Obesity/Behavior

Barriers to and enablers of healthy lifestyle behaviours in adolescents with obesity: a scoping review and stakeholder consultation

M. Kebbe1, S. Damanhoury2, N. Browne1, M. P. Dyson1, T.-L. F. McHugh3 and G. D. C. Ball1

1Department of Pediatrics, Faculty of Medicine & Dentistry, University of Alberta, Edmonton, Canada, 2Department of Agricultural, Food and Nutritional Sciences, Faculty of Agricultural, Life and Environmental Sciences, University of Alberta, Edmonton, Canada, and 3Faculty of Physical Education and Recreation, University of Alberta, Edmonton, Canada

Summary

Healthy lifestyle behaviours are key to successful weight management, but have proven to be challenging to attain for adolescents with obesity. The purpose of our scoping review was to (i) describe barriers and enablers that adolescents with obesity encounter for healthy nutrition, physical activity, sedentary behaviour and sleep habits and (ii) identify gaps in the literature. We adhered to established methodology for scoping reviews. Six databases were searched (1980–June 2016) for original articles published in English or French that focused on lifestyle behaviours of 13- to 17-year-olds in paediatric weight management. Following screening and data extraction, findings of selected articles were synthesized thematically using a social ecological framework. Stakeholder consultation (n = 20) with adolescents with obesity and health professionals was completed to enhance methodological rigour. Our search yielded 17 articles for inclusion, including 546 unique participants. Barriers to healthy nutrition and physical activity were more consistently related to individual-level and interpersonal-level factors; enablers tended to be linked with interpersonal-level factors. Knowledge gaps identified related to sedentary behaviour and sleep as well as environmental and policy levels of influence. Our review revealed that some barriers and enablers were unique to adolescents with obesity, which were either within or beyond their control. These findings highlight the importance of multilevel interventions to enable healthy lifestyle behaviours for weight management.

Keywords: Adolescent, diet, exercise, paediatric obesity.

Introduction

The high prevalence (1) and adverse health risks (2,3) of obesity are well documented. Paediatric obesity can be difficult to manage successfully, further adding to its recognition as a global health concern. Adolescents, in particular, undergo physiological and behavioural alterations coupled with psychosocial adjustments, all of which can lead to a heightened risk of developing obesity and its complications. In Canada, caloric consumption and a low diet quality reach their peak in adolescence (4). Further, whereas physical activity and sports participation, especially among girls, decline from childhood to adolescence, significant increases in sedentary behaviours are observed (4). Poor health behaviours may therefore be likely contributors to the existing disparity between children and adolescents, whereby adolescents exhibit lower rates of success (5) and higher rates of discontinuation (6) in weight management.

Obesity most likely persists into adulthood (7) as do nutrition, physical activity and sedentary behaviour habits (8,9), which together with sleep, influence body-weight regulation (8–10). More specifically, the sleep–wake cycle and circadian rhythm are associated with lifestyle (e.g. nutrition (11,12), physical activity (13) and sedentary behaviour (12)) and environmental (e.g. electronic media (14)) influences. There is also evidence to support that the timing of the
and (ii) potential gaps in the literature.

behaviours related to nutrition, physical activity, sedentary behaviour and sleep (19,20), likely owing to factors that either negatively (barriers) or positively (enablers) influence their choices. To our knowledge, no review has yet synthesized the evidence in relation to lifestyle behaviours of adolescents with obesity seeking weight management. Based on the aforementioned issues and gaps, learning about barriers to and enablers of establishing and maintaining healthy lifestyle behaviours prior to becoming well-established with the transition into adulthood.

Adolescents with obesity exhibit suboptimal lifestyle behaviours related to nutrition, physical activity, sedentary behaviour and sleep (19,20), likely owing to factors that either negatively (barriers) or positively (enablers) influence their choices. To our knowledge, no review has yet synthesized the evidence in relation to lifestyle behaviours of adolescents with obesity seeking weight management. Based on the aforementioned issues and gaps, learning about barriers to and enablers of establishing and maintaining healthy lifestyle behaviours from the perspectives of adolescents with obesity may optimize their success in managing weight and inform health services and novel interventions to guide their treatment. Accordingly, the purpose of this scoping review and stakeholder consultation was to identify (i) barriers and enablers experienced by adolescents with obesity to adopt healthy lifestyle behaviours in areas of nutrition, physical activity, sedentary behaviour and sleep and (ii) potential gaps in the literature.

Methods

Based on an adaptation of the Arksey and O’Malley (21,22) methodological framework for scoping reviews, we completed the following six stages:

Stage 1: identify the scope of objectives and inquiry

Research questions

Our review aimed to address the following research questions:

1. What is the extent of the literature on barriers and enablers experienced by adolescents with obesity to change their lifestyle behaviours? What barriers and enablers are reported by adolescents with obesity?
2. Are barriers and enablers distributed differently across the four lifestyle areas of nutrition, physical activity, sedentary behaviour and sleep?
3. What are the current gaps in the literature related to barriers to and enablers of healthy lifestyle behaviours of adolescents with obesity?

Study design

Our scoping review was completed between May 2016 and May 2017. It was conceptualized (M. K. and G. D. C. B.) and reviewed by individuals with content and methodological expertise (M. P. D. and T.-L. F. M.). For the purpose of this review, healthy lifestyle behaviours were operationalized according to (i) nutrition – consumption of fewer unhealthy and more healthy foods; reduction of disordered eating, eating speed, number of servings or portion sizes; and regularization of timing of dietary intake, (ii) physical activity – participation in structured (e.g. exercise and sports) or unstructured (e.g. walking and cycling) activities, (iii) sedentary behaviour – reduction in screen time (e.g. video games) or seated time (e.g. reading) and (iv) sleep – appropriate quality and duration. In the context of the aforementioned healthy lifestyle behaviours, we defined a barrier as ‘a circumstance or obstacle that […] prevents progress’ (23) (e.g. having limited access to fruits and vegetables due to financial limitations) and an enabler as ‘a person or thing that makes something possible’ (23) (e.g. living near a recreation facility or park as a support for physical activity).

Inclusion and exclusion criteria

We included articles that (i) were published in English or French, (ii) focused on paediatric weight management, (iii) included 13- to 17-year-olds with a body mass index ≥85th percentile who were enrolled in clinics, interventions and/or programmes that were designed to treat or manage obesity and (iv) contained information on barriers and/or enablers that adolescents with obesity encountered in relation to nutrition, physical activity, sedentary behaviour and/or sleep. No restrictions were placed in regard to study setting (e.g. clinic, community, home and school), but study type was limited to primary research (e.g. qualitative studies and trials). Articles were excluded if the prior criteria were not met (e.g. barriers and enablers provided from the perspectives of parents or healthcare providers) and if adolescents presented with intellectual and/or developmental disabilities.

Stage 2: identify relevant studies

Primary searches were conducted (M. K.) from 1980 to 17 June 2016. Six electronic databases (CINAHL, EMBASE, MEDLINE, PsycINFO, ProQuest Dissertations and Theses and Scopus) were searched with assistance from a research librarian at the University of Alberta (Edmonton, AB) using both controlled vocabulary (e.g. ‘Attitude to Health’) and specific keywords (e.g. adolescent*, challenge*, enabler* and perspective*). Search terms were adapted for each database and combined using Boolean operators to narrow the results. A sample search strategy is presented in Table 1. Reference lists from full-text articles that met our inclusion criteria were searched (M. K.) to identify any additional articles of relevance.
Stage 3: select studies

All references were exported to Mendeley Desktop (v1.16.3, Glyph & Cog, LLC, 2008), and duplicates were removed (M. K.). Screening was initially conducted by titles and abstracts by two independent reviewers (M. K. and S. D.). As a preliminary step, a 10% (n = 140) sample of articles was screened to ensure consistency between reviewers; upon confirmation of consistency, the remaining articles were assessed. The secondary step included full-text reviews by two independent reviewers (M. K. and N. B.); any discrepancies were discussed and resolved with a third independent reviewer (G. D. C. B.).

Stage 4: chart the data

The data elements we included were chosen through discussion among team members (M. K., M. P. D. and G. D. C. B.) and were revised iteratively. Identifiers and variables included author(s) and year of publication, setting, study samples and characteristics (e.g. mean age and/or age range, sex, weight status and sample size) and aim(s) of the study. The data charting form was completed by one reviewer (M. K.) with 30% of articles (n = 5) extracted by an independent reviewer (N. B.); any differences were resolved through discussion. Authors of studies were contacted (M. K.) for additional information, when necessary (e.g. for mean ages).

Stage 5: collate, summarize, analyse and report the results

Descriptive, numerical summaries were calculated. All data underwent an abductive approach to thematic synthesis (24); the researchers followed the stages of familiarization (M. K.), generation of initial codes (M. K.), organization of codes into related areas to construct descriptive themes and sub-themes (M. K.), development of analytical themes based on the chosen theoretical framework (M. K. and G. D. C. B.) and sharing and discussing key themes, sub-themes and exemplar quotes with team members (M. P. D., T.-L. F. M. and G. D. C. B.). The social ecological model is a framework that aims to understand the multifaceted and dynamic effects of personal and broad factors that determine behaviours (25). It was used as a theoretical lens for presenting our findings, with the following levels of influence: individual, interpersonal, environmental and policy. Study quality of included articles was appraised for descriptive purposes using the mixed methods appraisal tool, which can be applied to qualitative, quantitative and mixed methods study designs (26,27). Two independent reviewers (M. K. and N. B.) completed this process; any differences were resolved through discussion.

Stage 6: consult with stakeholders

We aimed to enhance methodological rigour of this review through a stakeholder consultation, with a purpose of sharing and gaining insight on our findings (21,22). Specifically, adolescents with obesity (adolescent stakeholders) were surveyed to (i) determine barriers and enablers experienced by adolescents in weight management corresponding with or additional to those retrieved by our review and (ii) implicitly fill in any knowledge gaps not identified by our review via the first objective. We also sought input from a group of researchers and healthcare providers (professional stakeholders) with expertise in adolescent obesity to (i) gain their perspectives on and interpretations of our findings and (ii) seek additional articles of relevance. More specifically, the main research questions for professional stakeholders were asked from their professional/clinical perspectives and spanned (i) common barriers to and enablers of healthy lifestyle behaviours experienced by adolescents with obesity in weight management, (ii) preconceived notions associated with our topic and (iii) views on our findings, including relevance to practice.

Purposive sampling was used to recruit adolescent stakeholders who had been active in a local multidisciplinary paediatric weight management clinic for 3 months. This restriction was set to ensure that adolescents have had sufficient clinical time to reflect on their lifestyle behaviours. Potential participants were contacted for recruitment...
in-person or by telephone. Professional stakeholders (≥1 year experience in paediatric obesity) were sampled purposefully and using snowball sampling. The first author (M. K.) approached professional stakeholders in-person at a national paediatric obesity conference, which was complemented by email recruitment through our team’s network of clinical and academic colleagues. Both expert groups were invited to complete an online survey (duration: ~10 min) that included open-ended and closed-ended questions in REDCap© (Research Electronic Data Capture; Women and Children’s Health Research Institute, University of Alberta), a secure, online data collection and management platform. Themes and interpretations of our findings were finalized after consultation with stakeholders. For this stage, ethics approval was obtained by the Human Research Ethics Board (University of Alberta) and operational approvals from Alberta Health Services (Stollery Children’s Hospital, Edmonton, AB) and the Covenant Health Research Centre (Missicordia Community Hospital, Edmonton, AB).

Results

Study selection and characteristics

After removing duplicates from the original sample (n = 2,594), 1,401 citations were retrieved for title and abstract screening, 69 articles were reviewed in full and 17 met our eligibility criteria and were included in this review. Inter-rater reliability for the inclusion of full-text articles between the two independent reviewers (M. K and N. B.) was excellent (Cohen’s kappa = 0.91). See Fig. 1 for a flowchart of the article selection process and Table 2 for details on the included articles.

All articles were published in English, which included qualitative (n = 11, 64.7%), mixed methods (n = 4, 23.5%) and quantitative (n = 2, 11.8%) designs. Our search of the grey literature yielded no articles. Several articles (n = 4, 23.5%) were identified by reviewing reference lists of included articles. Of the included articles (n = 17, 100%), 94.1% (n = 16) and 88.2% (n = 15)
Table 2  Descriptive characteristics of the studies included in our scoping review (n = 17)

<table>
<thead>
<tr>
<th>Author(s), year of publication</th>
<th>Setting</th>
<th>Study samples and characteristics</th>
<th>Study design and data collection method</th>
<th>Aim(s) of the study</th>
<th>Study quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alm et al. (36)</td>
<td>Clinical</td>
<td>Mean age: 15.3 ± 1.3 years</td>
<td>Qualitative; semi-structured individual interviews</td>
<td>To examine the reasons for managing weight, to explore the barriers and enablers to attaining behaviour goals and to evaluate the role of a behaviour coach in goal setting among obese inner-city adolescents in a weight management programme</td>
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<tr>
<td>Curtis (37)</td>
<td>School</td>
<td>Age range: 10–17 years</td>
<td>Qualitative; closed-ended and open-ended focus groups and individual interviews</td>
<td>To explore how the focus on healthy eating, physical activity, and emotional health and bullying within an obesity intervention programme impacts adolescents with obesity</td>
<td>****</td>
</tr>
<tr>
<td>Daley et al. (42)</td>
<td>School</td>
<td>Age range: 11–16 years</td>
<td>Qualitative; semi-structured interviews</td>
<td>To explore the experiences of adolescents with obesity participating in an exercise therapy intervention</td>
<td>***</td>
</tr>
<tr>
<td>DeSmet et al. (31)</td>
<td>Clinical</td>
<td>Age range: 11–18 years</td>
<td>Quantitative, case–control and cross-sectional; closed-ended questionnaires</td>
<td>To assess the influence of traditional and cyber-victimization on psychosocial distress and barriers to healthy lifestyles among adolescents with severe obesity</td>
<td>****</td>
</tr>
<tr>
<td>Hoer and Nelson (34)</td>
<td>School</td>
<td>Age range: 12–15 years</td>
<td>Mixed methods, longitudinal; closed-ended and open-ended evaluations at two time points (following intervention and at follow-up)</td>
<td>To develop, implement and evaluate a weight control intervention programme for adolescents with obesity</td>
<td>***</td>
</tr>
<tr>
<td>Lane-Tillerson et al. (32)</td>
<td>Clinical</td>
<td>Age range: 13–17 years</td>
<td>Mixed methods; pre-intervention and post-intervention measurements, open-ended questionnaires</td>
<td>To evaluate the effectiveness of a behaviour modification weight loss/management nursing intervention from the perspectives of adolescents with obesity and their mothers and to test the theory that effective nursing is likely because nurse–client interactions lead to the attainment of goals</td>
<td>**</td>
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<tr>
<td>Lindlof et al. (39)</td>
<td>Community</td>
<td>Age range: 14–16 years</td>
<td>Qualitative, longitudinal; participant observations and semi-structured group interviews</td>
<td>To longitudinally explore attitudes towards physical activity of adolescents with obesity and to investigate the origins behind these attitudes as well as their influence leading an active lifestyle</td>
<td>****</td>
</tr>
<tr>
<td>Lindlof et al. (29)</td>
<td>Community</td>
<td>Age range: 14–16 years</td>
<td>Qualitative; field observation and semi-structured group interviews</td>
<td>To explore the views of adolescents with obesity (and their parents) on their condition and on weight loss barriers and motivational factors</td>
<td>****</td>
</tr>
<tr>
<td>Peeters et al. (41)</td>
<td>Community</td>
<td>Age range: 14–18 years</td>
<td>Qualitative, longitudinal randomized controlled trial; semi-structured individual interviews at three time points (beginning, middle and end)</td>
<td>To examine the experiences of adolescents with obesity on programme components, outcomes and preferences</td>
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(Continues)
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<tr>
<th>Author(s), year of publication</th>
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<tbody>
<tr>
<td>Porter et al. (28)</td>
<td>Clinical</td>
<td>Age range: 11–18 years; Mean age: 13.7 years; Sex: male and female; Weight status: obese; Sample size: 135</td>
<td>Qualitative; semi-structured individual interviews</td>
<td>To explore the psychosocial well-being of adolescents with obesity, the barriers they encounter in regard to exercise and nutrition, and to determine whether the previous factors are associated with level of compliance in the programme</td>
<td>***</td>
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<tr>
<td>Pratt et al. (35)</td>
<td>Community</td>
<td>Mean age: 13.2 ± 1.7 years; Sex: female; Weight status: obese; Sample size: 10</td>
<td>Mixed methods; questionnaires and focus groups</td>
<td>To assess the views of African-American female adolescents with obesity in regard to healthy lifestyle and obesity factors impacted by parents and family associations</td>
<td>***</td>
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<tr>
<td>Reece et al. (30)</td>
<td>Community</td>
<td>Age range: 11–16 years; Mean age: 14.0 years; Sex: male and female; Weight status: overweight and obese; Sample size: 12</td>
<td>Qualitative; semi-structured individual interviews and focus groups</td>
<td>To explore the experiences of adolescents with obesity and their perspectives towards obesity treatment</td>
<td>***</td>
</tr>
<tr>
<td>Trout and Graber (43)</td>
<td>Community</td>
<td>Age range: 13–18 years; Mean age: 15.2 years; Sex: male and female; Weight status: overweight (according to the Centers for Disease Control and Prevention labels in 2009); Sample size: 12</td>
<td>Qualitative; open-ended individual interviews</td>
<td>To explore the perceptions and experiences of adolescents with overweight or obese in the context of physical education from geographically diverse regions</td>
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<tr>
<td>Watts et al. (33)</td>
<td>Home</td>
<td>Age range: 11–17 years; Mean age: 14.0 ± 1.9 years; Sex: male and female; Weight status: overweight and obese; Sample size: 22</td>
<td>Qualitative; Photovoice and semi-structured individual interviews</td>
<td>To explore barriers and enablers to healthy eating in the home environment of adolescents with overweight or obesity</td>
<td>***</td>
</tr>
<tr>
<td>Woolford et al. (38)</td>
<td>Clinical</td>
<td>Age range: 11–19 years; Mean age: 14.3 years; Sex: male and female; Weight status: obese; Sample size: 24</td>
<td>Qualitative; focus groups</td>
<td>To explore the perspectives of adolescents with obesity on message content of weight-related tailored text messages</td>
<td>****</td>
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<tr>
<td>Woolford et al. (44)</td>
<td>Clinical</td>
<td>Age range: 12–18 years; Mean age: 14 years; Sex: male and female; Weight status: obese; Sample size: 20</td>
<td>Mixed methods; questionnaires, surveys and semi-structured individual interviews</td>
<td>To test the feasibility and acceptability of tailored text messages among adolescents with obesity</td>
<td>**</td>
</tr>
<tr>
<td>Zabinski et al. (40)</td>
<td>Clinical and community</td>
<td>Age range: 13–16 years; Sex: male and female; Weight status: overweight and obese; Sample size: 44</td>
<td>Quantitative; questionnaires</td>
<td>To examine and compare overweight and non-overweight children's perceived barriers and enablers towards physical activity</td>
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1In articles with multiple studies, only data of participants meeting eligibility criteria are included; weight status was based on the terms and definitions used in each study.
contained barriers to and/or enablers of at least one of the four lifestyle areas, respectively. For barriers, an equal number of articles pertained to nutrition (n = 11, 64.7%) and physical activity (n = 11, 64.7%). For enablers, 47.1% (n = 8) contained information on nutrition and physical activity compared with 17.6% (n = 3) on sedentary behaviour. No barriers or enablers were retrieved for sleep. In regard to the setting, 41.2% (n = 7) took place in a clinic and/or in the community, 17.6% (n = 3) in the school and 5.9% (n = 1) at the home. Over half (n = 9, 52.9%) of the studies were conducted in the USA, followed by the UK (n = 3, 17.6%), Canada (n = 2, 12.5%), Denmark (n = 2, 12.5%) and Belgium (n = 1, 5.9%). With respect to our quality assessment, four stars (out of four) were assigned to 35.3% (n = 6) of articles, three stars to 52.9% (n = 9) and two stars to 11.8% (n = 2); a higher number of stars reflected a higher quality study. Inter-rater reliability for the study quality appraisal between the two independent reviewers was good (Cohen’s kappa = 0.79).

Thematic synthesis
Barriers to and enablers of healthy lifestyle behaviours are presented under corresponding categories and thematic and sub-thematic headings (Figs 2 and 3).

Barriers: Nutrition

Individual

Autonomy and behaviour control
Adolescents with obesity perceived a lack of control over the food that they purchased and ate. More specifically, purchasing unhealthy foods and/or binge eating was driven by a number of factors, including temptation and a lack of impulse control (28), forgetfulness regarding long-term goals (e.g. weight loss) for behaviour change (29) and being away from home and their parents (29).

I wish I didn’t do it [eat unhealthy food], but I just forget everything about losing weight when I’m buying it. (Lindelof et al., p. 5)

Biological and psychological factors
Emotional eating was considered a barrier to adopting healthy food habits by adolescents with obesity in a number of studies (29–32), some of whom engaged in disordered eating behaviours when faced with upsetting or emotional circumstances (30). In particular, adolescents reported that anxiety (30), loneliness (31), sadness (29–31) and being upset (30) influenced the quantity and/or quality of the food that they consumed.

I think one of the reasons why I probably, I comfort eat a lot and there’s like stuff going on, well used to be stuff going on at home which kind of like used to upset me a lot and I used to comfort eat. (Reece et al., p. 5)

Mindless eating (e.g. not consciously considering the type of food consumed in the moment (30)) also interfered with eating healthfully. This behaviour was common (28,30,32,33), although some adolescents recognized that eating mindlessly or when bored could contribute to weight gain (30). Others associated the use of screens (e.g. computer and television) and studying with unhealthy eating (33), a link that was strengthened by procrastination and perceived stress related to academics (33).

I actually eat a lot more when I’m using my computer than I do [otherwise]. [I usually eat] stuff that I probably shouldn’t, like small snacks and stuff that tend to build up ... like crackers or chips. (Watts et al., p. 3283)

Feelings of hunger also presented as a barrier (34). For example, adolescents reported feeling hungry after school (33), which increased their food intake and tended to include eating alone (29). To satisfy hunger, individual palates determined food selection, whereby some adolescents disliked the flavour of more nutritious foods (28).

Logistics
Adolescents with obesity reported that their busy schedules and a lack of time prevented them from preparing healthy meals (28).

Interpersonal

Family and social network
Adolescents with obesity found it difficult to make and maintain healthy food choices without family support. Based on adolescents’ reports, there was a high level of uncertainty among their family on how to positively shift health practices, and this was linked to a lack of awareness...
from parents (30). Although family members held negative views of their adolescents’ health behaviours (35) and perceived them as having little willpower (36), adolescents blamed their parents for their unhealthy diets (29). More specifically, adolescents experienced challenges to eating healthfully because their families consumed large portion sizes (35) and unhealthy foods (33,35), were not actively trying to improve their own diets (33,35,36) or were satisfying other family members’ requests for less healthy foods (33). Competition between siblings also dictated adolescents’ food choices (33).

I know I want to get to it before [my brother] does ’cause I know I won’t get any if he’s there first. So it’s kind of, ‘overdo it to the max’ because I know he will too. (Watts et al., p. 3283)

Adolescents also reported feeling pressured by their peers (28,36), and their healthy-weight counterparts in particular, for making unhealthy food choices (36).

I don’t want the salad when my friends are eating Big Macs and French fries. It’s just not cool. They’d make fun of me. (Alm et al., p. 281)

Because of this preoccupation with self-image, adolescents believed that eating healthy foods would indicate to their peers that they were dieting or attempting to manage their weight, which made them feel self-conscious (37).

I’m more self-conscious when I’m eating healthily than when I’m not, I feel like people look at me like you know because you’re fat you’re going to eat unhealthily but if you’re eating healthy, I think, I don’t know, I just, just feel it’s more of a big deal that you’re eating an apple or something, they like look and wonder why. (Curtis, p. 414)

Special occasions (33) (e.g., eating out at restaurants (28,35), family celebrations (35), holiday gatherings (35), get-togethers with peers (29)) and specific family members (e.g., grandmothers (35)) were also viewed as challenging because they often included or promoted predominantly unhealthy foods, which made it difficult for adolescents to make healthy food choices.

Like this time we were going to have fruit, but then [our company] brought a cake and we didn’t want to be rude. So we ate it. (Watts et al., p. 3283)

Environmental

Home environment
In the home environment, adolescents described how their parents purchased (29), prepared (28) and served (29) unhealthy foods (e.g., frozen pizza and crackers (33)). For instance, adolescents reported a lack of control and influence over dinnertime meals (33). This made it difficult for them to eat healthy foods and could be attributed, at least in part, to resources (e.g., limited finances (28)).

If you’re just having something for dinner and it’s … healthy or not healthy … it’s not like you can change it necessarily because if that’s what … is made at home, then that’s what you’re going to eat. (Watts et al., p. 3282)

In addition to abundant unhealthy foods, some households had limited availability of healthy foods; the former were hard to resist, especially when adolescents had limited time to eat and were in a negative emotional state (28,33), and their visibility in the home increased mindless eating (38).

Barriers: Physical Activity

Individual

Autonomy and behaviour control
Adolescents with obesity de-prioritized non-structured physical activities (e.g., cycling, playing and walking), which appeared to coincide with their increased autonomy as they grew and developed (39).
When I was younger, my mum sometimes forced me to ride my bike to school, but now … I can decide for myself now and I really don’t like riding my bike, so I catch the bus. (Lindelof et al., p. 117)

**Biological, cognitive and psychological factors**

Adolescents with obesity acknowledged the desire to lose weight; however, mental factors and physical challenges presented as barriers to engage in physical activity. For instance, self-consciousness about excess weight and dissatisfaction with physical appearance had negative impacts on adolescents’ participation in physical activity (30,36,40). Further, medical conditions (28), excess weight (40), fatigue (41,42), injury (39,41,43), physical discomfort (e.g. joint pain and shortness of breath) (40,42,43) and a lack of energy (28) limited physical activity. Some adolescents believed that physical activity was too hard (40) and that exercise was boring (42), whereas others stated not being in the mood (41). Many lacked the motivation to exercise (28,29,31,40–42) and derived little pleasure from being physically active (28,29,31,39,40).

It’s difficult to explain, I just don’t like it (physical activity). (Lindelof et al., p. 118)

Learned helplessness was a common barrier to being physically active; negative experiences from participating in sports during childhood shaped adolescents’ perceptions of and decisions to participate in sports in later years (39). For instance, many adolescents stopped making an effort because they had previous failures (37) or were traumatized from previous experiences (43). Similarly, adolescents believed that they would perform poorly in physical education class because of their weight, which led them to exert lower efforts in this setting (43).

I think the weight caused [failure in physical education class]. Because I was overweight I didn’t want to make an effort. I didn’t want to try because I knew I wouldn’t be good at it. (Trout and Graber, p. 283)

This perceived lack of competence and skill in physical activity (29,39,40,42) led to changes in the types of activities that they performed (39). Others simply reported that they did not prefer to be physically active, describing themselves as inactive (39) and lazy (30,39,42).

I’m doing nothing (physical activity), well I walk up the stairs at home but we live on the ground-floor, so, it’s only 3 steps. (Lindelof et al., p. 117)

Some adolescents appeared to associate physical activity with exercise specifically (e.g. going to the gym or for a run) versus general activities (e.g. bike riding and walking) (29), so they were less likely to engage in such activities. This lack of knowledge extended to exercise initiation in general (36,40).

I want to start exercising, but I don’t know what exercises to do. (Alm et al., p. 282)

**Logistics**

Adolescents with obesity claimed that a lack of time limited their participation in physical activity (39–41). They indicated a number of factors were responsible, including academic commitments (40–42), difficulties with exercising after school (42), jobs (41) and household chores (41). However, some adolescents disclosed that they reported a ‘lack of time’ as an excuse (42).

It’s not opportunity. I probably could, somehow, fit it in, but it’s just, I really can’t be bothered. I want to, but actually, I don’t at the same time. It’s like, I must go to the gym, and then I don’t bother. (Daley et al., p. 815)

**Interpersonal**

**Family and social network**

Parents’ unsupportive behaviour (e.g. lack of appropriate role modelling) (29,39) appeared to discourage adolescents with obesity from being physically active, as did the former’s lack of active participation (36).

Adolescents’ behaviours were also influenced negatively by their peers (28); many of their friends were not physically active (40), were absent in the neighbourhood (28) or had unhealthy exercise habits that they did not want to emulate (36). Both previously (in childhood) and currently (in adolescence), adolescents reported being bullied and teased by their peers while participating in sports (29,31,37,40), which discouraged their participation (31) or led them to change activities (29) or hold negative perceptions of physical education at school (37).

Being visible to others while physically active emerged as a factor that limited physical activity (40,43). For instance, adolescents revealed greater concern about being seen by their peers than they did about the type of activity or their performance, which they felt put their weakness (e.g. lack of skills and slowness) and weight status on display for others to judge (37,43). They were uncomfortable changing clothes in front of their leaner peers because they felt that they would be ridiculed for their appearance (43). Girls, in particular, reported being embarrassed about wearing revealing workout clothing (e.g. shorts), especially around boys (36). For these reasons, adolescents avoided crowded gyms (41) and physical education classes, which they considered too public (43). In lieu of being active in more public settings, adolescents favoured exercising in private or with a friend (43).
I don’t really go to gyms. At my mom’s house, I have a basketball court. When I work out and I do stuff, I usually like to do it with my cousin or by myself … because then I don’t have to prove nothing to nobody. I do what I can do. (Trout and Graber, p. 279)

Logistics

Parents’ busy work schedules limited the time that they spent on exercise with their adolescents (28), who also had social obligations (e.g. obligations to family/friends (41,42) and social activity (41)) that deterred them from being physically active.

Environmental

Access and resources

In the exercise context, adolescents with obesity considered the lack of access to specialized equipment (39,40) a barrier. A lack of transportation options, especially in relation to parental support and assistance, limited adolescents’ access to gym facilities and impeded their participation in exercise (28). Those with limited financial resources had difficulties securing a membership to the local gym, which resulted in less structured physical activity (36).

Natural environment

In a number of studies, there was a perceived decreased engagement in physical activity because of poor weather (e.g. rain and heat) (39–42).

School environment

While some adolescents with obesity believed that insufficient time was dedicated to physical education in school (36), others viewed physical education as detrimental to their social and emotional health because of concern about visibility by peers (43).

Social environment

A lack of convenient places to be active (40) was reported as a barrier to exercising. Comparably, a major reason for not exercising, especially for girls, was a perceived lack of neighbourhood safety (28,36).

I need someone to walk with me. My mom doesn’t want me walking around by myself. She says that she doesn’t trust the guys in the neighborhood. (Alm et al., p. 281)

Enablers: Nutrition

Individual

Biological and cognitive factors

Adolescents with obesity considered taste before consuming healthy foods and claimed that healthy foods need to be tasty to enable healthy eating (33).

Interpersonal

Family, professional and social network

Adolescents with obesity desired dietary support provided by their families to be multifaceted. On the one hand, some adolescents preferred emotional, motivational or verbal support from family members, including parents and siblings (33,35,36), while others described a preference for active participation by family members to enable healthy eating (33,35,36). In addition to healthy food modelling, enablers of change included asking adolescents for input on foods to purchase and family meals (33,35), cooking at home (35) and eating together (35). Restrictions imposed by parents around eating were favourable in limiting consumption of less healthy food (33). Some adolescents were inclined to eat better following parental cues (e.g. triggering feelings of guilt through comments or facial expressions) (33).

My mom will walk up and … sigh and make stupid faces at me … my parents, they make it quite obvious that I’m not healthy, so it’s sort of a negative way of pushing me to eat well. (Watts et al., p. 3282)

Enrolment in a weight management programme or intervention was considered helpful by adolescents. The support that they received increased their awareness of the quantity and quality of the foods that they ate (30,32,42), calories (32) and other food-related behaviours including frequency of, speed of, and compulsive eating (34).

… my mom and coach believe in me. They are great and supportive. I need the support to keep me going. (Alm et al., p. 281)

Within the context of text messages that were a part of a weight management programme, adolescents’ favourite messages related to meal suggestions and recipe ideas (44). Delivering this information in this manner helped them to remember to make healthy choices and a maintained focus on weight management (44).

Two studies described active participation by peers as an enabler to healthy eating (35,36). More specifically, adolescents valued adopting healthy eating practices with others, such as helping with portion control and sharing food (35).

Environmental

Home environment

Having readily available healthy food choices at home (e.g. hard-boiled eggs, pre-cut fruits and vegetables) was considered convenient by adolescents with obesity (29,33,36), as were home-cooked meals (33).
Most of what’s in there is relatively healthy on purpose. So when we look for something to eat, we’ll get ... vegetables or ... fruits are on the table already. Like, as I said earlier ... it’s faster ... than to try and find something that’s not as healthy. (Watts et al., p. 3282)

**Enablers: Physical activity**

**Individual**

*Cognitive factors*

In one study (41), some adolescents with obesity were driven to be physically active by enjoyment, the desire to achieve their goals and intrinsic motivation.

I could see the benefits, like my heart rate going down, things like that, it was good to know that it was making me more healthy and I enjoyed it really. (Daley et al., p. 814)

**Interpersonal**

*Family, professional and social network*

Active participation (e.g. exercising together) (35,36) by and support (e.g. encouragement and motivation to exercise) (29,35,41) from family members facilitated physical activity for adolescents with obesity.

Support from professionals was viewed as an enabler to engage in physical activity (30). Adolescents benefited from both direct guidance (e.g. realizing that they underestimated their physical activity capabilities) (42) and the structure of weight management programmes that were led by professionals (e.g. engaging in specific amounts of exercise and increasing exercise) (32).

One study described active participation by peers (e.g. exercising together) as an enabler to physical activity (36). In another, adolescents had specific criteria as to whom they desired active participation from; for example, while some disliked being active with their leaner peers, others had more positive perceptions of doing activities with their peers who also had excess weight or with older individuals (43). When asked about how they thought their peers at the weight loss camp perceived them, one participant said:

Everybody here’s like family .... They always push each other [when running on the track] because we all know how it was to be made fun of .... If the world could be like this, I’d love it. (Trout and Graber, p. 280)

**Environmental**

*Access and resources*

Because of their inability to drive, adolescents with obesity indicated practical support from parents to be helpful, such as providing transportation to a gym facility (35,41).

**School environment**

For some adolescents with obesity, physical education provided an enjoyable medium to learn new activities and acquire new skills, which made them eager to become better in sports (43).

**Policy**

*Access and resources*

Adolescents with obesity touched on policy in only one study, where they explicitly stated that having a free gym membership would help them to be more physically active (41).

**Enablers: Sedentary behaviour**

**Individual**

*Cognitive factors*

In a study by Porter et al. (28), adolescents with obesity described a preference for sedentary activities, including playing video games, using the computer and watching television (28), all of which were barriers to being physically active (41).

... If I get home and change and watch TV or go on the internet, like there’s no way I’m going to the gym. (Peeters et al., p. 655)

This partiality towards sedentary behaviour was portrayed in one study (29), where adolescents were readily inclined to be sedentary at the mention of potential benefits of sedentary behaviour (i.e. the number of calories burnt while watching television). Similarly, adolescents seemed to also believe that only vigorous activity was useful for weight management (39). This misperception may have reinforced adolescents’ sedentariness.

I know it would be better if I rode my bike to school, but I rarely raise my pulse rate on these rides .... The gym or a run is much better if I want to lose weight. (Lindelof et al., p. 117)

**Consultation with adolescent and professional stakeholders**

A total of 5 adolescents with obesity and 15 professionals (n = 11 healthcare providers; n = 4 researchers) completed our survey. All professionals agreed with the framework used to present our findings, and none recommended any additional studies for inclusion in our review. In line with our review, professionals highlighted the importance of the family unit and peers in the management of obesity and noted that they could either be barriers or enablers to a
healthy lifestyle depending on the circumstances. Further, they cited a lack of motivation as a barrier to leading a healthy lifestyle and emphasized the importance of acknowledging and addressing mental health issues before attempting to make lifestyle changes. Interestingly, another key point that emerged from our consultation was the normalization of overweight and obesity in today’s society as a barrier to achieving a healthy lifestyle. Healthy sedentary behaviours and sleep habits were only mentioned by a minority of professionals as contributors to a healthy lifestyle for adolescents.

In contrast to professionals’ views and to findings from our review, most adolescent stakeholders viewed their social network (e.g. peers) as only barriers to having a healthy lifestyle. In agreement with our review, mindless eating and the appeal of junk food inhibited most adolescents from having a healthy diet, while family support was considered by all an enabler to living a healthy lifestyle. The availability of media (e.g. Internet and video games) was also reported by all adolescents an enabler to sedentariness. Lastly, sleep was again an unpopular point of discussion; only one adolescent related difficulty sleeping to her mental state and time spent on the computer.

Discussion
Our scoping review aimed to provide a comprehensive summary of the perspectives of adolescents with obesity regarding barriers to and enablers of undertaking or sustaining healthy lifestyle behaviours related to nutrition, physical activity, sedentary behaviour and sleep. Our synthesis of 17 studies, including qualitative, quantitative and mixed methods study designs, identified factors primarily related to nutrition and physical activity behaviours at several levels of influence. Across studies, barriers to healthy nutrition (e.g. emotional and mindless eating and family influential behaviour) and physical activity (e.g. lack of motivation, physical challenges and concern about visibility) were mainly linked with individual and interpersonal factors, compared with enablers (e.g. family, social and professional support) that were concentrated at the interpersonal level. According to our review, there is a knowledge gap with respect to the perspectives of adolescents with obesity on barriers and enablers related to sedentary behaviour and sleep as well as environmental and policy levels of influence.

Our findings are generally aligned with the literature on barriers and enablers affecting lifestyle behaviours of healthy-weight adolescents (45,46), which suggest that while certain factors may be potentially exasperated by obesity, similarities in lifestyle behaviours also subsist across the weight spectrum. Notably, emotional and mindless eating, which were found to be common barriers to healthy eating across studies included in our review, were not identified in studies of healthy-weight adolescents. This highlights the effects that excess weight may have on psychosocial well-being (2), and potentially, disordered eating behaviours (47), which are known to be a compensatory mechanism triggered by difficult situations (48).

In contrast with adolescents who were more likely to associate healthy foods with the family and fast foods with pleasure and their social circle (45), adolescents with obesity were in agreement with the latter, but often commented that the family environment was a hindrance to their success in behaviour change. This was due to unhealthy dietary practices implemented at home, suggesting parental adaptation to the macroenvironment. Naturally, data have shown that adolescents, albeit more independent, consume approximately 60% of their diet at home (49). Adolescents’ developed responses to particular foods and their food intake patterns also stem from familiarity, which is largely a reflection of the home environment. Justifiably, support derived from the family was perceived as necessary for both populations to enable healthy eating (31,36,45). Given that the family is considered the food provider and has the ability to influence food-related behaviours (e.g. attitudes, preferences and values), the family’s role of mediating adolescents’ dietary patterns is pivotal to undertake and sustain healthy lifestyle behaviours (50), especially in the early ages.

Although the social network exerts its uttermost influence in the context of conformity to group norms during adolescence (51), as reciprocated by adolescents included in our review, empirical evidence has not revealed strong association between peer influence and dietary behaviours (52). This could be explained by adolescents’ positioning between two opposing ends (refutation of exterior influence due to supposed independence), which may render peers’ influence on dietary patterns indirect rather than direct (50). Nonetheless, healthy role modelling by the peers is certainly invaluable for adolescents with obesity to practice healthy habits in the social environment, and effective measures and resources (e.g. a support network) are needed to support this adaptation.

Two recent reviews on barriers to physical activity (53,54) showed that some barriers were not limited to adolescents with obesity, but were also experienced by non-overweight adolescents, namely, a lack of motivation (53,54), a perceived lack of skills (54), body self-consciousness (53,54), concern about visibility (53,54), conflicting interests (53,54), family and social influences (53) and negative perceptions about or experiences in physical education (53,54). Others factors, however, such as physical discomforts (e.g. knee pain and shortness of breath) were not generalizable to the healthy-weight adolescent population, highlighting the impact that excess weight can have on the body and its tolerance to activity.

Some enablers to physical activity among healthy-weight adolescents corresponded with findings from our review, for instance, family and social support (53,54). In contrast,
some of these healthy-weight adolescents considered physical activity a medium by which to enjoy their time (53,54), feel accomplished and confident (53), receive social benefits (53,54), relieve stress (54), improve general health (53) and show off their skills (54). These enabling factors were not experienced by most adolescents with obesity in this review whose psychosocial vulnerability is magnified and who may view physical activity in a different light.

In studies included in our review, some comments stated by adolescents with obesity stemmed from a lack of knowledge, for example, their belief that an inactive lifestyle does not have a strong influence on weight compared with vigorous exercise. Previous research has shown that knowledge alone is arguably not causative of behaviour change (55). This is supported by multiple behaviour theories (e.g. Theory of Planned Behavior (56) and Social Cognitive Theory (57)), where knowledge is merely a minor instigative factor in the behavioural change pathway. Nonetheless, knowledge remains necessary to underpin behaviour change and can be especially effective when combined with behaviour change strategies such as goal setting and motivational interviewing.

In addition to individual factors, it is proposed that the process of behaviour change initiation-maintenance is cued by environmental stimuli (58). The environment encompasses required resources by an individual and can influence active self-regulation; if not conducive, behaviour change is less likely to be maintained (59), so interventions at the environmental and policy levels are of value in the behavioural context of change. Our review did not retrieve substantial information relating to factors positively or negatively affecting behavioural changes at these levels. This is likely owing to the fact that individuals tend to not delve into macro-level factors on all facets of behavioural determinants (60,61). Further, aside from the one adolescent in our stakeholder consultation, we did not retrieve any articles commenting on barriers to and enablers of healthy sleep patterns from the perspectives of adolescents with obesity. Because sleep is intertwined with other lifestyle factors, its impact on weight cannot be disregarded. With these gaps in mind, future research on the corresponding barriers and enablers is needed, allowing external parties (e.g. healthcare personnel and policy makers) to eliminate barriers and capitalize on enablers.

Limitations of this review must be acknowledged. First, our findings are dependent on information obtained from individual studies, all of which have their own methodological characteristics (e.g. different body mass index measures and studies with exclusively female participants) and potential drawbacks (e.g. insufficient reflexivity by authors leading to lower study quality and lack of specificity in results). For authors of qualitative studies, it is recommended to follow the consolidated criteria for reporting qualitative studies standards of reporting (e.g. making the interview guide available) (62) to facilitate the understanding and synthesis of the data. Second, as with all reviews, retrieved studies were defined by our search criteria, which if too sensitive, may have reduced precision by not capturing all relevant studies or omitted certain article selections (e.g. published, but non-indexed articles in MEDLINE). Third, although we included studies in which participants’ mean ages coincided with our age range criteria limits, this does not guarantee that some barriers or enablers were not reported by children. Lastly, because this review focused on treatment-seeking adolescents with obesity, it is unknown whether our findings are fully generalizable to the unengaged obese population.

In conclusion, adolescents with obesity reported barriers and enablers at and beyond their control. This underscores the value of multilevel approaches (e.g. acknowledging external sources of influence in addition to individual factors when designing behavioural interventions) to help eliminate barriers, enhance enablers and support adolescents in living a healthy lifestyle. Because some barriers and enablers were unique to adolescents with obesity, it is important for these approaches to be tailored and targeted to this population. Lastly, the literature was scarce in relation to sedentary behaviour and sleep as well as environmental and policy levels of influence on lifestyle behaviours. These knowledge gaps will be explored qualitatively in future research with adolescents with obesity in weight management.

Conflict of interest statement

The authors declare no competing conflicts of interest.

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