage, Obesity, Physical activity, Diet, Exercise, Intervention, Weight loss.

DECLARATION

I confirm that this dissertation is my own work, is not copied from any other person's work (published or unpublished) and has not previously submitted for assessment either at the University of East London or elsewhere. I confirm that I have read and understood UEL's regulations on academic integrity.

AKNOWLEDGEMENT

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INTRODUCTION

Obesity is a major epidemic in the United Kingdom (UK), leading to various health, economic, and social concerns. The rate of Obesity in adults and children in the United Kingdom is alarming, with the numbers rising yearly. The National Health Service (NHS) reported that the prevalence of obesity among age 10-11 years (entry age to adolescence) rose from 21 percent in 2019 to 25.5 percent in 2021 (NHS Digital, 2021). The early teenage group (ages 11 - 15 years old) also shows the highest and fastest growth of obesity prevalence compared to other age groups in the United Kingdom (Broadbent et al., 2024). This prevalence indicates excess weight among the teenage population and a rising trend in the future.

To address this burden, the NHS identifies physical activity (PA) and dietary intervention as effective ways to reduce obesity among the affected population. It is recommended that adolescents undergo 60 minutes of moderate-to-rigorous exercise daily with the consumption of a calorie-controlled diet (Allcott-Watson et al., 2024; NHS, 2017). Both physical activity and dietary interventions are effective in reducing body weight, but their relative effectiveness may vary based on limitations, adherence rates, sustainability and demographic characteristics. This study critically answers the question: is physical activity or diet more effective in increasing weight loss in teenagers living with obesity in the United Kingdom. To answer this research question, a systematic review of peer-reviewed papers that address physical activity or diet among obese adolescents in the United Kingdom was conducted. These papers were critically evaluated and subjected to thematic analysis.

CHAPTER 1: LITERATURE OVERVIEW/BACKGROUND

Obesity is currently a major global epidemic, whereby the number of children and adults being affected keeps a rising trend. According to the World Health Organization (WHO), a tenfold increase has been seen in children and adolescents (aged 5 – 19) with obesity in the last 40 years (WHO, 2017). The United Kingdom is a significant victim of this global epidemic having the highest population of teenagers living with obesity in an international comparison with fourteen other countries in Europe (Shah et al., 2019), and is projected to be the country with the highest obesity prevalence in Europe by 2030 (Broadbent et al., 2024).

The National Health Service (NHS) statistics report indicates an increase from 30% to 38% among ages 11 to 15 showing the highest and the fastest growth of obesity prevalence among other age groups between 1995 and 2019 (Broadbent et al., 2024). Currently, approximately 40 percent of teenagers (aged 13-15) are recognized as either overweight or obese (Solmi et al., 2021). This indicates not only a high prevalence of excess weight among the teenage population in the United Kingdom but also a rising trend into the future.

The WHO described obesity as a chronic disease characterized by excessive fat deposits that can result in impaired health. Being overweight is also defined as an excessive deposit of body fat but is distinct from obesity by the measure of body mass index (BMI). For an adult, a BMI above 25kg/m2 but less than 30 kg/m2 is considered overweight while a BMI above 30 kg/m2 is considered obese. This measure is quite different when approaching children and adolescents (age 5-19); diagnosis is marked overweight when BMI-for-age is higher than 1 standard deviation, and obese when higher than 2 standard deviation, above the WHO Growth Reference median (WHO, 2024).

Adolescence is recognized as a stage of rapid development characterized by significant physiological, hormonal, neurological, sexual and behavioural changes. It is a stage that bridges childhood into adulthood. The WHO and the United Nations General Assembly recognize the age bracket 10 to 19 years old as adolescence age. Lancet Commission on Adolescent Health and Wellbeing further defined this age bracket into early adolescence (10 – 14 years old) and (15 -19 years old). This literature considers this age bracket to address teenagers and adolescents (Das et al., 2017; Shah et al., 2019).

The impact of obesity on this young population is a major concern for the government and society due to the associated health, social and economic burdens. A study by the NHS in 2020 indicates a record of 900000 hospital admissions related to obesity between 2018 and 2019. The problem became more pressing with the emergence of COVID-19, which put victims associated with obesity-related health problems at higher risk of dying. Previous literature has established the association of adolescent obesity with the development and early onset of non-communicable diseases (NCDs) such as type-2 diabetes, cardiovascular diseases, sleep apnea, chronic respiratory diseases and cancer. Obese adolescents are also predisposed to adult obesity and social discrimination. Moreover, the establishment of obesity is mostly associated with other factors within society, which include gender, race, education, psychological problems and the socioeconomic status of individuals (Haase et al., 2020; NHS Digital, 2021; WHO, 2024; Wickham and Carbone, 2015).

Salam et al. (2020) recognise lifestyle modification such as physical activity and dietary changes as the primary means of reducing overweight and obesity among other interventions like pharmacological and surgical methods. Adolescents generally have the unhealthiest diet, increased inactivity and sedentary behaviours. To reduce the prevalence of adolescent obesity, the NHS guidelines recommend a physical activity engagement of 60 minutes of moderate-to-vigorous exercise alongside the consumption of healthy diets containing all classes of food with at least five portions of fruits and vegetables daily. Despite the recorded significant benefits of physical activity and a healthy diet, such as optimal growth and protection against certain health conditions, data shows that only 43 percent of 11 – 16 years olds are meeting the NHS physical activity guideline while only 8 percent of 11 -18 years olds are meeting the dietary recommendation (Allcott-Watson et al., 2024)

RATIONALE

Based on the global and national burden of obesity and obesity-related diseases, it is known that more effective measures need to be in place to tackle obesity among teenagers to improve wellbeing and reduce the incidence of obesity-related NCDs. Previous research has focused on the impact of either physical activity or diet on weight loss; only a few have focused on comparing whether dietary modification or physical activity has different levels of impact on weight loss among teenagers. This study would address this gap through a critical review of

previous peer-reviewed literature and government programmes to determine and compare the effectiveness of physical activity and dietary intervention in increasing weight loss among teenagers in the United Kingdom.

RESEARCH QUESTION

Is physical activity or dietary intervention more effective in increasing weight loss among teenagers living with obesity in the United Kingdom.

AIMS

- To determine the comparative effectiveness of physical activity and dietary interventions in promoting weight loss among teenagers with obesity in the United Kingdom.
- To assess the impact of gender, socio-economic factors, and psychological variables on the success of weight loss interventions in this demographic.
- To explore the long-term effects and sustainability of weight loss achieved through sustained physical activity versus consistent dietary modifications.
- To identify specific types of physical activities and dietary patterns that contribute most significantly to weight loss in United Kingdom teenagers with obesity.

OBJECTIVES

- Design and implement a qualitative research study to collect data on the weight loss outcomes of teenagers engaging in physical activity interventions, dietary interventions, or a combination of both.
- Identify specific physical activities and dietary patterns associated with the most significant weight loss in teenagers with obesity through detailed data analysis.
- Provide evidence-based recommendations for effective weight loss interventions tailored to the unique needs and circumstances of teenagers with obesity in the United Kingdom.

CHAPTER 2: METHODOLOGY/METHODS/MANAGEMENT

METHODOLOGY

The research will focus on a qualitative research approach. Previous research has recommended a combination of both quantitative and qualitative research. According to Diaz-Mendez (2021) states, “Both approaches are necessary to the study of a multicausal phenomenon such as obesity." Due to the impact of Obesity, both through social and biological factors, there is a need for research to be done through a collaboration (multi-, inter, and transdisciplinary) with those in the natural and social sciences and other careers. This study will concentrate on a single qualitative method that relies on longitudinal data for this study. The reason for using longitudinal data to study Obesity is that qualitatively, a longitudinal approach allows the researcher to better understand the effectiveness or impact of previous experiences or approaches on proposed measures or actions. To answer the research question systematically, the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines was used to provide a structural framework for this study (Page et al., 2021).

METHOD

Research Question

The research question for this study was developed in alignment with the Population Intervention Comparison Outcome (PICO) system, as in Table 1: This provides a clear definition of the population under study; the interventions being considered, their comparison and expected outcome. (Cumpston et al., 2022; Higgins, 2023).

Table 1: Research question Development using PICO.

Population/Problem Intervention Comparison Outcome (PICO) system	**Research Question Component**
Population	Teenagers living with obesity in the United Kingdom
Intervention	Physical Activity
Comparison	Diet
Outcome	Weight loss

Search Strategy

To answer this research question and ensure that the search covers the key aspect of the research question, the following procedure was strategically followed.

1. Key terms such as Physical activity, Diet, weight loss, obesity, teenagers and the United Kingdom were extracted as keywords from the research question.
2. Alternative terms and expression were considered for each keyword as in table 2.

Table 2: Search Term Development

Question component	**Physical Activity**	**Diet**	**Weight-loss**	**Teenagers**	**United Kingdom**
Search Terms	Exercise	Dietary	Lose weight	Adolescents	England
	Fitness	Dietary habits	Weight reduction		British
	Active Lifestyle	Nutrition	Slimming		UK
		Eating Habits			

3. Boolean operators (AND, OR) and parenthesis were used in combining keywords into complex expression that was searched across selected databases: (‘Physical activity’ OR exercise OR fitness OR ‘active lifestyle’) AND (Diet* ‘dietary habits’ OR nutrition OR ‘eating habits’) AND (‘Weight loss’ OR ‘weight reduction’ OR slimming OR ‘losing weight’) AND (Teenagers OR adolescents) AND (‘United Kingdom’ OR UK OR British OR England) (Denney and Tewksbury, 2013)

Selection Criteria

The study analysed two measures, which are physical activity and healthy diet. The inclusion criteria allow the study to focus on research done in the United Kingdom that focuses on either one of the measures implemented or both. Focusing on secondary data will provide evidence through analysis of previous outcomes on research based on physical exercise or diet towards reducing obesity in teenagers between the age of 12 and 19. Research studies published between 2014 and 2024, including peer-reviewed articles, books and reports are considered for recent evidence.

Quality Appraisal

The resources collected for this research study were examined and selected to meet the Critical Appraisal Skills Programme (CASP) guidelines (CASP Checklists, 2024). These guidelines were used to examine the quality and fitness of each study. The CASP checklists allow the evaluation of different studies, including Randomized Control Trials (RCT), Cohort Studies and Case-Control Studies that were considered. Each study reported a clear research question, appropriate methodologies and results that supports an evidence-based research quality.

Data Extraction and Synthesis

The developed search terms were searched across five elect

ronic databases (Google Scholar, PubMed, Europe PMC, CINHALE, CORE and Cochrane) to obtain relevant peer-reviewed academic literature that are relevant to answering the research question and also meets the inclusion criteria. The advanced search features of these databases were used appropriately to better enhance the quality of the search results. An initial broad search was conducted followed by refining search terms to obtain a better search result.

Potentially relevant articles were examined through the quality appraisal check and details of selected articles such as Authors, year, country, abstract and Meta-data were obtained to familiarise with the rationale of data presented in selected papers. The selected articles underwent a full text assessment and their references were examined for additional resources that are relevant to answering the research question or fall within the study inclusion criteria and satisfy the quality assurance check.

The full text of each selected paper was read thoroughly and notes were taken from the data they contained. A summary table of the key findings derived from these papers was created to effectively put things in logical arrangement. The thematic analysis method was used to analyse data obtained from selected articles. This is due to its effectiveness in analysing qualitative data and wide adoption for qualitative analysis in systematic review studies. The thematic analysis method provides an approach to effectively identify, analyse and report patterns (themes) within qualitative data.

Recurring concepts were labelled with initial codes which were later modified and organized into specific code terms that are helpful in answering the research question. These code terms were analysed for patterns to obtain themes that are presented as results in this study. This approach aimed to obtain both explicit and implicit ideas that answers the research question.

DATA MANAGEMENT

Ethical approval was sought from the National Health Service but the chairman of the local research committee said that since this was research that did not involve patients or NHS staff ethical approval was not required. Because the study involved the use of previous data. Utilising articles with primary research methods helps determine present changes and statistics of Obesity in different regions (Agha and Agha, 2017). The approach will also help in analysing previous measures and determining their effectiveness in helping to reduce Obesity in various community settings and schools. The research will conduct a thematic systematic review of previous literature and surveys done by various departments, such as NHS and WHO (Xiao and Watson, 2019). The articles will be arranged based on different years and sample group focus, including children and teenagers between 12-19 years.

CHAPTER THREE: FINDINGS/RESULTS/DATA ANALYSIS

The systematic search through selected databases yielded relevant literature that is relevant to providing an answer to the research question. The papers included in this study showed evidence of conducting their research using participants from the United Kingdom or data available on government or nationally recognised databases that are available for research purposes. The resources generated were screened for inclusion, eligibility and quality. A detailed list of these papers is provided in the data matrix in Appendix 1. These papers are explored and used to develop an appropriate thematic framework.

Prevalence of obesity among teenagers in the United Kingdom.

A study by Broadbent et al. (2024) identifies an overall rising trend in childhood obesity between 1995 and 2019, with the highest prevalence among aged 11 to 15 years. The Commission on Ending Childhood Obesity reports the need to reduce the prevalence of obesity among children and adolescents, which is in line with the United Nations Sustainable Development Goal in taking "action on the prevention of non-communicable diseases" a top priority. In 2016, the commission highlighted six recommendations to reach this goal. These recommendations focused on providing and implementing programs that promote physical activity and the consumption of healthy foods among school-age children and adolescents. This also involves reducing the intake of unhealthy foods and a sedentary lifestyle, which is common among adolescents, promoting literacy for health, nutrition and physical activity in schools as well as providing a family-based, multicomponent lifestyle weight management system (Nishtar et al., 2016; WHO, 2016).

Low Compliance of Adolescents with United Kingdom Physical Activity Guidelines

The current NHS guideline on physical activity among adolescents is aimed at reaching 60 minutes of moderate-to-vigorous physical activity (MVPA) daily and practised across the week. This target includes engaging in aerobic exercise and vigorous exercise that strengthens the muscles and bones (NHS, 2022a). Sport England, through the Active Lives Children and Young People Survey in 2019, reported the activity level of children and young people in England: 29% are inactive (less than 30 minutes MVPA), 24.2% are fairly active (between 30-59 minutes

MVPA) and 46.8% are active (over 60 minutes MVPA); also indicating that adolescents aged 13–16 years have the highest record of inactivity (Sport England, 2019).

A study by Strain and colleagues reviewed the compliance of adolescents to the MVPA guideline through national surveys across the four home countries in the United Kingdom, highlighting 21% (male: 24%, female: 18%) from the Health Survey in England and 20% (20% in male and 14% in female) from the Active Lives: Children and Young People Survey (Strain et al., 2020).

Another study by Fairclough and colleagues (2023) using a wristwatch accelerometer to monitor the physical activity of Year 1 to Year 9 participants established that physical activity is lowest in years 8 and 9 (age 12–14 years) when compared to younger age participants and emphasised an age-related gradual decline in both genders. The result of this study identified 60 mind-1 MVPA and 10 mind-1 VPA (vigorous physical activity) in boys while 30 mins/day MVPA and 2 mind-1 in girls of ages 12–14 years (Fairclough et al., 2023). A study indicated that self-reported sedentary behaviour such as longer sitting hours (approximately 5 hours/day) is associated with a low level of MVPA (Zwolinsky et al., 2016).

Barriers to Physical Activity among Adolescents

Moore et al. (2023) identified 52 barriers and 68 behaviours that restrict adolescents from having effective engagement with physical activity. Participants engaging in less than 30 minutes of MVPA are categorized as inactive, while those with a record of over 30 minutes of MVPA are categorized as active. The study identifies main barriers, including ‘lack of confidence’, ‘feeling self-conscious (or shy)’, and ‘lack of partner’, as barriers that are common to both active and inactive groups and among both genders. The inactive group reported an average of 2.4 barriers per individual which is slightly higher than that of the active group which is an average of 2.3 barriers. Only 20% of the active group reported that nothing stops them from engaging in physical activity. There was no significant difference among genders in both active and inactive groups, but girls reported more main barriers when compared to boys. The prevalent barriers to physical activity are clustered into psychological and social barriers, which point to areas to approach when promoting physical activities among adolescents (Moore et al., 2023).

A study indicated that the cost-effectiveness of an intervention is dependent on the sustainability of the intervention in the long term. Either engaging in a simple low-cost physical activity intervention or a complex high-cost intervention produces similar health outcomes in the long term. Moreover, having an intervention is better and saves the cost of the burden of cardiovascular disease and other non-communicable diseases (Gc et al., 2019).

The correlation between diet and weight loss

A healthy diet is a balanced intake of all food groups in the right proportion. A healthy diet contains a high proportion of fruits and vegetables daily while limiting the intake of free sugars, total sugars, fats, and salt. One key indicator of a healthy diet is the consumption of fruits and vegetables. A healthy diet is known to prevent malnutrition and protect against non-communicable diseases such as type-2 diabetes, cardiovascular disease, stroke and cancer. Currently, the NHS 'Eatwell' guide recommends the consumption of at least five different portions of fruits and vegetables per day and should cover just over a third of a meal. The WHO recommends 400g of fruits and vegetables daily and this was interpreted by NHS as a 5-a day 80g portion of fruits and vegetables per day. (NHS, 2022b; WHO, 2020).

The HSE survey between 2011 and 2018 identified disparities in consuming fruits and vegetables across age, gender and ethnicity. Less than 26% of men and less than 32% of women meet the NHS 5-a-day portion of fruits and vegetables recommendation daily. An average of 3.4 and 3.6 portions are consumed by men while women consumed between 3.7 and 3.9 portions. This disparity in fruit consumption is also seen across ethnic groups. The Black Caribbean, White British and Irish have the lowest consumption while the Chinese have the highest consumption of fruits and vegetables (NHS Digital, 2022).

Adolescence being a vital stage of development may be the wrong time to diet due to the suggested association with detrimental health status such as adolescent mental health disorders, delayed growth and eating disorders. This study acknowledges the existence of evidence that dieting alone is generally an ineffective way of losing weight, and that it is also associated with weight gain and the development of mental health disorders in the long term (Solmi et al., 2021).

Motivation for Weight Loss among Adolescents

A study examining three cohorts of adolescents in the United Kingdom over decades shows trends in weight-loss behaviours such as dieting and exercising and their associated implications. The population of obese adolescents who are engaging in weight loss by dieting has increased over the last 30 years. 44 percent of participants aged 14 years were dieting to lose weight in 2015. In 2015, 44.4% had engaged in dieting while 60.5% had exercised to lose weight. This is a higher proportion when compared to 37.7% and 6.8%, respectively, in 1986. The percentage of adolescents trying to lose weight grew from 28.6% in 2005 to 42.2% in 2015 (Solmi et al., 2021). However, these behaviours are more likely reported in girls, but a prevalent increase was seen in boys over time.

Solmi et al. (2021) reported that social pressure influences weight-loss behaviours among adolescents, such as the experience of being bullied, media representation of beauty in girls as slim and boys as lean muscle mass, as well as public health campaigns promoting weight loss. Adolescents also have a subjective attitude towards their weight, which increases their chances of poor mental health. The study shows that adolescents tend to overestimate their weight, whereby girls who consider themselves overweight show greater depressive symptoms than those who see themselves as right-weighted. The drive to lose weight and not meeting dietary or exercise targets also contributes to the prevalence of depressive symptoms among adolescents (Solmi et al., 2021).

Factors Influencing the Sustainability of Weight-Loss Management in Adolescence

Previous studies identify inequalities that are associated with obesity among adolescents. Socio-economic factors such as ethnicity and gender have been identified to contribute to differences in the outcome of weight management among teenagers. This identifies the contribution of social patterns to the prevalence of obesity among adolescents. A study by Broadbent and colleagues showed that disadvantaged populations and ethnic minorities (non-whites) show increased risks of overweight and obesity. Socio-economic status like living in areas that experience deprivation, and living with single or non-degree-educated parents, are disparities that increase the risk of overweight or obesity among adolescents (Broadbent et al., 2024).

Emotional factors such as feeling low self-esteem, ashamed, stigmatized or being bullied are associated with obesity among adolescents. Reece and colleagues explored the experiences of obese adolescents and their engagement with obesity treatment through interviews. Self-blame and responsibility for being obese were found to be a common attribute which increases self-stigma or bears the weight of societal stigmatization. Long-term post-intervention support was also reported as a common challenge in maintaining weight loss in the long term. This study suggest that adolescents pay more attention to the intervention rather than how they can incorporate behavioral change in their lifestyle while focusing on their self-esteem and parental support. Adolescents struggle to meet weight management at home while having the knowledge of how physical activity and dieting could maintain weight loss. It was noted that the main problem is not a lack of knowledge of the right intervention to lose weight but the inability to form new behaviours that can be sustained in a family or social environment. This study acknowledges that there is limited factors that foster the maintenance of healthy habits among adolescents thereby drawing questions to the effectiveness of interventions (Reece et al., 2016).

Another study also provides evidence of difficulties in maintaining weight loss management among adolescents. This study identifies challenges faced by adolescents in maintaining weight loss management. These challenges include social and environmental triggers, conflicting priorities, as well as lack of psychological support in maintaining motivation in the absence of positive feedback. Winter season and festive celebrations such as Christmas are examples of environmental triggers while having school work and exams form conflicting priorities that pose challenges to maintaining weight loss management. The study identifies the need to recognize psychosocial factors and the significance of building a supportive family and social environment that promotes weight loss management. This includes having an authoritative figure such as a parent or guardian that instils discipline and helps build self-efficacy in adolescents to maintain weight loss (Sides et al., 2024).

The NHS ‘Advice for Parents of Overweight Children’ report identified the roles of parents in helping adolescents get healthy weight. This includes helping them set realistic goals, engage in physical activities (such as playground activities) and meet dietary requirements by quality and quantity of food as well as avoidance of certain foods (NHS, 2021).

The concept of neighbourhood safety is also a barrier for adolescents to engage in physical activity. Geographic and social safety are perceived objectively and subjectively by adolescents and their parents, thereby reducing the opportunity to engage in outdoor physical activities like cycling or outdoor games. Fear of crime, traffic safety, anti-social behaviours or a parent's low trust in the neighbourhood community has been associated with reduced physical activity among adolescents. Subjective perceptions are reported to pose more influence or fear than the actual existence of unsafety in the neighbourhood (Constable Fernandez et al., 2023).

Effective Weight Loss Among Adolescents in the United Kingdom

A study by Hobkirk and colleagues (2014) investigated lifestyle modification's impact on improving weight loss among adolescents in the United Kingdom. This study provides insight into the potential mechanisms to improve the reduction in body composition, anthropometrics and lipid profile. The study implemented a lifestyle intervention for children and adolescents, including energy restriction (1050 – 3050 Kcal/day) according to individual basic metabolic demands; three meals and one portion of snack (15% protein, 30–35% fat and 50–55% carbohydrate); physical activity (six 1-hour sessions) daily; and lifestyle education (on food choices, balance of good health, food portion control and stimulus control). This intervention yielded a significant reduction in anthropometric profile, body composition, cardiometabolic risk factors, triglyceride and low-density lipoprotein profile (Hobkirk et al., 2014).

CHAPTER 4: DISCUSSION

This study critically reviews resources that identify the level of physical activity and diet to weight loss among adolescents in the United Kingdom population. This study provides evidence of the national guidelines, compliance rate and sustainability of these two interventions in weight-loss management among adolescents in the United Kingdom. The results of this review provide insights into barriers and limitations that restrain the effectiveness of both physical activity and diet in increasing weight loss, especially among the teenage population. The United Kingdom has already recognised the effectiveness of both physical activity and diet in the prevention and reduction of obesity among different age groups in the United Kingdom population (Balogun et al., 2024). This has been expressed in the development of relevant health and social policy and guidelines, such as the NHS guideline for preventing obesity as well as NICE practice guideline for caring for obesity among adolescents (NHS, 2017; NICE, 2006).

Statement of principal findings

Despite evidence of increased engagement in weight loss activities in the last 30 years (Solmi et al., 2021), the adolescent population generally shows a higher prevalence of obesity when compared to other age groups in the United Kingdom population (Broadbent et al., 2024). This study finds relevant factors such as low compliance with physical activity (MVPA) guidelines, difficulty meeting the dietary guidelines, demographic disadvantages and emotional influences that have contributed to this prevalence (Solmi et al., 2021). The contribution of these factors is more influential from a psychosocial perspective than the potential effectiveness of physical activity or dietary interventions (Sides et al., 2024). Teenagers often struggle with weight loss due to a number of negative emotional experience. Low self-esteem, bullying and stigma are common experiences which caused them to gain while involved in weight loss activities (Moore et al., 2023; Reece et al., 2016). Most teenagers also sit for longer hours engaged in activities like screen entertainment or academic study or classes. This contributes to the time spent inactive and forms a significant part of their sedentary habits (Fairclough et al., 2023). Effective weight-loss management requires a supportive environment; a safe neighborhood, and well-educated parents to instill discipline and encourage weight-loss activities (Constable Fernandez et al., 2023).

Implications of the findings

The findings of this study point out the need to address weight loss among teenagers from a multi-component perspective. Considering physical activity or dieting as components of a larger intervention programme has proven more effective in improving weight loss in adolescents than emphasising physical activity or dietary intervention alone (Hobkirk et al., 2014). The findings from this study reveal limitations experienced by teenagers in achieving the effectiveness of dietary or physical activity interventions. Personal, environmental, and macrosystem factors contribute to these limitations (Das et al., 2017). The high variability of limiting factors and complexity in the performance assessment of the interventions explains why one cannot be considered more effective than the other. Both interventions have a low status of effectiveness, suggesting interdependence and the need for innovative and multicomponent interventions that can fit into the contemporary world of adolescents. Physical activity or exercise needs to be complemented with a dietary intervention (Selvendran et al., 2018).

Comparison to other studies

Studies outside the United Kingdom have also shown commonalities with the findings of this study, thereby emphasising the health benefits of physical activity and dietary intervention as well as factors influencing adolescent health and weight loss behaviours. Despite challenges, interventions focusing on diet and physical activity have shown a positive correlation towards increasing weight loss among teenagers (Psaltopoulou et al., 2019; Rose et al., 2017). According to a review study by Lee (2021), engaging in walking, running, swimming, dancing or other aerobic exercise increases weight loss among overweight or obese teenagers. Aerobic exercise helps in reducing body fat and increasing physical fitness (Lee, 2021). Similarly, dietary interventions have also proved beneficial in weight management among teenagers (Miguet et al., 2020).

Lloyd and Wyatt, (2015) designed and applied a school-based intervention known as the Healthy Lifestyle Programme (HeLP) across primary and secondary schools in the United Kingdom. This intervention targets reducing inactivity and snacking by providing alternative activities and improving behavioural discipline among children and teenagers (Lloyd et al., 2018). This study supports addressing physical activity and dieting collectively as components of a holistic intervention. Another study by Fairclough and colleagues (2023) considered three components:

energy restriction (diet), physical activity and lifestyle education, as a single holistic approach to improving weight loss among teenagers.

The NICE guidelines for weight loss among adolescents indicated that dietary changes or physical activity should be part of a broader intervention and not considered as a standalone weight loss strategy (NICE, 2014). This support findings that the effect of physical activity and weight loss interventions on overall health, body weight and body composition might be in part mediated by modifications in eating behaviors. Adolescents' energy and nutrition needs must align with their physical activity levels (Das et al., 2017b; Miguet et al., 2020). A review study across different settings (communities and schools) and demographics (High-income, and low-middle-income countries) provides evidence that a combination of interventions is more favourable in weight management among children and adolescents (Salam et al., 2020). This evidence strengthens a multicomponent approach rather than engaging in physical activity or dieting alone (Salam et al., 2020).

Limitations

The findings of this study should be considered in the context of the limitations surrounding this research and those of the resources used. First, there is a level of difference in the participant age group that was considered in the resources used. The use of terms like "pediatric, childhood and adolescence as well as adolescents and young adults", in different studies contributed to these differences in participants sampling. Although this study included resources that considered participants between the ages of 12 and 19 Some studies fulfil this criterion, while some studies use a narrower age range (13–19 and 11–16) or an extended age range (5–18). Secondly, numerous differences were observed in the scope of the studies considered in this research. Some studies performed data collection using electronic accelerometers with different metrics while some obtain data through interviews or surveys. Demographic differences, such as obtaining data from schools, hospitals or camps was also observed. Some studies assess the performance of the intervention after 12 or 24 months, while others studies considered a longer period. Some studies used a self-reporting measure, which could pose some measurement bias, while others considered supervised anthropometric measurement, which varies across studies. These variabilities caused difficulty in comparing the outcomes of these studies and the two

interventions in the research question. These variabilities suggest the need for a standardised methodology and assessment metrics in weight loss management.

Recommendations

The findings of this study provide implications and recommendations for clinicians, policymakers, and stakeholders interested in addressing adolescent overweight. Engaging in dietary changes with exercise, as recommended by NICE guidelines, is crucial in weight management (Miguet et al., 2023). Policymakers should prioritise implementing programmes that target both physical activity and diet, as well as the associated socioeconomic factors and behavioural determinants (Murphy and Demaio, 2018). Providing effective education on diet or physical activity through different media, including classroom-based lectures, face-to-face information sessions and teachings through digital or web-based resources, would increase weight loss among teenagers (Rose et al., 2017) Digital interventions and eHealth tools aimed at improving diet, physical activity, or health behaviours in children or adolescents often facilitate improvements in diet and physical activity, and sometimes in body weight or BMI (Rose et al., 2017). The use of smartphones and smartwatches and other personal digital devices, especially among the teenage population, has increased in recent years. Many of these tools are mobile and can be used to personally promote physical activity engagements and health-based education. Adopting digital intervention also provides opportunities for personalised goal setting, behaviour monitoring, and guidance, thereby enhancing modest weight reduction compared to no or minimal digital intervention (Ryan et al., 2015). eHealth and web-based weight loss interventions, particularly those tailored to individual characteristics, have shown greater efficacy in improving weight loss among adolescents (Ryan et al., 2019). This study suggests the use of multicomponent interventions that includes dietary changes, physical activity, behavioural and health education that are personalised to individual needs. Adopting digital tools in delivering and monitoring interventions is also important.

Future research

Future research should further improve on intervention designs and longitudinal investigation. Longitudinal studies would investigate the long-term effectiveness and sustainability of integrated multicomponent interventions combining dietary changes and physical activity. Understanding the course of weight management outcomes over time will inform the development of more robust intervention strategies (Allcott-Watson et al., 2024). Addressing

lifestyle factors, such as socioeconomic status and behavioural determinants in intervention design, could improve the effectiveness of individual components of the intervention and thereby improve the overall outcome of weight loss among teenagers in the United Kingdom (Goisis et al., 2016).

CONCLUSION

This study addresses the effectiveness of physical activity and dietary intervention in improving weight loss among teenagers living with obesity in the United Kingdom. Obesity among teenagers is considered a critical public health concern due to its associated behavioural and health implications. Both physical activity and dietary interventions have been proven to increase weight loss among overweight or obese teenagers, but the desired level of outcome has not been reached and the teenage population still records a high prevalence of obesity in the United Kingdom.

Several limitations have contributed to the prevalence of obesity among the teenage population. Sedentary habits, negative emotional experiences and a lack of environmental and psychological support are common limitations that prevent teenagers from achieving effective weight loss. The various limitations experienced by teenagers make it challenging to consider one intervention more effective than the other. Evidence from this study highlights the interdependence of both physical activity and dietary changes in effective weight management. This points out the need for innovative and multicomponent interventions that can fit into the contemporary world of adolescents. Utilizing digital tools and web-based programmes in delivering weight loss intervention among teenagers would also enhance positive outcome and reduce cost. Further research should focus on multi-component intervention design as well as longitudinal studies that investigate the long-term impact of these interventions.

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APPENDICES 1: DATA MATRIX

Author and Title	Country	Year	Study design	Method	Result	Conclusion
Broadbent et al., 2024: Trends in inequalities in childhood overweight and obesity prevalence: a repeat cross-sectional analysis of the Health Survey for England	United Kingdom	2024	Observational and cross-sectional study	Analysis of HSE and NCMP data between 1995 and 2019 to monitor the prevalence of childhood obesity (below 16 years) and the contribution of certain inequalities; parental education, family structure, ethnicity and area-level Index of Multiple Deprivation.	Overweight and obesity prevalence was highest among age 11 - 115 boys (27.4-42.1%) and girls (28.3-36.0%). Children from higher deprivation areas, non-white children and those from non-degree-educated or single-parent households have a rising prevalence of obesity and overweight. - contributing to increasing inequalities.	Overall levels of child overweight and obesity increased between 1995 and 2004. Since then, increases in prevalence among less advantaged groups have driven the widening of inequalities
Hobkirk et al., 2014: The metabolic	United Kingdom	2014	Cohort study	Seventy-five clinically obese adolescents	There were highly significant	A multifactorial weight loss programme with

inter-relationships between changes in waist circumference, triglycerides, insulin sensitivity and small, dense low-density lipoprotein particles with acute weight loss in clinically obese children and adolescents				(aged 8–18 years) undergo a multifactorial weight loss programme between 2004 and 2006. Pre- and post-measurements of Anthropometric, body composition, and cardiometabolic risk factors were taken.	reductions in anthropometric, body composition and cardiometabolic risk factors in response to acute lifestyle modification.	outcome of acute and highly significant weight loss improve the Atherogenic Lipoprotein Phenotypes in clinically obese children and adolescents
Sides et al., 2024: The lived experience of weight loss maintenance in young people	United Kingdom	2024	Qualitative study (interpretative phenomenological analysis design)	Six semi‐structured interviews were carried out to understand the barriers and motivating factors of weight loss management among young people aged 8–17 years in England	The study identifies conflicting priorities, environmental triggers, behavioural control, psychosocial skills and social support as factors that can be addressed to improve weight loss management among young people.	Young people struggle with weight loss and weight loss management due to psychosocial and environmental barriers.
Constable Fernandez et al., 2023: Subjective and objective indicators of neighbourhood safety and physical activity	United Kingdom	2023	Longitudinal cohort study	This study used Linear regression and zero-inflated Poisson models to examine associations between subjective and objective	Adolescents living in areas with a high violent crime rate or who feel unsafe in their neighbourhood reported less physical	Geographic and social safety are perceived objectively and subjectively by adolescents and their parents thereby reducing the opportunity to

among UK adolescents				indicators of safety and physical activity within the United Kingdom Millennium cohort study.	activity engagement.	engage in outdoor physical activities
Fairclough et al., 2023: Reference values for wrist-worn accelerometer physical activity metrics in England children and adolescents	United Kingdom	2023	Cross-sectional design	Collection of data from ten studies that used wrist-worn accelerometers to monitor lengths of waking hours by age groups and day types, the waking hours of youth in school Years (Y) 1&2, Y4&5, Y6&7, and Y8&9. Average acceleration, intensity gradient, and MX measures produced by mean ENMO and MAD were computed and reported as weighted week averages.	Girls and participants who were less active had the highest activity levels. The Y8&9 group had the lowest level of physical activity, especially when compared to the Y1&2 group, and boys were more active than girls.	physical activity is lowest in year 8 & 9 school children (age 12 – 14 years) when compared to younger age participants. This study emphasised an age-related gradual decline in both genders
Zwolinskey et al., 2016: Physical Activity and Sedentary Behavior Clustering: Segmentation to Optimize Active Lifestyles	United Kingdom	2016	Observational between-subjects design	Using an observational between-subjects method, data on total daily activity were obtained from a non-probability sample of 22,836 people. A two-step	The "Ambulatory & Active" group was more active, much younger, had a higher percentage of males, and showed lower Indices of	Policies and interventions that discourage sedentary behaviour and promote light-intensity exercise in its place could be beneficial to

				hierarchical cluster analysis was used and considerable cluster differences were evaluated using univariate analysis.	Multiple Deprivation. On the other hand, the "Sedentary & Low Active" group sits for ≥8 hours a day and engages in less physical exercise. They were the oldest, had the highest percentage of females, and exhibited moderate indicators of multiple	reducing obesity prevalence.
Solmi et al., 2021: Changes in the Prevalence and Correlates of Weight-Control Behaviors and Weight Perception in Adolescents in the UK, 1986-2015	United Kingdom	2021	Repeated Cross-sectional study	This study analysed data from repeated cross-sections from successive longitudinal birth cohort studies. Samples include United Kingdom adolescents aged 14 to 16 years from 3 birth cohorts: the British Cohort Study 1970, the Avon Longitudinal Study of Parents and Children, and the Millennium Cohort Study.	The population of obese adolescents who are engaging in weight-loss by dieting has increased over the last 30 years. 44 percent of age 14 are dieting to lose weight in 2015. In 2015, 44.4% had engaged in dieting while 60.5% had exercised to lose weight. This is a higher proportion when compared to 37.7% and 6.8%	Weight-control practices and poor mental health may have been unintentionally affected by the increased emphasis on obesity prevention. Obesity-related public health initiatives should focus on preventing disordered eating habits and take into account the detrimental effects on mental health.

					respectively in 1986. The percentage of adolescents trying to lose weight grew from 28.6% in 2005 to 42.2% in 2015. These behaviors are more likely reported in girls but prevalent increase was seen more in boys over time.	
Gc et al., 2019: Cost-effectiveness of physical activity interventions in adolescents: model development and illustration using two exemplar interventions	United Kingdom	2019	Markov cohort simulation model	A Markov cohort simulation model was constructed to be capable of estimating long-term costs and health impacts of changes in activity levels during adolescence. Univariate and probabilistic sensitivity analyses were used to gain insight to the incremental cost-effectiveness ratio as measured by cost per quality-adjusted life year, in two exemplar school-based interventions.	The model estimates the long-term impact of modifications in physical activity. The approach may be used to assess a variety of physical activity interventions for teenagers.	Either engaging in a simple low-cost physical activity intervention or a complex high-cost intervention produces similar health outcomes in the long term

Moore et al., 2023: Facilitators and barriers to physical activity among English adolescents in secondary schools: a mixed method study	United Kingdom	2023	Cross-sectional survey design	Using the COM-B domains, data from pre-intervention online survey distributed to 233 schools were cross-tabulated to analyse activity levels and behavioural obstacles for both active and inactive groups. The research team classified obstacles according to their relevant domain in the TDF mapped to the COM-B using a seven-step procedure.	52 barriers and 68 behaviors that restrict adolescents from having an effective engagement with physical activity were identifies. Main barriers include 'lack of confidence', 'feeling self-conscious (or shy)', and 'lack of partner'. These are common to both active and inactive group and among both genders. The inactive group reported an average of 2.4 barriers per individual which is slightly higher to that of the active group which is an average of 2.3 barriers. There was no significant difference among genders of both active and inactive groups, but girls reported more main barriers when	The prevalent barriers to physical activity are clustered into psychological and social barriers which point to areas to approach when promoting physical activities among adolescents

					compared to boys.	
Strain et al., 2020: How are we measuring physical activity and sedentary behaviour in the four home nations of the UK? A narrative review of current surveillance measures and future directions	United Kingdom	2020	Descriptive Comparative Analysis	Information was obtained from national survey data that monitors physical activity and sedentary behaviours over a decade.	This study highlights the compliance of teenagers to physical activity guidelines: 21% (Male: 24%, Female: 18%) from Health Survey in England and 20% (20% in male and 14% in female) in Active Lives: Children and Young People Survey.	It is difficult to track the proportions of the population in the United Kingdom who fulfil the requirements for physical activity. The introduction of device-based measures should be considered to improve comparability among the four home countries.
Reece et al., 2015: I just don't want to get bullied anymore, then I can lead a normal life'; Insights into life as an obese adolescent and their views on obesity treatment	United Kingdom	2015	Qualitative Study	This study conducted one-to-one interviews with overweight and obese adolescents attending a community weight management intervention in South Yorkshire	Adolescent attributed their patterns of eating and overeating to social and emotional factors or triggers. They have knowledge of the right intervention to lose weight but the inability to form new behaviours and healthy habits that can be sustained in a family or social environment pose a significant challenge in	Weight loss interventions should be designed with the complex experiences of obese youth in mind, with an emphasis on long-term lifestyle modifications.

					achieving long term weight loss.	