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The Behavior Prevention Of Obesity In Adolescents With Self Efficacy: A Systematic Review

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ABSTRACT
Obesity defined as the accumulation of abnormal fats and in obesity measurements usually use body mass index (BMI). Obesity in adolescents greatly affects health, physical, and cognitive so it is necessary to do preventive behavior. The purpose of this research literature is to find out how to prevent obesity in adolescents by means of self-efficacy that has formed in adolescents. The literature search strategy identified 605 by identifying various articles across six databases. Scopus, Science direct, Pubmed, Proquest, Sage, and Cinahl were explored to find relevant articles published from 2016 to 2021 with the keywords "Preventive Body Weight" or "Preventive. Obesity "AND" Self-Efficacy "or" Self-Concept "AND" Adolescence "or" Youth "or" Youth "" in titles, abstracts, or keywords. The most common type of research is a randomized control trial. This study shows several general characteristics such as type of study, time of evaluate and type of behavior that can trust adolescents to do and implement obesity prevention by controlling eating behavior, doing moderate to strong physical activity (MVPA), improving lifestyle behavior, Nutrition / Eating Habits, Parents and School Influence. Self-efficacy is very important in the early stages, modifiksi and maintenance of obesity prevention behavior.

Keywords: Obesity, Adolescents, Self-Efficacy

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BACKGROUND

Non-communicable diseases (NCD) are problems that threaten the health of every individual globally. The WHO report on the prevention of chronic disease states that obesity is a major risk factor for non-communicable diseases (Becker et al., 2018). The growth of modern times and increased life expectancy can lead to an increase in the burden of non-communicable diseases related to life style (S. K. Ong et al., 2017). Obesity is an abnormal or excessive accumulation of fat in the body. In measuring obesity, usually using body mass index (BMI), a person's weight (in kilograms) divided by the square of his height (in meters). BMI categories are calculated according to World Health Organization guidelines: underweight (<18.5 kg / m²), normal weight (18.5–24.9 kg / m²), overweight (25– 29.9 kg / m²) and obesity (≥ 30 kg / m²) (Becker et al., 2018).

Obesity in adolescents has been recognized as a global pandemic. During the last three decades, the prevalence of overweight and obesity in adolescents has continued to increase in several regions and countries around the world (Bentham et al., 2017). According to the World Health Organization (Who, 2020), 340 million children and adolescents are obese (Bentham et al., 2017). Adolescence is a period that marks the transition from childhood to adulthood and classically covers ages between 12 and 18 years (Jaworska & MacQueen, 2015). Adolescents are the subject of improving global public health with prevention strategies as the most effective public health intervention and a multi-component approach involving dietary modification and support for a healthy lifestyle consisting of regular physical activity and behavioral interventions has been shown to be beneficial in preventing obesity (Dabas & Seth, 2018).

Self-efficacy is defined as an individual's belief in the ability to change behavior to achieve his goals in various situations (Bandura, 2004). Over time The effectiveness of behavioral health theories that lead to behavior change. Self-efficacy has been associated with adoption and engagement in many health behaviors, including smoking cessation and cancer screening (Emmons et al., 2005); (Gwaltney, Metrik, Kahler, & Shiffman, 2009); (M. Christopher, 2016). In addition, self-efficacy has been studied extensively as a psychosocial correlation and predictor of weight change and obesity prevention behavior (Jeffery, 2004), specifically designed to combine strategies to increase self-efficacy to increase increased physical activity, Healthy Eating Behavior in weight control.

In other studies, self-efficacy is also mentioned as a means of prevention and a key predictor of effective social cognitive theory in physical activity-based interventions (Warner et al., 2014). For example, participation in physical activity for preventive behavior (Koring et al., 2012). Research has shown that self-efficacy is one of the most consistent predictors of adolescence (Craggs, Corder, Van Sluijs, & Griffin, 2011). Systematic Review This review is to analyze obesity prevention behavior in adolescents with the concept of self-efficacy**.**

METHODS

Study Design

The source of the articles in this systematic review used research databases such as Scopus, Science direct, Pubmed, Proquest, Sage, and Cinahl. Additional articles are selected by article unless they are included in this systematic review.

Keywords and Search Terms

Search for articles in the database using the hep bolean operator with a combination of keywords and search terms as follows: “Preventive Body Weight” or “Preventive

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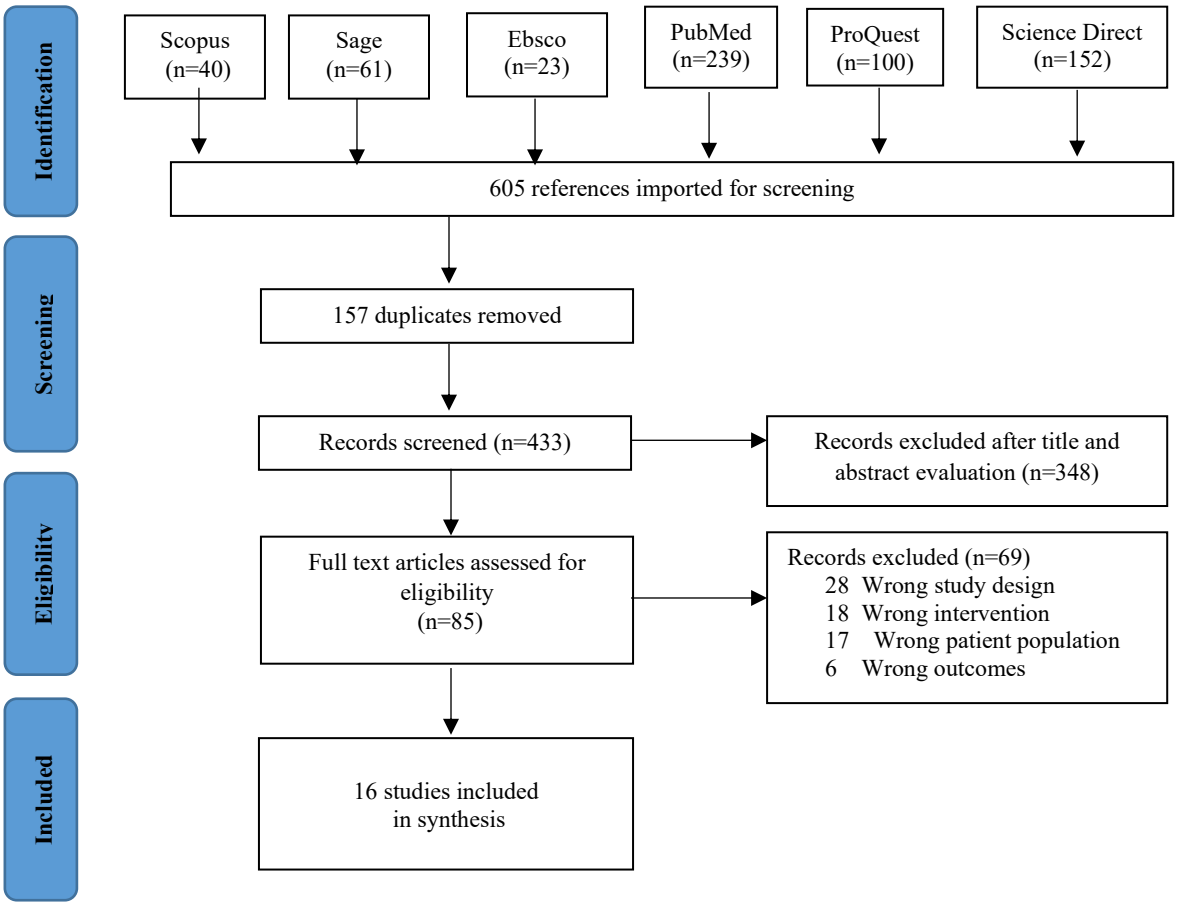
Obesity" AND "Self-Efficacy" or "Self-Concept" AND "Adolescence" or "Teenagers" or "Youth" During 2016-2021.

Article Selection

The preparation of this systematic review follows the flowchart diagram and checklist guidelines established by PRISMA (Optional Reporting Items for Systematic Review and Meta Analysis) in 2009. We obtained articles from all research electronic databases using a total of 605 documents. After conducting the first-stage screening by means of title and abstract evaluation, the remaining 85 documents were deemed eligible. The second stage is filtering the full text of 69 selected articles, then before going to the Critical assessment stage, the remaining 16 journals are in accordance with the questions and research objectives contained in this systematic review.

During the screening of articles, three reviewers were tasked with selecting titles, abstracts and keywords relevant to the inclusion criteria. The reviewer notes the reasons why a study is considered relevant for inclusion in this systematic review. Next, the other two reviewers will review the studies that have been selected to match the questions or objectives of the systematic review. In an effort to minimize the risk of the study input being wrong or not meeting the criteria, all reviewers conducted a joint discussion to obtain agreement. The process of selecting this article is shown in more detail in the PRISMA 2009 Flow Diagram (Figure 1).



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Population, Samples, and Sampling

We use PICOS framework to identify the articles, start from population, intervention, comparator, outcome and study design.

Tabel 1. PICOS Framework

PICOS	Inclussion	Exclussion
Population	Population in this study are Adolescence between 12 and 18 years	Population does not child, adult and elderly
Intervention	intervention with self-efficacy to prevent obesity in adolescents	Pharmacological treatment to prevent obesity
Comparators	The comparison is a combination of Eating Behavior, Physical Activity, Eating Behavior and Multidisciplinary lifestyle interventio	There are no exceptions
Outcome	IMT normal	Studies that do not address the effects of self-efficacy on obesity prevention
Study design	RCT, Quasy experimental, experimental study	Systematic review, cross sectional
Years of publication	2016-2020	Before 2016

Risk of Bias

The risk of bias was measured using The JBI Critical Appraisal to assess the quality of each study. Studies with RCT research designs were assessed using the JBI Critical Appraisal Checklist. The checklist consists of some questions with answers to "yes", "no", "unclear" and "not valid". An assessment score that reaches a minimum of 50% then meets the critical appraisal with the cut-off point value agreed upon by the researcher. We did not include studies with scores below 50% to avoid bias in results and discussion. The JBI scores for each journal in this review >50 %.

Tabel 2. The JBI Critical Appraisal tools

No	Title (Sitasi)	Kriteria (Jika ada di beri "√")													Hasil
		1	2	3	4	5	6	7	8	9	10	11	12	13	(%)
1	Importance of Self-Efficacy in Eating Behavior and Physical Activity Change of Overweight and Non-Overweight Adolescent Girls Participating in Healthy Me: A Lifestyle Intervention with Mobile Technology (Dzielska, Mazur, Nał¸ Ecz, Oblací Nska, & Fijałkowska, 2020)	√	√	√	√	√	-	√	√	√	√	√	√	√	92,30
2	Self-Efficacy, Planning, or a Combination of Both? A Longitudinal Experimental Study Comparing Effects of Three Interventions on	√	√	√	-	√	√	√	√	√					88,88

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	Adolescents' Body Fat (Dzielska et al., 2020)														
3	Secondary benefits of the families improving together (FIT) for weight loss trial on cognitive and social factors in African American adolescents (Sweeney, Wilson, Loncar, & Brown, 2019)	√	√	√	√	-	-	√	√	√	√	√	√	√	84,61
4	The Effect of a Multidisciplinary Lifestyle Intervention on Obesity Status, Body Composition, Physical Fitness, and Cardiometabolic Risk Markers in Children and Adolescents with Obesity (Seo et al., 2019)	√	-	√	√	√	√	√	√	√					88,88
5	Assessment of the Efficacy of Physical Activity Level and Lifestyle Behavior Interventions Applying Social Cognitive Theory for Overweight and Obese Girl Adolescents (Bagherniya, M et all, 2018)	√	√	√	-	-	√	√	√	√	√	√	√	√	84,61
6	The Effect of Self-Efficacy on Behavior and Weight in a Behavioral Weight Loss Intervention (Nicholas Dias, Yung Peng, 2017)	√	√	√	-	√	√	√	√	√	√	√	√	√	92,30
7	Transtheoretical Model Based Exercise Counseling Combined with Music Skipping Rope Exercise on Childhood Obesity (Ham, Sung, Lee, Choi, & Im, 2016)	√	√	-	√	√	√	√	√	√					92,30
8	Improved confidence in performing nutrition and physical activity behaviours mediates behavioural change in young adults: mediation results of a randomised controlled mHealth intervention (Partridge, McGeechan, Bauman, Phongsavan, & Allman-Farinelli, 2017)	√	√	-	-	√	√	√	√	√	√	√	√	√	84,61
9	A Mobile Health Lifestyle Program for Prevention of	√	√	-	√	√	√	-	√	√	√	√	√	√	84,61

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	Weight Gain in Young Adults (TXT2BFiT): Nine-Month Outcomes of a Randomized Controlled Trial (Allman-Farinelli et al., 2016)														
10	Lifestyle Interventions and Weight Control of Adolescents With Abdominal Obesity: A Randomized Controlled Trial Based on Health Belief Model(Nourian, Kelishadi, & Najimi, 2017)	√	√	-	√	√	√	-	√	√	√	√	√	√	84,61
11	Effectiveness of cognitive-behavioral therapy on nutrition improvement and weight of overweight and obese adolescents: A randomized controlled trial (Miri et al., 2019)	√	√	√	√	-	-	√	√	√	√	√	√	√	84,6
12	Knowledge, Attitudes, Self-Efficacy, and Healthy Eating Behavior Among Children: Results From the Building Healthy Communities Trial (Kulik et al., 2019)	√	√	√	√	√	√	√	√	√					100
13	Benefits of Activity-Based Interventions among Female Adolescents Who Are Overweight and Obese (Bonney, Ferguson, Burgess, & Smits-Engelsman, 2019)	√	√	√	√	-	√	√	√	√	√	√	√	√	92,30
14	The Healthy Primary School of the Future: study protocol of a quasi-experimental study (Miri et al., 2019)	√	√	√	√	-	√	√	√	√					88,88
15	Adapting family-based treatment for paediatric obesity: A randomized controlled pilot trial (Loeb et al., 2019)	√	√	√	√	√	√	√	√	√	√	√	√	√	100
16	The Effects of If-Then Plans on Weight Loss: Results of the McGill CHIP Healthy Weight Program Randomized Controlled Trial (Knäuper et al., 2018)	√	√	√	-	√	-	√	√	√	√	√	√	√	92,30

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Data Synthesis

Qualitative and quantitative analyses were used for this review. The results presented narratively based on each outcome.

RESULTS

General Characteristics

Based on the 16 articles analyzed (Table), the most common type of study was a randomized control trial with 11 articles (68.75%), and the most common time for evaluating obesity prevention behavior was 6 months with 3 articles (18). 75%). Various behaviors can form self-efficacy in adolescents to carry out and implement obesity prevention behaviors.

Table 3. General characteristics of selected studies (n = 16)

Category	n	%
Year of Publishing		
2016	2	12,5 %
2017	3	18,75%
2018	2	12,5%
2019	7	43,75%
2020	2	12,5%
Types of behavior that can form self-efficacy to prevent obesity in adolescents		
Eating Behavior and Physical Activity	4	25%
Family Influence (Families Improving Together (FIT) for Weight Loss trial and Adapting family-based treatment)	2	12,5%
Multidisciplinary lifestyle intervention	5	31,25%
Physical activity intervention (MVPA/ moderate to vigorous activity, Model Based Exercise, and Wii Fit Training)	3	18,75%
Knowledge, Attitudes, Self-Efficacy, and Healthy Eating Behavior community setting	1	6,25%
School Influence/ healthy school interventions	1	6,25%
Type of study		
RCT	11	68,75%
experimental study	2	12,5 %
quasi-experimental study	3	18,75%
Time of evaluate		
12 weeks	1	6,25%
14 weeks	1	6,25%
15 weeks	1	6,25%
16 weeks	2	12,5 %
24 weeks	1	6,25%
2 months	1	6,25%
6 months	3	18,75%
8 months	1	6,25%
9 months	1	6,25%
10 months	1	6,25%
1 year/12 months	1	6,25%
2 years	1	6,25%
4 years	1	6,25%

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The main findings are presented in table 3 about 3 types of behavior that form a lot of self-efficacy to prevent obesity in adolescents, among 5 studies implementing Multidisciplinary lifestyle intervention (31.25%), 4 studies implementing Eating Behavior and Physical Activity (25%), 3 studies implementing Physical activity intervention (MVPA / moderate to vigorous activity, Model Based Exercise, and Wii Fit Training) (18.75%). Table 3 also reports the type and time of intervention used in the study, 2 times the intervention was mostly at 6 months (18.75%) and 16 weeks (12.5%).

DISCUSSION

In adolescence, it is a transitional period from childhood to adulthood so it needs health behavior intervention and consolidation to form a healthy lifestyle (Dick & Ferguson, 2015). Lifestyle health promotion is an intervention to stop the increasing incidence of obesity in adolescents. Self-efficacy is defined as an individual's belief in their ability to make the behavioral changes necessary to achieve their goals in a wide variety of situations (Bandura, 2004). Self-efficacy has been widely studied as a psychosocial correlate and a predictor of changes in weight and weight-related behavior, this is also reinforced by research from (Jeffery, 2004) which states that obesity prevention behavior is specifically designed to combine strategies to increase self-efficacy to promote improvement. in food intake, physical activity, and weight loss. In table 3 it is also found that the types and types of behavior that can form self-efficacy to prevent obesity in adolescents;

1. Eating Behavior and Physical Activity
   Eating habits that are usually measured before or after research on the eating behavior of vegetables, fruits, sweet foods/drinks, fast food, and the frequency of eating every day can affect adolescent weight. Nowadays, it is common for adolescents to increase their consumption of large meals, sugary drinks, and fatty foods, which are directly associated with increased overweight and obesity rates (Bastianello, Epkey, & McMullin, 2012). Meanwhile, the activity pattern is the activity of moving every day according to the ability and condition of the body which consists of light, moderate to heavy physical activity. Weight loss in adolescents is carried out by intervening with eating habits, especially increasing intake of vegetables and fruit and increasing physical (Partridge, Mcgeechan, Bauman, Phongsavan, & Allman-Farinelli, 2016).
2. Family Influence (Families Improving Together (FIT) for Weight Loss trial and Adapting family-based treatment)
   Parents greatly influence the eating habits of adolescents in a physical and social context (Lin Tzou & Chu, 2012). For example, adolescents are more likely to eat foods that are accessible and often available in their homes (Couch et al., 2014) (J. X. Ong, Ullah, Magarey, Miller, & Leslie, 2017). Parental modeling was also closely related to their children's eating habits, so fruit and vegetable intake was found to be highly correlated between parents and their children (Draxten, Fulkerson, Friend, Flattum, & Schow, 2014)(J. X. Ong et al., 2017). Regular family diets, which provide opportunities for parent-child interactions, predict healthier eating habits (for example, higher consumption of fruits, vegetables, and calcium-rich foods) and weight status in children and adolescents (Hammons & Fiese, 2011) (Neumark-Sztainer, Larson, Fulkerson, Eisenberg, & Story, 2010).
3. Multidisciplinary lifestyle intervention
   Prevention and treatment of obesity in adolescence is complex and requires a multicomponent approach that involves the family and addresses individual and social aspects, (Rajmil et al., 2017) focuses not only on physical activity but also on nutrition

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and increasing motivation towards a healthy lifestyle (Ling, Robbins, & Wen, 2016). Lifestyle in the intervention includes a behavioral component and cognitive skills training that focuses on weight-related behaviors (Eve A. Herrera, 2004). Interventions with behavioral components that change diet and activity patterns such as increased physical activity and reduced immobility have the greatest impact on weight loss in overweight adolescents (Eve A. Herrera, 2004). Obese children and adolescents need appropriate clinical judgment. Eating problems and body weight are recognized as abnormal daily patterns including cognitive and behavioral cycle disorders (Eve A. Herrera, 2004). Handling weight control problems requires a comprehensive approach because these problems occur in adolescents, families, and the social environment through a self-efficacy approach with a process of changing habits and attitudes that support mental disorders, therefore this method is the right choice in treating obesity (Wilfley, Kolko, & Kass, 2011).

4. Physical activity intervention (MVPA/ moderate to vigorous activity, Model Based Exercise, and Wii Fit Training)
   Increased use of technology, such as television, video games, and computers has been correlated with increasing rates of obesity among children and adolescents. (Bastianello et al., 2012), found that as the use of television, computers, and video games increases, the likelihood of obesity increases. According the Committee on Nutrition, National Survey data have shown that 25% of children aged 8 to 16 years report watching at least 4 hours of television per day (Gidding et al., 2005). Technological improvements also have an impact on the lack of physical activity in adolescents, which can lead to an increase in obesity. One of the strongest predictors of obesity in adolescence is that regular physical activity is an important part of maintaining a healthy lifestyle and maintaining an ideal body weight (Bastianello et al., 2012) this is also in line with research (Becofsky, Baruth, & Wilcox, 2014) states that changes in physical activity self-efficacy are positively associated with changes in physical activity behavior.
5. Knowledge, Attitudes, Self-Efficacy, and Healthy Eating Behavior
   Increased knowledge, attitudes, and beliefs about a topic and behavioral abilities and self-efficacy for healthy eating are often precursors of behavior change, according to several theories of behavior change (Kulik et al., 2019),, this is also in line with research (Sanchez, 1992) which states that with knowledge, attitudes, and behavior towards a diet that can increase the risk of coronary heart disease, it can be used as a recommendation for increasing self-efficacy.
6. School Influence/ healthy school interventions
   The school setting is the ideal environment to promote enabling health promotion (education, social environment, physical environment, school health policy, nurture) to be modified, thereby facilitating successful implementation (L.W. Green, 2001). For example, school settings offer the advantage of facilitating compliance with interventions and also enabling preventive action to reach children from a wide variety of socio-economic and ethnic backgrounds (Neumark-Sztainer et al., 2010). Besides, there is some preliminary evidence that lifestyle interventions improve academic achievement, thereby helping schools to achieve their main academic goals (Hollar et al., 2010).

In table 3 there are various kinds of time evaluations for obesity ranging from short-term with a time of 12 weeks to long-term 4 years and at most for time evaluations of 3 articles (18.75%). The evaluation builds on a scientific foundation that aims to better

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understand the complex biology of obesity, and on proven efficacy interventions to combat the epidemic. This evaluation plan includes key actions to improve evaluation efforts containing guidelines for organizing and implementing evaluation-related efforts (frameworks and suggested approaches and methods) to achieve the desired outcome plan (eg ideal body weight) (CEPOP Committee on Evaluating Progress of Obesity Prevention, 2014). BMI has been shown to have a direct correlation with functional ability; Psychosocial function decreases with increasing BMI (Lisa Y. Gibson, Susan M. Byrne, Eve Blair, Elizabeth A. Davis, Peter Jacoby, 2008). There is a negative correlation between obesity and self-esteem and this relationship grows stronger with age (Walker, L., & Hill, 2009). Adolescent body dissatisfaction and body image attention were associated with the accuracy of weight perception regardless of weight status, adolescents who considered themselves overweight had a stronger intention to lose weight (Jankauskiene & Baceviciene, 2019). . Healthy lifestyles will not only improve physical health, but they will also improve and enhance mental health (Wang & Veugelers, 2008).

CONCLUSION

Adolescents with higher self-efficacy change their perceptions of themselves. They know how to spend their time and energy in the best possible way because they trust in their ability to overcome adversity and improve performance resulting in obesity prevention behavior. Obesity prevention behaviors are specifically designed to incorporate strategies to increase self-efficacy in order to promote improvements in dietary intake, physical activity, and multidisciplinary lifestyle intervention. As a result, higher self-efficacy leads to better behavior.

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CONFLICT OF INTEREST

No conflict of interest have declared

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APPENDIX

Tabel 4 Summary of selected studies

No	Title, Authors, Year	Design Study	Time Evaluation	Results
1	Importance of Self-Efficacy in Eating Behavior and Physical Activity Change of Overweight and Non-Overweight Adolescent Girls Participating in Healthy Me: A Lifestyle Intervention with Mobile Technology (Dzielska et al., 2020)	Design : RCT Sampel : 1111 individuals 15-year-old girls Variable: eating behavior and physical behavior Intrumen: Health Behavior Indicators Analysis generalized linear models	1. Study 1—at the beginning of the program implementation (November 2017). Study 2. after the intervention completion (June 2018). 3. Study three months after the intervention completion (September 2018)	After adjusting for other factors, a significant interaction between body weight status and level of self-efficacy as predictors of HBI changes was confirmed. The program turned out to be more beneficial for overweight girls
2	Self-Efficacy, Planning, or a Combination of Both? A Longitudinal Experimental Study Comparing Effects of Three Interventions on Adolescents' Body Fat (Dzielska et al., 2020)	Design: This experimental study Sampel Participants were adolescents (N= 1217; Mage = 16.45, SD = 0.70, age range 14–18 years) Variable physical activity, Body fat, BMI, intention, Self Efficacy Intrumen: moderate-to-vigorous physical activity (MVPA), Analysis SEM	The measurement was conducted at baseline (T1), two-month follow-up (T2), and fourteen-month follow-up (T3)	Similar small increases of body fat were found across the three intervention groups, but the increment of body fat was significantly larger in the control group. On average, differences between control and intervention groups translated to approximately 1% of body fat. Effects of the interventions on body fat were mediated by relevant social cognitive variables and MVPA. A lower increase of body fat was found among intervention group participants who had access to newly-built MVPA facilities
3	Secondary benefits of the families improving together (FIT) for weight loss trial on cognitive and social factors in African American adolescents	Design: RCT Sample: 815 41 parents and 41 adolescents Variable: Health outcomes	16-week intervention with two phases	Across both adolescents and parents, the cognitive outcomes were the most frequently discussed outcomes, including self-regulation, monitoring strategies for diet, establishing long-term goals, and ultimate relapse

	(Sweeney et al., 2019)	Social Outcomes Cognitive outcome Intrumen: motivational plus family weight loss (M + FWL) Analysis : Qualitative analysis		prevention. Parents made a greater number of comments about the social outcomes, including family support, group support, self-efficacy, and family connectedness, whereas adolescents made a greater number of comments about positive family communication
4	The Effect of a Multidisciplinary Lifestyle Intervention on Obesity Status, Body Composition, Physical Fitness, and Cardiometabolic Risk Markers in Children and Adolescents with Obesity (Seo et al., 2019)	Design : quasi-experimental intervention trial Sampel : , 103 participants aged between six and 16 years (63 boys and 40 girls), with a BMI ≥85th percentile of age and sex-specific BMI according to the 2007 Korean National Growth Charts Variable: two types of lifestyle interventions for obese children and adolescents were compared Intrumen: Childhood and Adolescents Obesity via Activity and Nutrition (ICAAN) Analysis : The paired t test	16-week intervention program	This study also demonstrated that in children and adolescents with obesity, the intervention achieved positive effects on body composition, physical fitness, and cardiometabolic risk markers. At the 16-week follow-up, significant improvement over the intervention period was found in the exercise group compared with the usual care group
5	Assessment of the Efficacy of Physical Activity Level and Lifestyle Behavior Interventions Applying Social Cognitive Theory for Overweight and Obese Girl Adolescents (Bagherniya, M et all, 2018)	Design: Randomized controlled trial study. Sampel: 172 overweight and obese girl students Variable: compared the two intervention groups with the control group with variables Body mass	15-week intervention program	School-based intervention using SCT led to an increase in the duration of physical activity and reduction in the duration of screen time in overweight and obese adolescent girls

		index, Waist circumferences, Minutes of daily physical activity, Hours of sedentary behaviors, Physical activity self-efficacy, Physical activity social support, Physical activity outcome expectation, Physical activity outcome expectancies, Physical activity intention, Physical activity perceived barriers Intrumen: Body Mass Index (BMI) and Waist Circumference (WC) were measured and questionnaires about duration of physical activity, duration of screen time (watching television and playing computer games) and psychological variables regarding the SCT constructs were obtained. Analysis Mann-Whitney *U* tests		
6	The Effect of Self-Efficacy on Behavior and Weight in a Behavioral Weight Loss Intervention (Nicholas Dias, Yung Peng, 2017)	Design: RCT Sampel : 246 participants Variabel: Eating self-efficacy (ESE), physical activity self-efficacy (PASE), calories consumed, minutes of moderate-to-vigorous	12 months	Change in ESE from baseline to 6 months was associated with calories consumed at 12 months and 12-month percent weight loss (PWL), but the mediated relationship was not significant. Baseline PASE was not associated with average MVPA Corresponding at 6 and 12 months or 12-month weight change, but change in PASE

		physical activity (MVPA) Intrument the Weight Efficacy Lifestyle Food Frequency Questionnaire, the SenseWear Pro Armband (BodyMedia) Analysis: SAS 9.3 (SAS Institute, Cary, NC)		from baseline to 6 months was associated with 12-month weight change through its effect on MVPA at 12 months.
7	Transtheoretical Model Based Exercise Counseling Combined with Music Skipping Rope Exercise on Childhood Obesity (Ham et al., 2016)	Design : The experimental study with a nonequivalent pretest and posttest design. Sampel 75 overweight/obese children participated in the study Variable: BMI, Self efficacy, pre-post exercise Intrumen: Fourteen items of decisional balance, developed by Marcus and Owen and Five questions developed by Marcus and Owen were used to measure exercise self-efficacy, which was translated and modi- fied by Korean researchers for Korean children Analysis Independent t tests and chi-square tests	6-month follow-up	TTM-based exercise intervention is effective in maintaining BMI and improving self-efficacy of overweight/obese children. The TTM-based counseling combined with exercise classes has potential to control weight among overweight/obese children, while involvement of parents and children in the development of the theory-based interven- tion may generate further benefits regarding health and well-being of overweight/obese children.
8	Improved confidence in performing nutrition and	Design: RCT	nine-months	Indirect effects of improved nutrition and physical activity behaviours at three- and

	physical activity behaviours mediates behavioural change in young adults: mediation results of a randomised controlled mHealth intervention (Partridge et al., 2017)	Sampel 250 participants Variable BMI, Psychosocial variables, Physical activity, Obesity risk reduction behaviors Intrumen: mHealth-program, TXT2BFiT Analysis SAS (version 9.2 SAS Institute Inc., Cary NC 236 US)		27 nine-months in the intervention group were explained by changes in self-efficacy, accounting 28 for 8%–37% of the total effect
9	A Mobile Health Lifestyle Program for Prevention of Weight Gain in Young Adults (TXT2BFiT): Nine-Month Outcomes of a Randomized Controlled Trial (Allman-Farinelli et al., 2016)	Design: RCT Sampel 250 participants . Variable: BMI, Psychosocial variables, Physical activity Intrumen: Mobile Health TXT2BFiT Analysis : t tests	A 12-week	Intervention participants weighed less at 12 weeks compared with controls (model β=−3.7, 95% CI −6.1 to −1.3) and after 9 months (model β=− 4.3, 95% CI − 6.9 to − 1.8).
10	Lifestyle Interventions and Weight Control of Adolescents With Abdominal Obesity: A Randomized Controlled Trial Based on Health Belief Model(Nourian et al., 2017)	Design: RCT Sampel: 90 obese adolescents 12 - 18 years Variable: Perceived susceptibility, BMI, self efficacy, Cues to action Intrumen: The HBM instrument, The self-efficacy scale Analysis the multivariate test	6 months	significant effects of interaction of time and group for knowledge scores ($F = 101.19$; $P < 0.001$), perceived susceptibility ($F = 5.01$; $P = 0.02$), self-efficacy ($F = 6.18$; $P = 0.01$) and waist circumference ($F = 5.643$; $P = 0.004$)
11	Effectiveness of cognitive-behavioral therapy on nutrition improvement and	Design : RCT	6-month period	The waist circumference, BMI, waist-hip ratio, and fat mass were significantly

	weight of overweight and obese adolescents: A randomized controlled trial (Miri et al., 2019)	Sampel 110 adolescents (age 13-18 years) Variable: Psychosocial health, physical activity, and quality of life, Dietary and anthropometrical outcomes Intrumen: Child Dietary Self-Efficacy Scale (CDSS), Physical Exercise Self-Efficacy Scale, Health-related quality of life Analysis : ANCOVA		decreased in the CBT group in the six-month follow-up compared with the TAU group (p-values<0.005). The CBT group significantly improved their psychosocial health, physical activity, and health-related quality of life (p-values<0.001).
12	Knowledge, Attitudes, Self-Efficacy, and Healthy Eating Behavior Among Children: Results From the Building Healthy Communities Trial (Kulik et al., 2019)	Design : Quasi-experimental Sampel : 628 fifth-grade youth Variable: healthy eating knowledge, attitudes, self-efficacy, and behavior Intrumen: The Student Attitudes and Self-Efficacy (SASE) scale Analysis the chi-square	8-month	The Student Attitudes and Self-Efficacy (SASE) scale had good measurement model fit. BHC group's healthy eating knowledge and behaviors increased significantly, while SASE remained moderate. For both groups, the students' knowledge and SASE significantly predicted their healthy eating behaviors; however, the intervention group accounted for a greater amount of variance (35% vs. 26%)
13	Benefits of Activity-Based Interventions among Female Adolescents Who Are Overweight and Obese (Bonney et al., 2019)	Design This study RCT Sampel 52 participants Variable: BMI, Anaerobic fitness, Aerobic fitness, Self Efficacy	14 weeks.	Participants in both groups demonstrated significant improvement in aerobic fitness and motor coordination but not self-efficacy. However, no between-group differences were observed on any of the outcomes.

		Intrumen: The Children's Self-perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA) Analysis : independent t test		
14	The Healthy Primary School of the Future: study protocol of a quasi-experimental study (Miri et al., 2019)	Design : quasi-experimental study Sampel : adolescents (N = 1200) in the southern part of the Netherlands Variabel: General health child , Socio-emotional health of chil, Physical activity, Dietary behaviour of child Intrument : SEQ-C and Manikin scale, full SEQ-C only in groups 7–8), food frequency questionnaire and dietary recall) Analysis Chi-Square	4 years	Findings show that youth empowerment significantly influences adolescents' self-efficacy, perceptions for healthy food choice, healthy eating, attitudes towards physical activity and the overall motivation for health. Gender differences exist in adolescents' self-efficacy for physical activity whereas ethnicity played a role in perceived youth empowerment and perceived barriers to healthy eating. Age was also a significant contributor in efficacy for healthy food choice and perception of healthy food availability
15	Adapting family-based treatment for paediatric obesity: A randomized controlled pilot trial (Loeb et al., 2019)	Design : This study RCT Sampel: 77 adolescent participants and their parent Variabel: BMI, Intrument: FBT-PO (adolescent module) Analysis : a two-group comparison using mixed-effects models for longitudinal data	24 weeks	Results supported our core prediction, in that weight status among adolescent study participants receiving FBT-PO remained stable while increasing among participants randomized to NEC. Attrition was high in both conditions.

16	The Effects of If-Then Plans on Weight Loss: Results of the McGill CHIP Healthy Weight Program Randomized Controlled Trial (Knäuper et al., 2018)	Design: RCT Sampel : 208 participants Variabel: BMI, Physical activity, Self-monitoring index Intrument: The McGill Healthy Weight Program Analysis Mplus version 8.0 (Muthen and Muthen).	This study presents the 3- and 12-month results of this 24-month trial.	Both groups achieved high weight losses at 3 (5.76%) and 12 (9.98%) months, with no differences between groups ($v2 < 1$). Both groups improved in blood pressure and physical activity