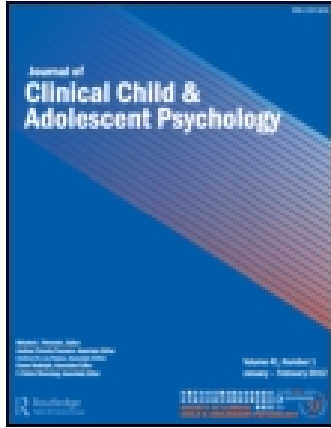


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Evidence Update on the Treatment of Overweight and Obesity in Children and Adolescents

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EVIDENCE BASE UPDATE

Evidence Update on the Treatment of Overweight and Obesity in Children and Adolescents

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Childhood obesity is associated with increased medical and psychosocial consequences and mortality and effective interventions are urgently needed. Effective interventions are urgently needed. This article reviews the evidence for psychological treatments of overweight and obesity in child and adolescent populations. Studies were identified through searches of online databases and reference sections of relevant review articles and meta-analyses. Treatment efficacy was assessed using established criteria, and treatments were categorized as well-established, probably efficacious, possibly efficacious, experimental, or of questionable efficacy. Well-established treatments included family-based behavioral treatment (FBT) and Parent-Only Behavioral Treatment for children. Possibly efficacious treatments include Parent-Only Behavioral Treatment for adolescents, FBT-Guided Self-Help for children, and Behavioral Weight Loss treatment with family involvement for toddlers, children, and adolescents. Appetite awareness training and regulation of cues treatments are considered experimental. No treatments are considered probably efficacious, or of questionable efficacy. All treatments considered efficacious are multicomponent interventions that include dietary and physical activity modifications and utilize behavioral strategies. Treatment is optimized if family members are specifically targeted in treatment. Research supports the use of multicomponent lifestyle interventions, with FBT and Parent-Only Behavioral Treatment being the most widely supported treatment types. Additional research is needed to test a stepped care model for treatment and to establish the ideal dosage (i.e., number and length of sessions), duration, and intensity of treatments for long-term sustainability of healthy weight management. To improve access to care, the optimal methods to enhance the scalability and implementability of treatments into community and clinical settings need to be established.

The childhood obesity epidemic is a pressing public health concern. Rates of childhood obesity increased threefold in a 30-year period between 1971 and 2002 (Freedman, Khan, Serdula, Ogden, & Dietz, 2006), and current levels remain high. The prevalence of childhood overweight (defined as BMI at or above the 85th percentile but below the 95th percentile by age and sex;

Kuczmarski et al., 2000) and obesity (defined as BMI at or above the 95th percentile) combined is estimated at more than one third of youth, with approximately 17.7% of children (ages 6–11) and 20.5% of adolescents (ages 12–19) being classified as obese (Ogden, Carroll, Kit, & Flegal, 2014). Severe obesity (BMI > 97th percentile) in children has quadrupled to 11.9% of children aged 1 to 18 and is the largest growing subcategory of obesity in children (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Overweight and obesity have many negative consequences for children and adolescents, including medical

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effects, such as increased risk of cardiovascular disease and other chronic health conditions (August et al., 2008; Dietz, 1998) as well as psychosocial difficulties, including reduced quality of life, anxiety, depression, and increased risk for the development of eating disorders (BeLue, Francis, & Colaco, 2009; Dietz, 1998; Wilson & Goldfield, 2014). These negative effects not only exist in childhood but, without appropriate intervention, persist into adulthood with elevated morbidity and mortality (Reilly et al., 2003). This represents a considerable cost to society through increased health care burden and associated spending (Finkelstein, Trogon, Cohen, & Dietz, 2009). An estimated 14.1 billion additional dollars are spent annually on medical care associated with excess weight in childhood (Trasande & Sampit, 2009), with these costs likely to increase as overweight children become overweight adults (Trasande, 2010), unless prevention and treatment efforts can decrease rates of obesity (Katzmarzyk et al., 2014). Thus, it is clear that effective interventions for childhood overweight and obesity (hereafter referred to as childhood obesity for conciseness) are urgently needed. This article reviews the evidence for treatments of overweight and obesity in child and adolescent populations and outlines some of the challenges and future directions in this area.

METHOD

Search Strategy

Treatment studies addressed in this review were identified through extensive searches of online databases (PubMed, PsycINFO, Google Scholar). Studies were identified using the following search terms (and derivatives thereof): “obesity,” “overweight,” “child,” “adolescent,” “pediatric,” “treatment,” and “intervention.” The reference sections of relevant articles were also reviewed to identify any additional studies for inclusion in this review. Finally, recent reviews and meta-analyses on this topic were examined to ensure that no pertinent studies were missed (American Dietetic Association, 2006; Ho et al., 2012; McGovern et al., 2008; Oude Luttikhuis et al., 2010; Snethen, Broome, & Cashin, 2006; Tsiros, Sinn, Coates, Howe, & Buckley, 2008; Whitlock, O’Connor, Williams, Beil, & Lutz, 2010; Wilfley, Tibbs, et al., 2007). Given that this is the first evidence update on this topic in this journal, research studies dating as early as 1983 and up to June 2014 are reviewed.

Using the available literature, treatments were assessed by their demonstrated efficacy in randomized control trials. Treatments are designated as *well-established* if the treatment efficacy has been shown to be (a) superior to a psychological placebo or wait-list control or (b) equal to a well-established treatment in *at least two research settings by two independent*

researchers (Southam-Gerow & Prinstein, 2014). A treatment is considered *probably efficacious* if it has been shown to be (a) superior to a waitlist control group in at least two randomized clinical trials (RCTs), or (b) meets criteria to be a well-established treatment but has not been tested by two or more research teams. Treatments are considered *possibly efficacious* if they have demonstrated efficacy over the control group in at least one RCT, or two or more clinical trials. Treatments that have not been tested in an RCT or with at least two clinical trials but have some support are considered *experimental*, and treatments found inferior to other treatment groups or waitlist control groups are considered of *questionable efficacy*.

Studies were included in this review if they (a) tested interventions or treatments for childhood obesity; (b) were conducted in a defined population of toddlers (ages 2–5), children (ages 6–12), or adolescents (ages 13–18) with overweight or obesity; (c) provided description of the intervention; (d) included weight change as an outcome measure; (e) compared the intervention to another intervention or control group in a randomized trial; and (f) used clearly defined study inclusion and exclusion criteria. The present review focuses on psychological treatments for childhood and adolescent overweight and obesity. Please refer to the following reviews for more information on bariatric surgery for adolescents (Barnett, 2013) and pharmacological treatments for children and adolescents (Brufani et al., 2013).

Measurement of Treatment Outcomes

Researchers have used multiple indices of weight change to measure treatment outcomes. An ideal measure of weight change should be easily interpreted in clinical practice, be sensitive to change in treatment, take into account age and gender (i.e., be a measure of relative weight), and be reliable and sensitive across a range of values, including the severely obese (Paluch, Epstein, & Roemmich, 2007). The majority of studies reviewed here include one or more of the following as the primary weight loss outcome variable: Standardized Body Mass Index (BMI) scores (BMI *z*-score or BMI-SDS), percent overweight/percent overBMI (%OW/%overBMI), BMI percentile scores (measures of relative weight; Paluch et al., 2007), BMI, absolute weight, waist circumference (Griffiths, Gately, Marchant, & Cooke, 2012), and direct measures of adiposity (body composition, percentage body fat; Basterfield et al., 2012). Of importance, although these measures differ in methodology, they are highly correlated (Cole, Faith, Pietrobelli, & Heo, 2005). Weight-related changes are the most commonly used metrics, however, additional measures—such as metabolic changes (Blucher et al., 2013; Ho et al., 2012), or behavior changes (diet and physical

activity; Oude Luttikhuis et al., 2010)—can also be illustrative, and further research is needed to determine the associations between and differential utility of these measures. It should be noted that there is no definitive conclusion on the best measure to use for children and adolescents, and limited consistency in the usage of metrics across studies and thus multiple outcomes are reported in this review. Please see Table 1 for a more extensive description of the various measures described and benefits and drawbacks of each measure.

It should also be noted that data regarding the degree of change needed to achieve clinical significance across any of these measures is limited. Cutoffs for clinical significance have been suggested in the literature for BMI *z* score (e.g., 0.25 or 0.5 decrease; Ford, Hunt, Cooper, & Shield, 2010; Hunt, Ford, Sabin, Crowne, & Shield, 2007; Reinehr & Andler, 2004), and %OW (7 percentage point decrease; TODAY Study Group, 2012), however, further research is needed to define the degree of change in these outcomes that produces clinically meaningful effects in the short term, and their long-term sustainability.

Treatment Components and Types

Treatment Components

To date, psychological treatments for obesity in children and adolescents have included a combination of three primary components: (a) modify and improve dietary intake (quantity and quality), (b) increase physical activity and reduce sedentary activity, and (c) use behavioral strategies (e.g., self-monitoring) to facilitate these changes. Treatments are most successful if they include family members (i.e., parents/caregivers), who are specifically targeted in treatment and help facilitate and maintain these changes (Boutelle et al., 2014; Epstein, Valoski, Wing, & McCurley, 1990). Further description and rationale for each component is summarized next.

Diet and physical activity modifications. Simply expressed, excess weight gain occurs when energy intake exceeds energy expenditure over time (Hall et al., 2012). Therefore, interventions aim to alter this positive energy

TABLE 1
Summary of Common Outcome Measures in Treatment Trials

Absolute Weight BMI	Weight Weight (kg)/ height ² (m)	<ul style="list-style-type: none"> • Does not account for height • Reliably measured, widely used • Does not change linearly as children age 	(Paluch et al., 2007) (Cole et al., 2005; Whitlock, O'Connor, Williams, Beil, & Lutz, 2008)
BMI % Change	Change in BMI percentage	<ul style="list-style-type: none"> • Larger changes as degree of overweight increases • Can be used interchangeably with BMI 	(Cole et al., 2005)
BMI Percentile	BMI relative to child's age and sex (plotted on growth curves)	<ul style="list-style-type: none"> • Measure of relative weight rather than absolute weight • Can be a large range in the highest extremes (i.e., many children fall above the 99th percentile), and poor at accounting for change at extremes 	(Cole et al., 2005; Whitlock et al., 2008)
BMI z-scores (zBMI; LMS score)	$\{[(\text{BMI}/\text{median BMI})^L]-1\}/(L \cdot S)$; where L is the power of the Box-Cox transformation and S is the generalized coefficient of variation.	<ul style="list-style-type: none"> • Provides the simplest substitute measure of percentage loss in adiposity • Attenuates change for heavier children (i.e., as children become heavier they will show less change in treatment) 	(Cole et al., 2005; Hunt et al., 2007; Paluch et al., 2007)
BMI-SDS	No. of <i>SD</i> units above or below the median based on statistically derived curves. (BMI-BMI 50th percentile/ BMI <i>SD</i>)	<ul style="list-style-type: none"> • Requires certain computer programs that access reference data and formulas 	(Daumit et al., 2013; Epstein et al., 2007; Mei et al., 2002)
Percent overweight/ Percent overBMI	Percentage above the 50th percentile BMI for age and gender $([\text{BMI} - \text{BMI}$ at 50th percentile for age and sex]/ BMI at 50th percentile) $\times 100$	<ul style="list-style-type: none"> • Demonstrated advantage in sensitivity changes in BMI across range of overweight (no truncated upper limit) • Easy to interpret 	(Paluch et al., 2007; Whitlock et al., 2008)
Percentage of the 95th percentile	BMI plotted against new growth curves based on new percentile curves above the 95th percentile	<ul style="list-style-type: none"> • Allows for accurate definition of severe obesity, and tracking of clinical change 	(Flegal et al., 2009; Gulati, Kaplan, & Daniels, 2012)
Waist Circumference	Measurement taken around waist (midway between 10th rib and iliac crest)	<ul style="list-style-type: none"> • Directly measures central adiposity, which may be associated with greater health risk in children • Concerns about technical errors in measurement 	(Griffiths et al., 2012)
Body Composition	% body fat/body fatness as measured by bioelectrical impedance	<ul style="list-style-type: none"> • Direct measure of adiposity (as opposed to a proxy measure) 	(Basterfield et al., 2012)

Note. BMI = body mass index.

balance and produce weight loss (or prevent additional weight gain) by encouraging both decreased energy intake through dietary modifications and increased energy expenditure through physical activity (Barlow & Committee, 2007). Dietary modifications that have been associated with improved outcomes include caloric reduction through decreased intake of high-energy dense, low-nutrient foods and/or increased intake of low-energy dense, high-nutrient foods (e.g., Traffic Light Diet; Epstein et al., 1985; TODAY Study Group, 2010). Physical activity modifications include encouraging increased physical activity and decreased sedentary activity (Epstein, Paluch, Gordy, & Dorn, 2000; Epstein, Valoski, Vara, et al., 1995).

Behavioral strategies. Whereas dietary and physical activity changes are the core components of the majority of weight loss treatments, behavioral strategies are routinely employed to facilitate behavior change and promote maintenance of these changes. Behavioral strategies are utilized to facilitate both weight loss and maintenance of weight change by promoting small, successive changes in behaviors (TODAY Study Group, 2010). Behavioral strategies that are commonly employed include self-monitoring (Helsel, Jakicic, & Otto, 2007; Kirschenbaum, Germann, & Rich, 2005), goal setting (Locke, 2002; Nothwehr & Yang, 2007), reinforcement for goal achievement (Foreyt & Goodrick, 1993; Williamson & Perrin, 1996), stimulus control (Epstein, Paluch, Kilanowski, & Raynor, 2004), social support (Wilfley, Stein, et al., 2007), problem solving (Perri et al., 2001), and motivational techniques (Resnicow & Blackburn, 2005).

Family involvement. Family involvement is often included in interventions as a method of facilitating physical activity and dietary modifications and encouraging behavioral changes. There are several rationales for including both parents and children in treatment of childhood obesity. First, it has been shown that parental obesity is a significant risk factor for childhood obesity (Hunt et al., 2002), with one study showing that children of obese parents are two to three times more likely to be obese themselves (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). This high rate of concordance is likely due to shared environmental and genetic influences that promote the development and maintenance of overweight and obesity across the family and suggests that parents have a strong influence on the weight status of their children (Vanucci, White, & Wilfley, 2010; Wilfley, Kass, & Kolko, 2011). In addition, it has been suggested that children's weight-related behaviors exist in the context of their home and family environment and can thus be influenced by changes made to this environment, again indicating the importance of parental involvement in treatment (Flodmark & Nowicka, 2011).

By including parents in their child's treatment, the goal is to capitalize on parents' influence over their child's behaviors to promote healthier behavior choices and maximize health outcomes for both parent and child. For example, parents are encouraged to create a healthy home environment and model healthy behaviors by purchasing healthier foods, planning healthier meals, developing a family-based reward system to reinforce healthy choices, participating in and encouraging increased physical activity, and using praise to reinforce healthy behaviors (Epstein et al., 2004; TODAY Study Group, 2010). For additional details on the possible components of childhood obesity treatments, please see Table 2.

Treatment Types

Multicomponent interventions. Specific use and combination of the four possible components of treatment—dietary modifications, physical activity modifications, behavioral strategies, and family involvement—vary across treatment approaches. Whereas single component treatments (i.e., treatments that focus only on dietary or physical activity modifications) have been tested, evidence widely recommends the use of multicomponent interventions (interventions utilizing several of these components, e.g., Ho et al., 2012; Oude Luttikhuis et al., 2010; Whitlock et al., 2010). For example, a recent meta-analysis found that behavioral lifestyle interventions (defined as interventions that include a combination of dietary, physical activity, and/or behavioral components) result in an average decrease in %OW of 8.9 percentage points compared to an average increase of 2.7 percentage points in education-only interventions (Wilfley, Stein, et al., 2007). Given the overwhelming support for multicomponent interventions over single-component interventions we do not review single-component treatments in the present article.

Behavioral weight loss treatment with family involvement versus family-based behavioral treatment. Reviews of family involvement in treatment suggests that targeting both parents and children together for treatment is generally associated with improved outcomes (Berry et al., 2004; McLean, Griffin, Toney, & Hardeman, 2003) and the majority of treatments include some amount of family involvement, however, the degree to which parents are involved varies considerably between treatments, making it difficult to separate treatments into discrete categories or types. In many treatments, parents' involvement is limited to the facilitation of their child's behavior changes; however, in Family-based Behavioral Treatment (FBT), a specific multicomponent behavioral treatment type,

TABLE 2
Components of Treatments for Family-Based Behavioral Treatment

Goal	Strategies
Dietary Modification	
Reduce Caloric Intake	<ul style="list-style-type: none"> • Define appropriate calorie range • Increase intake of low-energy dense foods (i.e., highly nutritious, low-calorie-dense foods) • Decrease intake of high-energy dense (HED) foods (i.e., high fat, high sugar foods)
Energy Expenditure Modification	
Increase Energy Expenditure	<ul style="list-style-type: none"> • Increase physical activity (goal: 60 min/day, 5 days/week) • Decrease sedentary activity (goal <2 hr/day outside of school time)
Behavior Change Techniques	
Goal Setting	<ul style="list-style-type: none"> • Dietary goals (e.g., <15 HED foods/week, calorie range 1,200–1,500) • Physical activity goals (e.g., >60 min activity/day, reduce sedentary activity by 50%) • Weight goals (e.g., weight loss of 0.5–2 lb/week)
Self-Monitoring	<ul style="list-style-type: none"> • Record daily food intake (e.g., calorie intake, number of HED foods, fruit and vegetable intake) • Record activity (e.g., time spent in moderate- to vigorous- intensity activity and sedentary activity) • Record weight (e.g., weekly weighing)
Reward Systems	<ul style="list-style-type: none"> • Rewards based on goal achievement • Rewards based on weight achievement
Stimulus Control	<ul style="list-style-type: none"> • Restructure home environment to increase chance of success
Family Involvement and Support	
Shape Home Environment	<ul style="list-style-type: none"> • Make the healthy choice the easy choice in home (limit unhealthy foods, etc.)
Model Healthy Eating and Activity	<ul style="list-style-type: none"> • Parent models healthy eating and physical activity lifestyle and positive body esteem
Parenting Skills	<ul style="list-style-type: none"> • Develop skills to support healthy lifestyle for family (e.g., establish stable meal and snack times, positively reinforce children for healthy behavior, identify barriers to healthy lifestyle and problem solve solutions)
Goals	<ul style="list-style-type: none"> • Diet, physical activity and weight goals are set for both parents and children

parents are robustly engaged in treatment, with lifestyle behavior changes, and behavioral and weight goals targeted in both parents and children. In FBT, parents are encouraged to make changes for themselves and act as agents of changes for their children, promoting long-term behavior change (Epstein et al., 2014), and directly targeting parents in treatment appears to be important for success (Boutelle et al., 2014). Thus, in the present review we differentiate between FBT and Behavioral Weight Loss (BWL) treatment with family involvement based on whether goals are set for both parents and children (FBT) or not (BWL; Boutelle, Cafri, & Crow, 2011; Epstein et al., 1990), and we provide evidence for each treatment type, broken down by age group as appropriate. It should be noted that there is heterogeneity in the delivery of treatments with a family component (McLean et al., 2003), and multiple treatments are referred to as FBT that do not always meet the guidelines just described (and more appropriately fit into the category of multicomponent intervention with family involvement).

RESULTS

Family-Based Behavioral Treatment

FBT has been tested in 10 separate studies in children (ages 6–12), with nine of these studies finding evidence

supporting the use of FBT over treatment of the child alone (Brownell, Kelman, & Stunkard, 1983; Epstein, Valoski, Wing, & McCurley, 1990), control conditions (Epstein et al., 1990; Graves, Meyers, & Clark, 1988; Israel, Stolmaker, & Andrian, 1985; Kirschenbaum, Harris, & Tomarken, 1984; Sacher et al., 2010; Savoye et al., 2007), and routine counseling (Kalavainen, Korppi, & Nuutinen, 2007). The addition of specific parent training on general child management skills (Israel et al., 1985), and parent problem-solving training (Graves et al., 1988) improved outcomes, suggesting these may be important additive components of treatment.

To illustrate the magnitude of effect sizes in these trials, two studies are used. In one seminal study comparing FBT (parent and child treated together) to a child-only treatment and a waitlist control group, participants in the FBT condition showed decreases in %OW (–11.2 and –7.5 at 5 and 10 year, respectively), whereas participants in the child-only (+2.7 and +4.5), and control (+7.9 and +14.3) groups showed increases in %OW (Epstein et al., 1990). In a more recent study, children 7 to 9 years of age who received FBT (with home visits) achieved superior decreases in BMI and BMI-SDS (0.8 and 0.3, respectively) compared to those receiving routine counseling (0.0 and 0.2, respectively; Kalavainen et al., 2007).

One trial found FBT to be no different from child-alone treatment (Wadden et al., 1990), although children in this study whose mothers attended more

sessions lost more weight, indicating that parental involvement is critical. Another trial conducted in the United Kingdom found no difference between FBT and a waitlist control condition; however, this study excluded calorie goals, food type goals, and participation incentives due to resistance from parents and health professionals (Croker et al., 2012). This suggests that setting clearly defined goals and including parents in goal setting may be important for achieving outcomes; however, it should be noted that it might be difficult for some families to follow these highly structured recommendations, perhaps due to external barriers, cognitive limitations, or psychiatric symptoms, although this needs to be assessed in additional research. Thus, it may be necessary to personalize treatment options to ensure all families can achieve success and be sensitive to cultural differences around these issues. Based on these results, FBT is considered *well-established* for use with children and has not been sufficiently examined with adolescents to designate a rating. A summary of the treatments that meet each level is provided in Table 3.

Parent-Only Behavioral Treatment

Whereas research strongly indicates the inclusion of both the child and parent in treatment, the optimal level

TABLE 3
Summary of Treatments by Level of Support

Treatment	Age Group	No. of Studies (No. Demonstrating Efficacy)
Well-Established Treatments		
Family-Based Behavioral Treatment	Children	10 (9)
Parent Only Behavioral Treatment	Children	14 (14)
Probably Efficacious Treatments		
None		
Possibly Efficacious Treatments		
Family-Based Behavioral Treatment – Parent Only	Adolescents	1 (1)
Behavioral Weight Loss Treatment With Family Involvement	Toddlers	3 (3)
	Children	10 (4)
	Children & Adolescents	11 (9)
	Adolescents	3 (3)
	Adolescents	1 (1)
Family-Based Behavioral Treatment – Guided Self Help		
Experimental Treatments		
Appetite Awareness Training, Regulation of Cues Treatment		
Treatments of Questionable Efficacy		
None		

of involvement from the parent remains an important question. It has been hypothesized that involving only the parent in the intervention could bolster outcomes for both parent and child, while making treatment easier to implement (Boutelle, Cafri, et al., 2011). This approach emphasizes the importance of parental modeling and authority over the home environment (Golan & Weizman, 2001), as well as engaging the parents as agents of change (Apter, Fainaru, Golan, & Weizman, 1998). Parent-only approaches have been tested in 14 trials included in this review (Apter et al., 1998; Bean, Wilson, Thornton, Kelly, & Mazzeo, 2012; Boutelle, Cafri, et al., 2011; Collins et al., 2011; Golan & Crow, 2004; Golan, Kaufman, & Shahar, 2006; Golley, Magarey, Baur, Steinbeck, & Daniels, 2007; Janicke et al., 2008; Jansen, Mulken, & Jansen, 2011; Magarey et al., 2011; Mazzeo et al., 2014; Moens & Braet, 2012; Morgan et al., 2014; Munsch et al., 2008; Okely et al., 2010; Shelton et al., 2007). In two trials, Golan and colleagues found FBT with parents as the agents of change more effective than FBT with children as the agents of change for both children (Golan et al., 2006) and adolescents (Apter et al., 1998), with the parent-focused treatment remaining superior at 7-year follow-up (Golan & Crow, 2004), although it should be noted that this study was conducted within a different region and culture (Israel with two-parent families). Parent-only treatment has also been found superior to (Munsch et al., 2008), and noninferior to (Boutelle, Cafri, et al., 2011) traditional parent and child FBT, and improved effects were shown with a parent-centered dietary intervention (Collins et al., 2011; Okely et al., 2010). Parent-only approaches have been found superior to waitlist control conditions (Bean et al., 2012; Jansen et al., 2011; Moens & Braet, 2012), including a father-only treatment (Morgan et al., 2014), and favorable outcomes have been shown with a predominantly African American population (Mazzeo et al., 2014). It is particularly effective when added to a lifestyle program (Golley et al., 2007), and the addition of parent skills training to behavioral programs (Magarey et al., 2011) and FBT (Israel et al., 1985) appear to bolster efficacy of treatments. Of importance, only one of these trials has been conducted with an adolescent-only population (Golan & Crow, 2004). A recent review suggested that parent-only approaches are as effective as parent-child and more cost-effective (Ewald, Kirby, Rees, & Robertson, 2014), with insufficient evidence to support a parent-only approach over a combined parent and child approach found in a meta-analysis (Jull & Chen, 2013). Of importance, higher rates of attrition in parent-only programs need to be addressed (Ewald et al., 2014). Parent-Only Behavioral Treatment is considered to be *well-established* for children, and *possibly efficacious* for adolescents.

Behavioral Weight Loss Treatment with Family Involvement

BWL treatments with family involvement have been tested in 10 studies of children (ages 5–12), with only four trials finding the multicomponent intervention more effective in comparison to self-help (Fullerton et al., 2007), minimal advice (Nemet, Barzilay-Teeni, & Eliakim, 2008), dietary advice usual care (Kalarchian et al., 2009), and control (Lochrie et al., 2013) conditions. BWL treatment with the addition of an active gaming component was also found to be more effective than usual BWL treatment in increasing moderate-to-vigorous PA and greater reductions in anthropometric outcomes (Troost, Sundal, Foster, Lent, & Vojta, 2014). In the remaining five trials, the multicomponent intervention was not different from control conditions (Arauz Boudreau, Kurowski, Gonzalez, Dimond, & Oreskovic, 2013; McCallum et al., 2007; Wake et al., 2009), a standard care condition (Hughes et al., 2008), and child-only treatment (Bathrellou et al., 2010). In addition, BWL treatments have been tested in an additional 11 studies of children and adolescents (ages 6–18), with nine of those trials demonstrating the efficacy of the BWL treatment compared to control conditions (Coppins et al., 2011; Jiang, Xia, Greiner, Lian, & Rosenqvist, 2005; Mellin, Slinkard, & Irwin, 1987; Nemet et al., 2005; Nowicka, Hoglund, Pietrobelli, Lissau, & Flodmark, 2008; Reinehr et al., 2010), self-help conditions (Johnston et al., 2007), written dietary advice (Weigel et al., 2008), standard care (Sabet Sarvestani, Jamalfard, Kargar, Kaveh, & Tabatabaee, 2009), and dietary advice usual care (Diaz, Esparza-Romero, Moya-Camarena, Robles-Sardin, & Valencia, 2010) conditions. In this age group, a BWL intervention with family involvement was found to be no different from a combined dietary and physical activity condition or waitlist control condition (Kitzman-Ulrich et al., 2009), and a brief family intervention (Steele et al., 2012).

Support for the use of BWL treatment with a family component is more limited with adolescents. Only three trials in adolescents are included here. In one trial, adolescents (ages 13–16) were randomized to receive cognitive behavioral weight loss treatment with either supervised aerobic exercise (CBT+EXER; e.g., stationary bicycle, treadmill, etc.) or peer-enhanced adventure therapy (CBT+PEAT), which was designed to challenge the adolescents both physically and mentally, and aimed to develop problem-solving skills, social skills, and self-confidence (Jelalian et al., 2010). In addition, both groups received recommendations for dietary and physical activity modifications and behavioral strategies, and parents attended concurrent meetings that followed the same topics. Following treatment, participants in both the CBT-PEAT and CBT-EXER group had significant

BMI z -score decreases at both posttreatment and 12-month follow-up. This suggests that CBT with either PEAT or supervised exercise can be efficacious in producing weight loss in adolescents. In a separate study of group behavioral treatment, delivered in a school setting, adolescents (ages 12–19) with BMI z -score less than 3.5 showed significant reductions in BMI z -scores compared to a waitlist control (Nowicka et al., 2008), and a third study (ages 11–18) found that BWL resulted in a significant z BMI reduction compared to control groups, but only for children of Western descent (Hofsteenge, Chinapaw, Weijs, van Tulder, & Delemarre-van de Waal, 2008). These findings suggest that although intervention can be successful in overweight and obese adolescents, outcomes may be reduced, especially among the severely obese. Multicomponent interventions with family involvement are considered *possibly efficacious* with children and adolescents, given the lack of evidence supporting efficacy compared to FBT, which is a *well-established* treatment.

There are several reasons why less robust changes are found in adolescents. First, greater change in weight status can be achieved when at younger ages, and it is harder to achieve and maintain significant weight loss in adults (Epstein, Valoski, Kalarchian, & McCurley, 1995). In addition, larger effects may be possible in younger children because smaller weight changes are needed to affect weight status, especially if children continue to grow in height while maintaining weight, and/or because diet and physical activity patterns are less established in younger children and thus more amenable to change (Braet, Tanghe, Decaluwe, Moens, & Rosseel, 2004; Dietz, 1998; Goldschmidt, Wilfley, Paluch, Roemmich, & Epstein, 2012; Vannucci et al., 2010). For example, an 8-year-old girl at the 97th percentile could achieve normal weight status if she lost approximately 4 lb in a year, whereas a 12-year-old girl at the 97th percentile would need to lose approximately 17 lb to achieve the same outcome (Goldschmidt et al., 2012), and younger children are more likely to achieve clinically significant weight loss (Danielsson, Kowalski, Ekblom, & Marcus, 2012). In addition, if untreated, children and adolescents with overweight and obesity are likely to continue to be overweight and obese as adults, which is associated with increased medical and psychosocial consequences and mortality (Reilly et al., 2003).

Fortunately, rates of obesity in 2- to 5-year-olds have decreased from 13.9% in 2003–2004 to 8.4% in 2009–2010 (Ogden et al., 2014); however, intervention with this age group remains important. Recent guidelines recommend that the goal of these interventions is to produce small weight decreases, or stabilize weight gain in these children, as this will be sufficient to produce meaningful change as children age and grow taller (Barlow & Committee, 2007; Daniels et al., 2005). Three separate

trials show promising results for the use of BWL treatment with a family component in children aged 2 to 5 (Quattrin et al., 2012; Small, Bonds-McClain, Melnyk, Vaughan, & Gannon, 2014; Stark et al., 2011) and suggest that intervening earlier may result in improved outcomes and that at-home intervention may be an efficacious addition to treatment. Multicomponent treatment with family involvement is considered *possibly efficacious* for toddlers; however, it should be noted that evidence is not as robust for this age group.

Family-Based Behavioral Treatment: Guided Self-Help

Given the high need for obesity intervention and limited access to care (Caprio, 2006), an additional goal in the treatment of childhood obesity is to ensure that treatment is accessible to the large numbers of people who need it. Researchers have thus begun to examine less intensive methods of delivering FBT to facilitate its widespread accessibility. One such approach is Guided Self-Help treatment (GSH), which has recently been tested for use in the treatment of childhood obesity and is a promising alternative treatment delivery model to intensive, in-person treatment (Boutelle, Norman, Rock, Rhee, & Crow, 2013). In this trial, children (ages 8–12) who received FBT-GSH achieved statistically superior outcomes compared to a waitlist control group following treatment and at 6-month follow-up. Whereas these results suggest that a GSH method, which was designed to be implementable in primary care or community settings, may be efficacious for the treatment of childhood obesity, the outcomes achieved are much lower than those achieved in more robust FBT interventions. It is thus possible that GSH may be an appropriate intervention for children who are at lower levels of overweight, or as a first step in treatment; however, additional research is needed to examine this possibility. FBT-GSH is considered to be *possibly efficacious* at this time.

Appetite Awareness Training and Cue Exposure Treatment

Child Appetite Awareness Training (CAAT) is a relatively new treatment modality that focuses on developing awareness of internal hunger and satiety cues and encourages eating in response to these as opposed to external cues (e.g., boredom; Bloom, Sharpe, Mullan, & Zucker, 2013; Boutelle et al., 2014) and Cue Exposure Treatment for food teaches children and parents to monitor cravings of food as they are exposed to cues, learn to resist eating in response to urges, and tolerate feelings of food craving (Boutelle et al., 2014). An initial pilot in children compared these two approaches and found that both led to decreases in binge eating

(Boutelle, Peterson, et al., 2011), and they were subsequently combined into one treatment—Regulation of Cues (ROC)—to combine the complementary treatment targets. ROC was tested in an initial RCT and no between-groups differences were found; however, the ROC group showed within-group improvements on zBMI and eating behaviors (e.g., boredom eating, negative affect eating, satiety responsiveness; Boutelle et al., 2014). A separate RCT of CAAT found within-group improvements on child BMI posttreatment but no change from baseline to 6-month follow-up (Bloom et al., 2013). CAAT and ROC are considered *experimental treatments* at this time; additional research may look at the adjunctive benefits of these approaches to *well-established* treatments.

Adjunctive Treatments

Motivational Interviewing

The goal of motivational interviewing (MI) is to facilitate the patient being the primary agent for change and involves promoting self-efficacy in goal setting (see Miller & Rollnick, 2002). Several studies examined the use of MI as an adjunctive to standard treatments, with no differences found between MI-enhanced FBT to standard FBT (Saelens, Lozano, & Scholz, 2013) or social skills training (Walpole, Dettmer, Morrongiello, McCrindle, & Hamilton, 2013), improved vegetable intake compared to standard Women, Infants, and Children nutritional counseling (Ogu et al., 2014), and improved physical activity outcomes at 6-month follow-up compared to a standard cognitive-behaviorally based weight loss program (Gourlan, Sarrazin, & Trouilloud, 2013). These results suggest that MI may be a viable addition to *well-established* treatments and additional research is needed and warranted.

Executive Function Training

The goal of executive functioning training is to improve impulse control and self-regulation skills in children. In a recent trial, obese children in inpatient treatment were randomized to receive executive function training or to a control group (Verbeken, Braet, Goossens, & van der Oord, 2013). Children who received twenty-five 40-min executive functioning training sessions (working memory and inhibition training tasks delivered through a virtual reality game) showed improved weight loss maintenance compared to the control group; however, this difference was no longer significant at 12-week follow-up. This suggests that although executive functioning training may be a valuable adjunctive approach, additional research is needed to determine how to bolster and maintain these effects.

Treatments Settings

The majority of the studies reviewed here are conducted in clinical research settings; however, additional delivery settings are being explored. Whereas physician-based treatment alone (usual-care or routine counseling typically involves either one or two education sessions or educational materials; e.g., Kalarchian et al., 2009; Kalavainen et al., 2007) is not sufficient to affect change (Wilfley et al., 2011), researchers have begun to examine novel ways to incorporate treatment into primary care settings. For example, in one trial, adolescent girls received a multicomponent intervention that was augmented with ongoing feedback from their primary care physician with promising results (DeBar et al., 2012). Research has also examined delivering the intervention directly to participants in the home, with beneficial results, possibly attributable to more direct impact on the home environment (Jiang et al., 2005; Stark et al., 2011). Additional research is needed to further explore avenues for incorporating treatment into primary care and community settings to maximize outcomes.

Inpatient Settings

For those children for whom traditional treatments are not efficacious, or who have very high degrees of obesity, it may be necessary to move to a more intensive treatment setting, such as inpatient treatment. In a clinical trial patients with obesity (ages 7–17) who did not succeed in outpatient treatment were enrolled in a maximum of 10 months of cognitive-behaviorally based inpatient treatment (Braet, Tanghe, Decaluwe, Moens, & Rosseel, 2004). Components of this treatment included living in an inpatient setting (with a school attached), having controlled meal options (approximately 1,400–1,600 calories/day), scheduled exercise (minimum of 14 hr/week), and a 12-week cognitive behavioral program (psychoeducation about obesity, diet and physical activity, and self-regulation skills). Parents were seen biweekly when visiting the center and encouraged to help their children adopt a healthier lifestyle. Participants in this trial lost 49% of their body weight following treatment and maintained a 31.7% bodyweight loss at 14-month follow-up. In another trial, children with severe obesity (ages 8–15) received 6 weeks of multicomponent inpatient treatment, followed by 10.5 months of monthly outpatient treatment conducted in the home, or were assigned to a waitlist control condition (Adam, Westenhofer, Rudolphi, & Kraaibeek, 2009). Participants in this group demonstrated significant decreases in BMI *z*-score compared to control participants, who demonstrated/evidenced/displayed an increase. Further research is warranted to determine who inpatient treatment is indicated for, when it should

be used, and whether it should be included as a precursor to outpatient treatment for the severely obese.

Medium of Delivery

To maximize access to care, researchers have also begun to research different media for delivering interventions. The use of technology (e.g., Internet, telephone) may be another appropriate avenue to enable broader dissemination of treatments, and research has begun to examine this option. In one study of Internet-delivered treatment, overweight African American female adolescents in the online behavioral treatment lost more weight than a control group; however, this was not maintained at 2-year follow-up, possibly because program usage decreased over this time (Williamson et al., 2006). An additional study found decreases in BMI over time (Taylor et al., 2012), whereas another study found an Internet-based program efficacious only among children who used the programs frequently (Delamater et al., 2013), suggesting that maintaining program usage is critical for establishing this treatment approach.

Studies of multicomponent interventions delivered by telephone are also promising, with greater %OW decreases shown in participants who received a telephone intervention, compared to a control group (Saelens et al., 2002), and high users of a separate phone-based intervention decreased weight, BMI, and BMI *z*-score compared to low users (Wright et al., 2013). These approaches are promising for meeting the high need for evidence-based childhood obesity treatments, although more research is needed to determine the ideal format for these programs to enhance participant use of the program and the magnitude of outcomes. The use of technology as stand-alone and adjunctive treatments warrants further investigation.

Predictors, Mediators, and Moderators of Treatment

Mediators of treatment help explain why and how treatments produce outcomes, and moderators help identify who treatments work for and the circumstances that affect treatment response (Kraemer, Wilson, Fairburn, & Agras, 2002). To our knowledge, no mediators and moderators of child and adolescent treatment outcome have specifically been identified, and this is a limitation of the field (Yildirim et al., 2011). Identifying predictors of treatment response is important in understanding the factors that contribute to success in existing treatments in order to identify who may benefit most from treatment and guide future treatment modifications or delivery to maximize effectiveness (Goldschmidt et al., 2014). Several predictors of treatment response have been identified, and these are reviewed next.

The degree of overweight has been shown to affect outcomes, with numerous studies having shown that higher initial body weight is associated with improved outcomes (Braet, 2006; Epstein, Valoski, Wing, & McCurley, 1994; Goossens, Braet, Van Vlierberghe, & Mels, 2009; Moens, Braet, & Van Winckel, 2010). One study also showed that increased overweight is related to poorer weight loss outcomes (Nowicka et al., 2008). This discrepancy in the literature is possibly because a higher degree of overweight is predictive of improved outcomes to a point, but once children become severely obese, their outcomes are not as robust. Another robust predictor of treatment success is child age. One study found that a child had a 47% greater chance of achieving a clinically significant decrease in BMI for each year younger, and indeed, significant weight reductions are seen much more frequently in children compared to adolescents (Danielsson et al., 2012). Studies also suggest that parental weight loss is a predictor of success, with increased parental weight loss in treatment associated with greater child weight loss (Boutelle, Cafri, & Crow, 2012; Goldschmidt et al., 2012; Watson et al., 2011; Wrotniak, Epstein, Paluch, & Roemmich, 2004). Degree of overweight, younger age, and parental weight loss success have all been identified as robust predictors of treatment success. Additional predictors are included next.

Other predictors of improved outcomes include early treatment response (Goldschmidt et al., 2012; Jelalian et al., 2008), greater social support (Braet, 2006; Epstein et al., 1994; Moens et al., 2010), lower parental psychopathology (Epstein et al., 1994; Frohlich, Pott, Albayrak, Hebebrand, & Pauli-Pott, 2011; E. Moens et al., 2010), higher session attendance (Jelalian et al., 2010), and self-monitoring (Epstein, Valoski, Wing, & McCurley, 1990; Jelalian et al., 2010). It has also been shown that, whereas boys and girls show similar weight loss outcomes in the initial stages of treatment, girls are more successful at longer term weight loss and maintenance (5- and 10-year follow-up; Epstein et al., 1990). In addition, there is preliminary evidence that appetite traits, such as high food reinforcement and impulsivity, predict poorer FBT response (Best et al., 2012). Across four FBT trials, features of the built environment were also shown to moderate treatment success with participants who have greater parkland and fewer convenience and supermarkets in their neighborhoods achieving greater reduction (Epstein et al., 2012).

DISCUSSION

Summary Levels

Based on the standards outlined above, FBT and FBT–Parent Only are considered *well-established* for use with children, and FBT Parent Only is considered *possibly*

efficacious for adolescents. FBT-GSH is also considered *possibly efficacious* for children. BWL treatments with family involvement are considered *possibly efficacious* for use with toddlers, children, and adolescents. CAAT and ROC treatments are considered experimental. No treatments are considered *probably efficacious*, or of *questionable efficacy*. See also Table 3 for a summary of these levels and the number of studies included at each level. Multiple review papers and meta-analyses on this topic have also been conducted and reach similar conclusions (American Dietetic Association, 2006; McGovern et al., 2008; Oude Luttikhuis et al., 2010; Snethen et al., 2006; Tsiros et al., 2008; Whitlock et al., 2010; Wilfley, Tibbs, et al., 2007; Young, Northern, Lister, Drummond, & O'Brien, 2007). For a summary of these findings, refer to Table 4.

Clinical Implications

Evidence supports the use of multicomponent interventions with family involvement for the treatment of childhood obesity (FBT and parent-only behavioral treatment). The core components of this treatment include specific dietary and physical activity recommendations, the use of behavioral strategies, and targeting parents/family directly in treatment. Specific recommendations for each of these components are summarized in Table 2 for easy reference. In addition, there are several important treatment considerations that must be considered in clinical settings.

Early Intervention

Given the importance of early intervention to improve treatment outcomes and mitigate, reverse, or prevent the development of the negative medical and psychosocial difficulties associated with childhood obesity (described in detail earlier in the review), it is crucial that children are screened routinely in clinical care to identify overweight and obesity at an early age (Wilfley et al., 2011), and referred to treatment as appropriate.

Treatment of Severe Obesity

Children and adolescents who are severely obese (BMI > 97th percentile) may show poorer treatment outcomes than moderately obese or overweight youth (Danielsson et al., 2012; Levine, Ringham, Kalarchian, Wisniewski, & Marcus, 2001; Nemet, Ben-Haim, Pantanowitz, & Eliakim, 2013). Research has thus begun to examine the effectiveness of interventions in severely obese populations. Whereas one study has found that behavioral lifestyle interventions lead to improved weight loss outcomes in prepubertal children compared to a control condition, these effects are modest, and the authors noted that treatment of the severely

TABLE 4
Summary of Recent Reviews and Meta-Analyses

<i>Author, Year</i>	<i>Type of Review and No. of Studies</i>	<i>Target Population</i>	<i>Conclusions</i>
Ho et al. (2012)	Review of 38 studies (meta-analysis of 19)	Overweight and obese children (younger than age 18)	Lifestyle interventions that have a dietary component as well as physical activity and/or behavioral therapy are effective treatments. The majority of effective treatments include a family component.
Oude Luttikhuis et al. (2010)	Review of 64 RCTs	Obese children and adolescents (<i>M</i> age = younger than 18)	Research supports the use of moderate- to high-intensity comprehensive programs, particularly in children aged 4 to 18 years. In obese adolescents the addition of pharmacological drugs should be considered
Whitlock et al. (2010)	Review of 15 fair- to good- quality trials	Obese or overweight children (ages 4–18)	Benefits found at least in the short-term for comprehensive medium- to high-intensity behavioral interventions
Tsiros et al. (2008)	Review of 34 RCTs	Overweight or obese adolescents (ages 12–19)	Lifestyle interventions with behavior/cognitive-behavioral components show promise, however long-term follow-up studies are needed
McGovern et al. (2008)	Meta-analysis of 61 RCTs	Overweight children and adolescents (ages 2–18)	Some evidence supporting the use of lifestyle interventions and medications, further research is needed on long-term efficacy
Epstein et al. (1994)	Meta-analysis of 14 RCTs	Overweight youth (age 19 or younger)	Lifestyle interventions produce significant changes in weight status in the short term with encouraging results for the persistence of effects
Young, Northern, Lister, Drummond, & O'Brien (2007)	Meta-analysis of 16 RCTs	Overweight children (ages 5–13)	Family-based behavioral treatments produce large and reliable effects that are maintained for several months
American Dietetic Association (2006)	Review of 29 RCTs and 15 other types of studies	Overweight children (ages 2–12) and adolescents (ages 13–18)	Positive effects for multicomponent, family-based programs for children ages 5–12, and multicomponent school-based interventions for adolescents
Snethen et al. (2006)	Meta-analysis of seven interventions	Overweight children (ages 6–16 with an overall mean age not older than 12)	Multicomponent lifestyle interventions that include parental involvement can be effective in assisting children to lose weight

Note. RCT = randomized clinical trial.

obese with currently available interventions is difficult (Nemet et al., 2013). A separate study of childhood obesity treatment found that 58% of the children ages 6 to 9 with severe obesity showed a clinically significant reduction in BMI *z*-score, whereas only 22% of children ages 10 to 13 with severe obesity did, and none of the adolescents ages 14 to 16 with severe obesity did, again reinforcing the need for early intervention (Danielsson et al., 2012). These findings suggest that although treatments may be efficacious with the severely obese, the results are less robust. It is thus preferable to intervene prior to the onset of severe obesity, and at earlier ages if possible. It may also be necessary to utilize more intensive treatment for the severely obese.

Maintenance of Weight Loss

Whereas FBT has demonstrated efficacy in producing short-term weight loss success and evidence suggests that gains can be maintained over the longer-term (Epstein, Paluch, Roemmich, & Beecher, 2007; Oude Luttikhuis et al., 2010), it is important to incorporate strategies on weight loss maintenance and relapse prevention for weight regain into treatment, especially for

those for whom successful maintenance of weight loss remains a challenge (Wilfley, Stein, et al., 2007). Maintenance of weight loss is crucial for reducing the negative medical consequences of overweight, to improve psychosocial functioning, and to prevent the tracking of obesity into adulthood (Myers, Raynor, & Epstein, 1998; Dietz, 1998; Hayden-Wade et al., 2005; Must, Jacques, Dallal, Bajema, & Dietz, 1992). Recent research has shown that including 4 months of weight maintenance treatment (either behavioral skills maintenance or social facilitation treatment) following FBT is effective for sustaining weight loss treatment success and preventing weight regain (Wilfley, Stein, et al., 2007). Additional research into these approaches is needed to maximize treatment success and prevent weight regain following treatment.

Attrition

Attrition rates vary between studies, with some studies reporting rates around 15% to 20% (e.g., Jelalian et al., 2010; Nemet et al., 2008), and others reporting rates as high as 40% (e.g., Boutelle, Cafri, et al., 2011; Savoye et al., 2007). Parent-only interventions have

particularly been identified as having higher attrition rates (Ewald et al., 2014), perhaps because parent motivation to remain engaged in the treatment is lower if their children are not attending treatment with them, although reasons for this, and approaches to minimize this attrition, need to be explored in additional research. Identified predictors of dropout include race (e.g., African Americans are more likely to withdraw from treatment early), older age, greater depressive symptoms, and lower self-concept (Zeller et al., 2004). It is crucial to further explore reasons for attrition and incorporate strategies to address such issues in treatment (e.g., maximizing treatment acceptability by personalizing treatment and remaining sensitive to cultural differences and barriers to treatment engagement) to ensure maximal uptake of treatment in clinical settings.

Diversity

Rates of obesity vary by race and ethnicity, with Hispanic and African American youth evidencing higher rates than Caucasians (Ogden et al., 2014) and, as mentioned, drop-out rates are higher in some non-White populations (Zeller et al., 2004). It is thus crucial to ensure that treatments are made effective and accessible for these populations. A position paper noted several considerations for treatment with these populations, including different parental perceptions of obesity, cultural differences, socioeconomic status, and inadequate reimbursement and insurance (Caprio et al., 2008). Whereas the majority of treatment studies have been conducted with majority White populations (Caprio et al., 2008), several studies have been conducted with non-White populations. In one study, 6-month intensive FBT was found superior to a self-help condition in Mexican American children (Johnston et al., 2007), another study of FBT in a Latino population found it equal to a waitlist control group (Arauz Boudreau et al., 2013), and a recent study concluded that it is possible to recruit and keep minority, low-income children in FBT, with favorable outcomes (Davis et al., 2013). It is clear that additional research is needed to examine the efficacy of existing treatments in non-White populations and to adapt these treatments as necessary to bolster access and outcomes.

Future Directions

A stepped care approach has been proposed for the treatment of childhood obesity, whereby the intensity of care given is escalated as the degree of overweight and risk status increases (Barlow & Committee, 2007). A crucial future direction in this area is to establish the feasibility and efficacy of this approach. The first step in meeting this goal is ensuring consistent and

reliable screening and identification of overweight and obesity, and referral to care as needed. To do so, it will be necessary to determine the ideal dosage (i.e., number, frequency and length of sessions), duration, intensity, medium (e.g., Internet or telephone), and setting (e.g., primary care, school, or community) that produce optimal short- and long-term outcomes for individuals of varying weight status (i.e., overweight, obese, or severely obese). In addition, as noted earlier, whereas effective treatment (FBT) exists, it is not being widely delivered in a standard format (McLean et al., 2003). It will be crucial to ensure that the most efficacious form of treatment is available to those who need it. Indeed, access to care is currently not available to everyone who needs it (Caprio, 2006), and thus increasing access to care is an important next step for the field. To do so, it will be necessary to evaluate how best to disseminate effective treatments and how to implement them in clinical settings, as well as establishing training protocols to increase the numbers of providers who can deliver evidence-based treatments effectively.

Finally, it is important to further identify predictors, moderators, and mediators of treatment outcome and increase treatment acceptability to ensure minimal attrition. In addition, there are methodological concerns that should be addressed in future research. Specifically, the most reliable outcome measure should be identified, as well as the magnitude of change that is necessary for producing clinically significant outcomes in the short- and long-term.

Conclusion

Childhood and adolescent overweight and obesity pose a significant public health concern and effective treatment is vital to mitigate this burden. Without treatment, overweight and obese youth will almost certainly continue to gain weight over time, making them vulnerable to overweight or obesity and associated comorbidities in adulthood, at which point it is increasingly difficult to produce sustainable weight loss (Cunningham, Kramer, & Narayan, 2014; Reilly et al., 2003). Research supports the use of multicomponent lifestyle interventions that include dietary and physical activity modification, behavioral strategies, and parental/familial involvement as the first line of treatment, with FBT being the most widely supported treatment type for children. Evidence supports early intervention, as more robust changes can be made at this time. Although more modest, significant improvements in weight and associated medical outcomes can still be made in adolescents, although additional research is warranted with this age group. Research also suggests that lifestyle interventions are probably cost-effective, although cost savings and health benefits may not be notable until the sixth or

seventh decade of life (Hollingworth et al., 2012), with family-based treatment more cost-effective than treating parents and children separately (Epstein et al., 2014). Additional research is needed to evaluate a stepped-care approach to treatment and further enhance the potency of treatments. Furthermore, it is imperative to ensure that access to effective interventions is increased in order to meet the pressing need for treatment.

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