ACSM
AMERICAN COLLEGE OF SPORTS MEDICINE

Physical Activity and Excess Body Weight and Adiposity for Adults. American College of Sports Medicine Consensus Statement

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ABSTRACT

JAKICIC, J. M., C. M. APOVIAN, D. J. BARR-ANDERSON, A. P. COURCOULAS, J. E. DONNELLY, P. EKKEKAKIS, M. HOPKINS, E. V. LAMBERT, M. A. NAPOLITANO, and S. L. VOLPE. Physical Activity and Excess Body Weight and Adiposity for Adults. American College of Sports Medicine Consensus Statement. *Med. Sci. Sports Exerc.*, Vol. 56, No. 10, pp. 2076–2091, 2024. Excessive body weight and adiposity contribute to many adverse health concerns. The American College of Sports Medicine (ACSM) recognizes that the condition of excess body weight and adiposity is complex, with numerous factors warranting consideration. The ACSM published a position stand on this topic in 2001 with an update in 2009, and a consensus paper on the role of physical activity in the prevention of weight gain in 2019. This current consensus paper serves as an additional update to those prior ACSM position and consensus papers. The ACSM supports the inclusion of physical activity in medical treatments (pharmacotherapy, metabolic and bariatric surgery) of excess weight and adiposity, as deemed to be medically appropriate, and provides perspectives on physical activity within these therapies. For weight loss and prevention of weight gain, the effects may be most prevalent when physical activity is progressed in an appropriate manner to at least 150 $min \cdot wk^{-1}$ of moderate-intensity physical activity, and these benefits occur in a dose–response manner. High-intensity interval training does not appear to be superior to moderate-to-vigorous physical activity for body weight regulation, and light-intensity physical activity may also be an alternative approach provided it is of sufficient energy expenditure. Evidence does not support that any one single mode of physical activity is superior to other modes for the prevention of weight gain or weight loss, and to elicit holistic health benefits beyond the effects on body weight and adiposity, multimodal physical activity should be recommended. The interaction between energy expenditure and energy intake is complex, and the effects of exercise on the control of appetite are variable between individuals. Physical activity interventions should be inclusive and tailored for sex, self-identified gender, race, ethnicity, socioeconomic status, age, and developmental level. Intervention approaches can also include different forms, channels, and methods to support physical activity.

INTRODUCTION

Excess body weight and adiposity, typically termed as overweight or obesity, contributes to an array of deleterious health concerns and is a global public health concern (1). However, because excess weight and adiposity may contribute to these adverse health outcomes in a continuous manner, rather than only when an individual crosses a specific threshold that would place them into a status of having overweight or obesity, it may be most appropriate to consider health implications across the continuum of weight and adiposity status. The health concerns related to excess body weight and adiposity apply across the lifespan and across most demographic characteristics (1). Moreover, the health burden of excess body weight and adiposity is not limited to cardiometabolic factors, but is associated with most body systems (2). Thus, there is a need for continued efforts to prevent and treat excess body weight and adiposity to reduce their associated health burden.

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This article is being simultaneously published in *Translational Journal of the American College of Sports Medicine*® (DOI:10.1249/TJX.0000000000000266).

2379-2868/24/5610-2076/0
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

DOI: 10.1249/MSS.0000000000003520

This consensus statement provides contemporary updates and extends prior positions of the American College of Sports Medicine (ACSM) related to the prevention of weight gain and the treatment of overweight and obesity. These prior positions include the 2001 and 2009 position papers focused on weight loss and the 2019 consensus paper on the role of physical activity in the prevention of weight gain (3–5). The scientific literature continues to expand, and therefore, this report provides contemporary updates to those prior reports. Moreover, this report expands to include contemporary perspectives on defining excess body weight and adiposity, medical management of body weight regulation, the influence of physical activity on energy balance regulation and food intake, physical activity mode and volume considerations, application to various population groups, and strategies for physical activity engagement within the context of body weight regulation. This report also highlights research areas for consideration, with a focus on physical activity, and considerations for exercise and fitness professionals.

PROCESS FOR DEVELOPMENT OF THE CONSENSUS STATEMENTS

The contributors to this consensus statement were appointed by ACSM, and the contributors agreed on a process for its development. The following procedures were adopted for this purpose.

- The topics for inclusion were developed by consensus of the contributors.
- Contributors volunteered to assist with the development of sections of the report, and the content of these sections was based on their review of related scientific literature. Each section was then reviewed by all contributors, and after addressing comments by the other contributors, consensus was obtained for the final content.
- Based on the scientific context contained within the report, consensus statements and areas for future research were developed. The final versions of these statements received consensus approval by the contributors.
- The final version of all content of this report was approved by the contributors.

ACSM'S RECOGNITION OF CLINICAL AND PUBLIC HEALTH CONSIDERATIONS

ACSM recognizes that the condition of excess body weight and adiposity is complex, with numerous factors warranting consideration. ACSM broadly supports the positions of other professional organizations and public health entities that have established prevention and treatment guidelines and recommendations. Within the context of these reports, ACSM recognizes the following key elements.

- Excess body weight and adiposity, typically termed as overweight or obesity, is a chronic health condition that warrants appropriate and effective treatments, and this persists across the lifespan (6–8).
- Treatment of excess body weight and adiposity should be conducted within the context of overall health and the concurrent presence of other health conditions.
- Recommend that adults with excess body weight and adiposity target to reduce their body weight by a minimum of 5%–10% and maintain at least this magnitude of weight loss long-term (8). However, weight loss of greater magnitude, with an effort on sustaining this weight loss, may have additional health benefits that may include reducing the onset of chronic conditions such as cardiovascular disease (8,9). Moreover, for some individuals, there may be health benefits with weight loss of less than 5%. The health benefits of varying amounts of weight loss should be monitored by clinicians.
- Treatment of excess body weight and adiposity should occur within the context of shared decision making that consider the perspectives of the provider, other members of a comprehensive care team, and the individual.
- Inclusion of physical activity should occur within a multifocused scope of prevention and treatment options for body weight regulation that include medical management, nutrition and eating behavior, and behavior modification.
- Prevention and treatment strategies for excess body weight and adiposity should adopt a broader systems approach as proposed by the National Academies of Science, Engineering, and Medicine's Roundtable on Obesity Solutions that includes the leverage points of structural racism and social justice, biased mental models and social norms, and effective health communications (10).
- Prevention and treatment strategies for excess body weight and adiposity should adopt public policies that facilitate healthful eating behaviors and engagement in adequate physical activity and promote prevention and management of excessive body weight and adiposity.
- "People-first" language (i.e., "individuals with obesity" rather than "obese individuals") should be used within the context of excess body weight and adiposity.
- Treatment for individuals with excess body weight and adiposity should be provided in an unbiased manner, with all individuals given equitable access to effective and affordable treatment options.

CONSIDERATIONS FOR DEFINING EXCESS BODY WEIGHT AND ADIPOSITY

Within the context of clinical management guidelines, body mass index (BMI), computed from measure of body weight and height ($kg \cdot m^{-2}$), has been widely accepted as a method to define overweight and obesity. However, BMI may misclassify an individual with overweight or obesity when there is a high amount of lean body mass. Moreover, the association between BMI and health risks may vary by race (11–13), and BMI may misclassify obesity more in women compared to men (14). Despite the potential limitations, and consistent with the recent American Medical Association (AMA) policy (15), ACSM supports the use of BMI as an initial screening tool for the potential presence of excess body weight or an indication of potential excess adiposity. Also consistent with the AMA policy, physicians and other healthcare professionals should use BMI within the context of broader health considerations when contemplating treatment options, which may include the presence of related risk factors, health conditions, and the desires and perspectives of the individual (15). This broader health consideration may also need to include measurement of abdominal adiposity, which can be assessed clinically using waist circumference, to enhance the precision of when total and regional body size may represent potential health concerns (16). Moreover, when appropriate and indicated, further evaluation of body composition may be warranted, which may include measures of total and regional adiposity and subcomponents of lean body mass that include bone, muscle, and specific organs (e.g., liver, heart). Examples of when body composition measurement may be indicated include clinical circumstances where there is concern that BMI may not appropriately represent health status or if there is concern about the reduction in lean mass, muscle mass, or bone in response to therapies to treat excessive weight and adiposity. Body composition measurements may also be warranted in research settings to quantify the contribution of different body tissues to health risk or to quantify changes in these tissues to various intervention approaches. However, it is recognized that methods of assessing body composition differ in their cost, precision, validity, and reliability, and these factors should be considered when selecting a method that is implemented in clinical or research settings (17).

MEDICAL TREATMENT CONSIDERATIONS

A variety of medical treatments are available for the treatment of excess body weight and adiposity. ACSM supports the inclusion of physical activity, as deemed to be medically appropriate, within each of these medical approaches to manage excess body weight and adiposity. Considerations within the context of pharmacotherapy and metabolic/bariatric surgery are provided below.

Pharmacotherapy

Contemporary approaches to pharmacotherapy, also referred to as antiobesity medications, mimic the body's naturally occurring nutrient-stimulated hormones (NuSH) that target the receptors of glucose-dependent insulinotropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1). These NuSH-based therapies reduce appetite, increase satiety, and slow gastric emptying, which contribute to weight loss. These have been shown to be highly effective for weight loss (18,19). At the time of this writing, the two most recently approved NuSHs for weight loss are Semaglutide and Tirzepatide. There are many other therapies in development or in phase 2 or 3 studies, with these additional therapies adding glucagon to both GLP-1 and GIP, or examining the potential of hormones such as amylin, cholecystokinin, and others (20). Thus, it is possible that these medications may be even more effective than the currently available therapies.

Semaglutide is a selective GLP-1 receptor agonist that is efficacious for weight loss in individuals with overweight/obesity and without type 2 diabetes mellitus (14.9% weight loss vs 2.4% weight loss in the placebo group) (19). In one recent study, those with type 2 diabetes mellitus had a 9.6% weight loss versus 3.4% weight loss in the placebo group (21). Similar magnitudes of weight loss have been observed in other studies of Semaglutide (19,22–25). Moreover, a systematic review and meta-analysis concluded that the mean difference in percent weight loss was −11.9% (95% confidence interval (CI): −12.8 to −10.9) favoring Semaglutide compared to placebo (26). Tirzepatide is a dual GIP and GLP-1 receptor agonist that has been shown to be effective for weight loss in individuals with overweight and/or obesity both with (14.7% weight loss vs 3.2% weight loss in the placebo group) and without (20.9% weight loss vs 3.1% weight loss in the placebo group) type 2 diabetes mellitus (18) (27). A systematic review of Tirzepatide reported weight loss exceeding the placebo by −9.81 kg (95% CI: −12.09 to −7.52) (28).

A potential concern with these NuSHs has been the excessive loss of lean body mass (29); however, most studies of antiobesity medications have not published data on changes in body composition. By comparison, the loss of lean body mass accounts for approximately 15% to 25% of total body weight loss resulting from a behavior lifestyle modification intervention (30,31). The loss of lean body mass is of potential concern because it may negatively impact components of energy expenditure, musculoskeletal health, and other health outcomes (32). However, it is unclear if the loss of lean body mass is proportional to a loss of muscle tissue, which is a subcomponent of lean body mass, suggesting a need for researchers to directly assess muscle mass and not solely lean body mass in response to antiobesity medication therapies. Moreover, a meta-analysis concluded that self-reported physical function improves with antiobesity medication-induced weight loss, but there are limited data available for the effects on cardiorespiratory fitness and objectively measured physical function (33), which are important health-related outcomes that need consideration.

Physical activity within the context of antiobesity medication therapy is an important clinical consideration. However, there is a paucity of data to support that physical activity, or structured exercise training, will enhance the initial weight loss or reduction in adiposity achieved with an antiobesity medication. There is also a paucity of data to support that physical activity, including resistance exercise training, will attenuate the loss of lean body mass and muscle mass that is typically observed with antiobesity medication treatment. One of the few studies of combining physical activity with a GLP-1 antiobesity medication was conducted after participants initially lost body weight (13.1 kg (95% CI: 12.4–13.7 kg)) across an 8-wk program with a low-energy diet (34). Following initial weight loss, participants were randomized to receive placebo only, placebo plus exercise, Liraglutide (an early-generation GLP-1 receptor agonist), or Liraglutide plus exercise. The exercise involved progressing over a period of 6 wk to 2 d·wk^{-1} of group-based 30 min of vigorous-intensity, interval-based indoor cycling plus 15 min of circuit training, and 2 d·wk^{-1} of moderate-to-vigorous–intensity exercise individually that included brisk walking, running, or cycling. At 12 months following randomization, significant weight regain occurred in the placebo group (6.1 kg (95% CI: 3.5–8.7)), nonsignificant weight change occurred with exercise alone (2.0 kg (95% CI: −0.7 to 4.6)) or Liraglutide alone (−0.7 kg (95% CI: −3.2 to 1.8)), and significant weight loss occurred with the combination of Liraglutide plus exercise (−3.4 kg (95% CI: −5.9 to −0.9)). Pertinent to antiobesity medication therapy, the weight loss and reduction in body fatness with liraglutide plus exercise were significantly greater compared to Liraglutide alone. Moreover, cardiorespiratory fitness increased with liraglutide plus exercise (oxygen consumption increased by 4.8 mL·kg^{-1}·min^{-1} (95% CI: 3.4–6.1)) but was not significantly changed with Liraglutide alone (1.1 mL·kg^{-1}·min^{-1} (95% CI: −0.3, 2.6)). Therefore, the results of this study suggest the importance of exercise and physical activity to elicit important cardiometabolic effects beyond what can be achieved with antiobesity medication-induced weight loss alone.

Metabolic/Bariatric Surgery

Relatively recent changes to lower the BMI thresholds for when metabolic and bariatric surgery is medically indicated will increase the number of individuals who are eligible for this form of obesity treatment (35). These new guidelines recommend that metabolic and bariatric surgery be considered for all individuals with a BMI ≥35 kg·m^{-2}, and this treatment be considered for individuals with a BMI ≥30 kg·m^{-2} who also have metabolic disease (e.g., type 2 diabetes). Moreover, the threshold for use of metabolic and bariatric surgery for Asian populations is for a BMI ≥27.5 kg·m^{-2}.

There have been dramatic shifts in metabolic and bariatric surgery procedures, and the most common current procedure is sleeve gastrectomy followed by Roux-en-Y gastric bypass (RYGB), with the biliopancreatic diversion with or without duodenal switch procedure less commonly performed (36). The laparoscopic adjustable band (LAGB) is rarely performed due to less effective long-term weight loss and the need for removal due to intolerance. Metabolic and bariatric surgery is highly effective and durable for long-term weight loss and reducing adiposity-related health risks (37). The STAMPEDE (Surgical Treatment and Medications Potentially Eradicate Diabetes Efficiently) Trial, which compared bariatric procedures to medical/lifestyle treatment, reported that weight loss at 12 months after surgery was 27.5% for RYGB and 24.7% for sleeve gastrectomy, which were both significantly greater than the weight loss observed with nonsurgical medical therapy (5.2%) (38). The TRIABETES Study compared RYGB, LAGB, and intensive lifestyle modification and reported 12-month weight loss of 27.0%, 17.3%, and 10.2%, respectively (39). By comparison, the 12-month weight losses in the nonsurgical intensive lifestyle interventions in the Diabetes Prevention Program (40) and in the Look AHEAD Study (41) were approximately 7% and 8.6%, respectively. Moreover, compared to nonsurgical and nonpharmacotherapy approaches, metabolic and bariatric surgery results in more durable weight loss, which may contribute to enhanced health benefits compared to nonsurgical lifestyle interventions (42). For example, in both the STAMPEDE Trial and TRIABETES Study, metabolic and bariatric surgery was superior to nonsurgical intensive lifestyle interventions for glucose control and full or partial diabetes remission at 5 yr (43,44). Moreover, the Alliance of Randomized Trials of Medicine versus Metabolic Surgery in Type 2 Diabetes (ARMMS-T2D) consortium reported similar findings after a 3-yr observation period (45).

Physical activity is recommended within metabolic and bariatric surgery clinical practice guidelines (46,47). The European Association for the Study of Obesity concluded that weight and adiposity are reduced by an additional 2.5 kg (on average) with aerobic, resistance, or the combination of these modes of physical activity following metabolic and bariatric surgery (46). Another meta-analysis concluded that physical activity contributes an additional 1.9 kg of weight loss to metabolic and bariatric surgery (48). However, it is important to consider the effects of physical activity across the duration of treatment, and the effects on body weight are mixed. Although premetabolic and bariatric surgery physical activity interventions have been shown to increase physical activity, there is low quality of evidence to support that this will enhance postmetabolic and bariatric surgery weight loss (46). Physical activity implemented across 6 months following metabolic and bariatric surgery shows minimal benefits on additional weight loss (49), but physical activity over a longer period is associated with enhanced weight loss (48). For example, 6-month weight loss was not enhanced with the inclusion of supervised exercise (49), whereas the Longitudinal Assessment of Bariatric Surgery (LABS) study reported a dose–response association between both more physical activity and less sedentary behavior with greater weight loss at 7-yr postmetabolic and bariatric surgery (50). Despite the association with improved long-term weight loss after metabolic and bariatric surgery, a recent systematic review and meta-analysis concluded that physical activity does not significantly prevent weight recurrence following metabolic and bariatric surgery (51).

The benefits of physical activity within the context of metabolic and bariatric surgery likely reach beyond the effects on body weight. There is a loss of lean body mass that accompanies weight loss from metabolic and bariatric surgery (49), and this may raise some concern with the potential for sarcopenia. Base on a systematic review, Morales-Marroquin et al. concluded that the addition of resistance exercise to metabolic and bariatric surgery prevented the loss of muscle strength; however, the attenuation of lean mass body loss with resistance exercise was only observed in younger persons (52). Specific to muscle, physical activity is associated with enhanced muscle quality after metabolic and bariatric surgery

(53,54). Supervised aerobic activity significantly improved cardiorespiratory fitness, insulin sensitivity, and glucose effectiveness compared to metabolic and bariatric surgery without supervised physical activity (49). Therefore, within the context of metabolic and bariatric surgery, the importance of exercise and physical activity needs to be considered beyond any effects on body weight and should include the effects on other health-related benefits.

Consensus Statements

- Antiobesity medications and metabolic and bariatric surgery are effective treatments for excess body weight and adiposity, and for the treatment of adiposity-related health conditions (e.g., cardiovascular disease, diabetes, etc.), and both antiobesity medications and metabolic and bariatric surgery should be made available to individuals when medically indicated and in a manner that is consistent with current clinical practice guidelines. Treatment should include balancing efficacy and safety in a shared-decision model indicated by medical providers.
- Consistent with the prior ACSM position statement (4), antiobesity medications should be used in combination with a behavioral intervention that focuses on eating and physical activity behaviors that are consistent with individual needs and complement the effectiveness of the antiobesity medications.
- Include both aerobic and resistance modes of physical activity with antiobesity medications and metabolic and bariatric surgery. This combination of physical activity will enhance cardiorespiratory fitness, muscle strength and function, muscle quality, and potentially attenuate the loss of lean body mass and muscle that may occur with weight loss. To sustain these benefits, physical activity needs to be maintained long-term.
- The inclusion of physical activity for individuals undergoing treatment with an antiobesity medication or metabolic and bariatric surgery should extend beyond its potential effects on body weight or body composition and should be considered within the context of holistic health and well-being. This may also need to include balance training to enhance kinesthetic awareness, which may change with weight loss, to facilitate safe mobility and physical activity.
- The initiation and progression of physical activity, which includes mode and dose (intensity, duration, frequency), should consider an individual's capacity and physical abilities, and warrants appropriate medical clearance by the antiobesity medication prescribing provider, by the individual's surgeon after metabolic and bariatric surgery, and other providers as indicated by the medical status of the individual.
- The comprehensive treatment team should consist of a professional with the appropriate training and professional certifications, such as an ACSM Certified Clinical Exercise Physiologist, to apply physical activity to the treatment of individuals receiving treatment with an antiobesity medication or metabolic and bariatric surgery.

PHYSICAL ACTIVITY CONSIDERATIONS FOR THE PREVENTION AND TREATMENT OF EXCESS BODY WEIGHT AND ADIPOSITY

The prevention of weight and adiposity gain may curtail the further worsening of adiposity-related health conditions. Physical activity is a key lifestyle behavior within this context. Both the 2001 and 2009 ACSM Position Papers concluded that physical activity was associated with attenuation of weight gain (3,4). Moreover, the systematic review conducted for the 2018 Physical Activity Guidelines Advisory Committee Report concluded that there is an association between greater amounts of physical activity and attenuated weight gain in adults, and this may be most pronounced when physical activity exposure is at a moderate-to-vigorous intensity and is above 150 $\text{min}\cdot\text{wk}^{-1}$ (5).

Consistent with prior reports, physical activity without a concurrent energy-restricted diet generally provides modest weight loss of approximately 0.5 to 3.0 kg, with greater weight loss and reductions in adiposity occurring in a dose–response manner (3). Moreover, without a concurrent energy-restricted diet, selective forms of physical activity may result in reduction in visceral adiposity and a possible increase in muscle mass (3,4), with the majority of evidence currently based on aerobic and resistance forms of physical activity. Even in the absence of reducing body weight or adiposity, physical activity contributes to other health benefits for persons with excess body weight and adiposity such as reduced risk of cardiovascular disease, diabetes, cancer, and others (3,4).

When combined with an energy-restricted diet, the effect of physical activity on body weight and adiposity is additive to diet and enhance weight loss by approximately 20% compared to what is observed with an energy-restricted diet alone (3,4). The magnitude of these additive effects of physical activity may occur in a dose–response manner (3), with greater effects observed with increased doses of physical activity. However, the effects of physical activity on these outcomes may be blunted and diminished with greater levels of dietary energy restriction (3).

Enhanced long-term weight loss is associated with 200 to 300 $\text{min}\cdot\text{wk}^{-1}$ or ≥2000 $\text{kcal}\cdot\text{wk}^{-1}$ of leisure-time physical activity (3,4). This dose of physical activity was first recommended by ACSM (4), with other clinical and public health recommendations also supporting this dose of physical activity (8,55,56). However, the evidence to support this recommendation was based primarily on prospective associations and secondary data analyses. Randomized studies of different prescribed doses of physical activity have not consistently supported this recommendation. When a combination of supervised and unsupervised exercise was added following weight loss of ≥5%, exercise of 225 and 300 $\text{min}\cdot\text{wk}^{-1}$ was not superior to 150 $\text{min}\cdot\text{wk}^{-1}$ for enhancing weight loss maintenance over a period of 12 months (57). Furthermore, another recent study reported that prescribing unsupervised 250 min·wk^{-1} of physical activity did not elicit greater weight loss than prescribing unsupervised 150 min·wk^{-1} within the context of a comprehensive behavioral weight-loss program (30). Thus, physical activity targets may need to be initially set to progress to 150 min·wk^{-1} of moderate-to-vigorous physical activity with progression to a higher dose when necessary to enhance body weight regulation and elicit additional health benefits that may not be realized for an individual engaging in a lower amount of moderate-to-vigorous physical activity.

Individual variability in weight change in response to exercise and physical activity has been observed. For example, data from the HERITAGE Study demonstrated heterogeneity in change in body composition in response to supervised exercise training (58). Data from the Midwest Exercise Trial also demonstrated heterogeneity, with supervised exercise resulting in weight loss in some individuals but not in others, and there was interindividual variability in the magnitude of weight change even in individuals for which weight loss was observed (59). This may suggest the need to develop individualized recommendations for structured exercise and physical activity, and there is a need to identify factors that may inform how to best personalize these recommendations.

An additional area of consideration is the potential influence of sedentary behavior on weight status and weight loss. The 2019 ACSM Pronouncement on sedentary behavior concluded that sedentary behavior was not associated with weight status (60). In individual studies of exercise alone without dietary modification, there was no difference in sedentary time between those defined as responders and nonresponders, with these categories based on whether weight loss was observed or not in response to the intervention (61). A study that combined dietary modification with physical activity reported that the change in sedentary behavior was not predictive of weight loss, but rather the increase in both light-intensity and moderate-to-vigorous intensity physical activity was predictive of weight loss (62). Moreover, a systematic review found that there was not a change in nonexercise energy expenditure in exercise studies (63), suggesting that, on average, there is not a compensatory increase in sedentary behavior in response to exercise that is targeting weight loss.

Within the context of body-weight regulation, there are emerging areas that are specific to physical activity. The 2018 Physical Activity Guidelines for Americans recommend the accumulation of moderate-to-vigorous physical activity with no minimum bout duration contributing to this accumulation (64). However, the scientific evidence to support this recommendation includes primarily cross-sectional studies, with a few studies supporting that moderate-to-vigorous physical activity of any bout duration was associated with lower body weight (65,66). A recent cross-sectional study showed modest but significantly lower body weight, BMI, and waist circumference with engaging in at least 150 min·wk^{-1} of moderate-to-vigorous physical activity regardless of the length of the activity bouts; however, a lower percent body fat was only observed when engaging in at least 150 min·wk^{-1} of moderate-to-vigorous physical activity that was accumulated in activity bouts of at least 10 min in duration (67).

Another emerging area is time of day consideration for engagement in physical activity and how this may be associated with measures of body weight and adiposity. Cross-sectional analysis of data from the Women's Health Study showed that lower physical activity in the morning was associated with greater odds of having obesity (68). In secondary analyses, it was shown that engaging in morning exercise was associated with greater 10-month weight loss compared to exercising in the afternoon/evening; however, sporadic exercise not performed consistently in the morning, at mid-day, or in the late afternoon or evening was shown to be associated with weight loss that was not significantly different from exercise performed primarily in the morning, around mid-day, or late afternoon or evening (69). Moreover, a 15-wk pilot study showed that morning and evening exercise resulted in similar magnitudes of weight loss (70). Physical activity at a consistent time of the day, particularly in the morning, may be important for sustaining exercise participation following weight loss (71). However, the data regarding the optimal time of day for exercise that may enhance body weight regulation are inconsistent (72). The data also do not necessarily support that morning activity is preferred over other times of the day for its effects on adiposity-related conditions such as glucose control. For example, some studies demonstrate a greater effect when physical activity is performed in the afternoon (73,74), other studies demonstrate a greater effect with activity performed in the morning (75), and yet other studies demonstrate no difference between morning and afternoon physical activity (76). The time of day that may be most appropriate for an individual may need to consider the health benefits that are balanced with factors that may contribute to physical activity engagement that may include occupational responsibilities, family responsibilities, and others.

Consensus Statements

- Physical activity contributes to the prevention of weight gain and adiposity, and an increase in physical activity above current levels results in weight loss and reduced adiposity, in a dose–response manner. The effects may be most prevalent when physical activity is progressed in an appropriate manner to at least 150 min·wk^{-1} of moderate-intensity physical activity, or the equivalent dose if at a different intensity.
- The effects of physical activity are additive to the effects of reduced energy intake for effects on body weight and adiposity.
- Total energy expenditure resulting from moderate-to-vigorous physical activity, regardless of bout duration, is associated with lower body weight and possibly adiposity. However, whether accumulating physical activity in bouts less than 10 min in duration is as effective for change in body weight and adiposity compared to bouts of activity performed in longer bouts, which are of equal energy expenditure, is unclear.
- Engaging in physical activity in a consistent pattern across days contributes to sustained engagement. However, data are limited and not consistent regarding whether the time

of day one engages in physical activity will have differential effects on body weight and adiposity.

PHYSICAL ACTIVITY INTENSITY CONSIDERATIONS

Most of the scientific literature has reported on the contribution of moderate-to-vigorous physical activity to the regulation of body weight, which includes prevention of weight gain, weight loss, and weight loss maintenance. Although still understudied, there is emerging evidence of the potential benefits of light-intensity physical activity on body weight regulation. Gay et al. (77) reported that there is a modest, but statistically significant, inverse correlation between light-intensity occupational physical activity and percent body fat. Within the context of a comprehensive behavioral weight loss intervention, light-intensity physical activity has been shown to be additive to the effects of moderate-to-vigorous physical activity for weight loss (62). It has been suggested that there would be energy expenditure benefits by shifting sedentary behavior to light-intensity physical activity, and this may influence body weight regulation (78).

High-intensity interval training (HIIT) provides another approach for consideration, and studies have concluded that HIIT is not superior to moderate-intensity physical activity performed in a continuous manner for its effect on body weight or body composition (79). However, when compared to adults of healthy body weight, adults with excess body weight and adiposity may demonstrate greater benefits to body composition with HIIT (79). Thus, when accepted by an individual and not otherwise contraindicated, HIIT may provide a viable alternative approach to physical activity for individuals with excess body weight and adiposity.

Consensus Statements

- Physical activity performed at a moderate-to-vigorous intensity that elicits a sufficient energy expenditure can be effective for body weight regulation, the treatment of excess body weight and adiposity, and the treatment of adiposity-related health conditions.
- HIIT is not superior to other modes of physical activity performed at a moderate-to-vigorous intensity for its effects on body weight and body composition, but HIIT can be an option when not contraindicated and when preferred by the individual.
- Light-intensity physical activity is additive to more intense physical activity for effects on body weight regulation and the treatment of excess body weight and adiposity. For individuals for whom moderate- or vigorous-intensity physical activity may not be feasible or is contraindicated, light-intensity physical activity provides a viable alternative to enhance energy expenditure for individuals who choose it over other alternatives. However, to elicit an energy expenditure that is equivalent to moderate-to-vigorous intensity physical activity, light-intensity physical activity will need to be of a longer duration. Moreover, the specific dose of light-intensity physical activity that may be effective for body weight regulation and the treatment of excess body weight and adiposity is currently unknown.

PHYSICAL ACTIVITY MODE CONSIDERATIONS

There is continued debate on the mode of physical activity that may be most effective for the prevention and treatment of excess body weight and adiposity. Although studies have been conducted to compare different modes of physical activity, most of these studies have not controlled for energy expenditure across the physical activity modes or have used designs that limit the ability to draw definitive conclusions. Moreover, physical activity mode considerations also need to account for other desired outcomes beyond regulation of body weight that can enhance health. Within the context of energy balance, the effects of different modes of physical activity on adiposity-related outcomes may be influenced by whether the mode of physical activity is accompanied by intentional dietary restriction and by the intensity and volume of the physical activity. Additionally, it is unclear if the context in which the physical activity occurs (e.g., leisure-time, household, occupational, transportation) influences the effect on body weight and adiposity regulation.

Consensus Statements

- Evidence does not support that any one single mode of physical activity is superior to other modes for the prevention of weight gain or weight loss, provided that the dose of physical activity is sufficient to result in the necessary effects on energy expenditure and energy balance. Moreover, options for non–weight-supported modes should be recommended to accommodate individual needs when body weight or body size limits the ability to engage in weight supported physical activity.
- To elicit holistic health benefits beyond the effects on body weight and adiposity, multimodal physical activity, rather than a single mode of physical activity, should be recommended for persons with excess body weight and adiposity that include (see Fig. 1): 1) aerobic activity to maintain or increase cardiorespiratory fitness; 2) resistance forms of activity to possibly enhance muscle mass and maintain or increase muscular strength and function; 3) mind-body forms of physical activity, such as yoga, to assist with mobility and balance, and kinesthetic body awareness, and to influence other domains that may contribute to holistic health and well-being; and 4) balance training to adjust to changes in distribution of body weight that will assist with safe mobility and fall prevention.

DIETARY CONSIDERATIONS

Clinical guidelines recommend dietary modification that results in a reduction in energy intake be used in combination with physical activity to induce weight loss and a reduction in adiposity (8). A reasonable reduction in energy intake of approximately

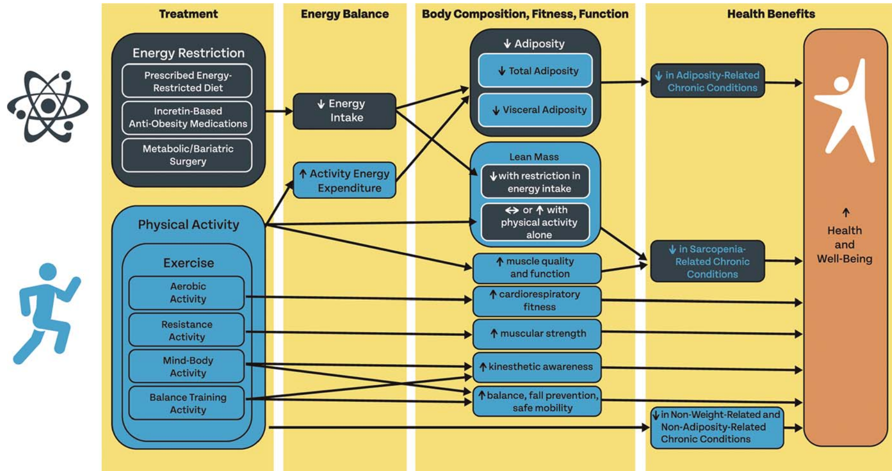

FIGURE 1—Theoretical framework for how physical activity contributes to body composition, components of fitness, and health within approaches targeting body weight regulation.

500 to 1000 $kcal \cdot d^{-1}$ is effective for decreasing body weight by approximately 1 to 2 $lb \cdot wk^{-1}$, with medically supervised greater reductions in energy intake resulting in a greater magnitude of weight loss (8). However, the expectation of body weight loss being 1 to 2 $lb \cdot wk^{-1}$ with a 500 to 1000 $kcal \cdot d^{-1}$ energy deficit is an estimate and should be viewed with caution. Evidence supports that, on average, most individuals will have actual body weight loss that is less than this estimated amount (80).

Portion control of eating is an important dietary strategy that influences body weight. Increasing the portion size at one meal can result in increased energy intake throughout the day (81–83), and the doubling of the portion size can increase acute energy intake by 35% (84). A recent systematic review and meta-analyses reported that decreased portion sizes resulted in decreased energy intake. In studies examining body weight, being served smaller versus larger portions was associated with approximately 0.6 kg less weight gain (85).

Intermittent fasting involves periods during the day (time-restricted eating) or across days (alternative days of fasting) where food is not consumed. Theoretically, this may facilitate greater reductions in energy intake that can facilitate greater weight loss. However, a recent meta-analysis of randomized controlled trials concluded that for persons with a BMI >30 $kg \cdot m^{-2}$, intermittent fasting (whether time-restricted eating or alternate day fasting) did not result in greater weight loss compared to consumption of a low-energy diet (86). Although the data are limited, the addition of exercise to a period of fasting has been shown to possibly enhance the beneficial effects on cardiometabolic markers of health (e.g., lipids, inflammation) and possibly liver health (87). It has also been suggested that the addition of exercise at the beginning of a fasting period may allow for the fasting period to be more tolerable by reducing the biological drive for hunger (88); however, the data are very limited to support this potential effect. Although data on the safety of combining intermittent fasting with exercise are limited, caution should be applied if implementing this strategy, particularly for individuals who may be at risk for hypoglycemia or other related conditions that may be impacted with this intervention strategy. Moreover, surveillance of individuals engaging in time-restricted eating or fasting is needed to understand if these types of eating patterns are linked to any negative health outcomes.

There are also a variety of dietary approaches that recommend different foods and macronutrient consumption. An umbrella systematic review and meta-analysis of randomized clinical trials involving ketogenic, low-carbohydrate, high-fat diets, and very low-energy ketogenic diets found that all these dietary approaches were effective for decreasing body weight, with none of these demonstrating superior effects for attenuating the loss of lean body mass (89). Moreover, a meta-analysis of dietary approaches focused on single food groups like fish, whole grains, and nuts found that these approaches resulted in minimal weight loss compared to control groups (90).

In addition to the content provided above, inclusion of a registered dietitian nutritionist (RDN) or their equivalent should be included on treatment teams to provide the appropriate medical nutrition therapy expertise for the treatment of excess weight and adiposity. This medical nutrition therapy should follow the recommendations of the Academy of Nutrition and Dietetics (91) or other appropriate organizations with this expertise. Exercise professionals should not exceed their scope of practice regarding providing guidance to individuals for medical nutrition therapy. Conversely, registered dietitian RDNs should refer patients to appropriately trained and certified exercise professionals (e.g., clinical certified exercise physiologists) to provide guidance to individuals on physical activity and exercise.

Consensus Statements

- Dietary approaches that lead to a reduction in energy intake will be the most effective for treating excess body weight and adiposity.
- Dietary approaches that reduce portion size can assist in the prevention of weight gain and may contribute to reducing energy intake resulting in weight loss.
- Time-restricted eating and intermittent fasting do not appear to be superior to low-energy intake diets.
- At the population level, one type of diet and macronutrient composition does not appear to be more effective

for weight loss when compared to other approaches, provided that these approaches result in similar effects in achieving negative energy balance.

PHYSICAL ACTIVITY AND THE REGULATION OF ENERGY INTAKE AND EATING BEHAVIOR

Exercise-induced weight loss is often lower than expected based on objective measures of exercise-induced energy expenditure (92), with changes in energy intake often suggested as the primary pathway through which individuals compensate for exercise-induced energy deficits. On average, acute aerobic exercise does not increase hunger or energy intake over the subsequent 24 h (93), with intense exercise (>70% $\dot{V}O_{2max}$) transiently suppressing hunger after exercise (94). Postexercise changes in hunger and gastrointestinal hormone concentrations often coincide (95), but these perturbations are short-lived and subsequent energy intake is typically unaffected. These appetitive responses may be modulated by exercise intensity, duration, sex, and obesity status, but these factors do not appear to strongly influence acute energy intake compensation (96). Following 7–14 d of exercise, studies using objective measures of energy intake indicate that energy intake begins to track increases in exercise-induced energy expenditure, with approximately 30% of the exercise-induced energy expenditure compensated for by increased energy intake (97–99). High-quality long-term exercise training studies are limited, but partial compensation is again seen in objectively measured energy intake (100). Of note, the effects of exercise training on the control of appetite are complex, individually subtle, and influence multiple aspects of appetite simultaneously. For example, fasting hunger may increase following exercise training, but this can be countered by enhanced postmeal satiety (101) and favorable changes in hedonic food responses (102) and eating behavior traits (particularly when weight loss occurs) (100). Indeed, individuals with high levels of habitual physical activity may operate within a “regulated zone” of appetite, with an increase in the sensitivity of appetite control leading to a tighter coupling between energy intake and energy expenditure (103–105).

Consensus Statements

- A single bout of aerobic exercise does not increase hunger or energy intake over the subsequent 24 h, yet further evidence is needed to examine individual responses. When performed over the longer term, regular aerobic exercise can elicit partial compensation in energy intake.
- High habitual levels of physical activity may sensitize the control of appetite with a tighter coupling between energy expenditure and energy intake following energy perturbations, whereas physical inactivity and sedentariness fail to downregulate energy intake and can permit overconsumption.
- The complex interaction between energy expenditure and energy intake means that the effects of exercise on the control of appetite will be variable between individuals.

POPULATION- AND INDIVIDUAL-SPECIFIC CONSIDERATIONS

The prevalence of excess body weight and adiposity is of public health concern across most sectors of the population. This includes across the lifespan (children and adolescents, young adults, middle-aged adults, older adults), within biological sex and self-identified gender, race, and ethnic identity, and across socioeconomic sectors (1,106–108). Moreover, the health concerns of excess body weight and adiposity are present in certain individuals with physical disabilities, mobility limitations, or intellectual and developmental disabilities (109–111). There are also geographical factors, such as urban versus rural settings, that may contribute to the public health concerns of excess body weight and adiposity (112,113). Physical activity contributes to body weight regulation, the treatment of excess body weight and adiposity, and related health outcomes within all of these populations. However, there may be population-specific factors that need to be considered for persons to effectively engage in and sustain effective doses and modes of physical activity.

Consensus Statements

- Providers and comprehensive care teams must acknowledge that social determinants of health influence excess body weight and adiposity and an individual’s access to physical activity. One’s identity must be considered when developing individualized plans that target these outcomes.
- Physical activity is an important lifestyle behavior across the lifespan, and physical activity approaches that are age and developmentally appropriate should be implemented to effectively contribute to body weight regulation, the treatment of excess body weight and adiposity, and the treatment of adiposity-related health conditions.
- Implement physical activity approaches that are inclusive of sex, self-identified gender, race, ethnicity, and socioeconomic status. This includes addressing systemic and structural factors such as providing access to safe and inclusive environments for physical activity in urban, suburban, and rural communities; affordable opportunities to be inclusive of socioeconomic status; and access to opportunities that are inclusive of individual physical activity preferences.
- For persons with physical disabilities, mobility limitations, or intellectual and developmental disabilities, physical activity should involve adaptive physical activity and sport programs that are developmentally appropriate and are tailored to address the needs of individual persons and that are effective for body weight regulation, treatment of excess body weight and adiposity, and treatment of adiposity-related health conditions. This may include attention to functional fitness that may enable individuals to participate more fully in physical activity. There is also a need for attention to be given to appropriately trained and qualified staff to assist these persons with physical activity and cost-sensitive access to appropriate facilities and equipment, which may include home-based or remote delivery options.
- Providers should recognize that for some people with excess body weight and adiposity, there may be other factors

that influence engagement in physical activity. These may include factors related to clinical intolerance, physiological detraining that may limit some modes or intensities of physical activity, or individual perceptions of tolerance to different intensities of physical activity.

STRATEGIES FOR SUPPORTING ENGAGEMENT AND SUSTAINABILITY OF PHYSICAL ACTIVITY

Previous position papers (3,4), the 2018 Physical Activity Guidelines Advisory Committee Report (66), and the 2023 Midcourse Report for Older Adults (114) provide insights into strategies for engagement and sustainability of physical activity. Many of these considerations apply to persons with overweight and obesity, namely, individual strategies (e.g., goal setting), community design elements, and environmental and policy strategies (115). This current perspective extends the previous evidence with a focus on different aspects of the social ecological framework (66,116), which is critical for understanding the multilevel influences on the adoption and maintenance of physical activity behavior (66).

Digital Health

Digital health technologies (e.g., apps, smartwatches) have increased in popularity and incorporate a number of components, such as activity trackers, feedback, goal setting, and social networking (117). Meta-analyses and systematic reviews have linked use of these technologies with physical activity behavior and weight loss (117–119) that included adults with excess weight and adiposity (117,118). Effects are enhanced by tailored messaging and feedback (118). Further, in 73% of instances, greater monitoring of physical activity behavior was linked to greater weight losses (117). There is some indication that passive forms of self-monitoring (stepping on an e-scale vs self-recording) result in higher engagement with monitoring, but less robust outcomes (117). This suggests that for those with overweight and obesity, the self-regulatory process of monitoring raises awareness of physical activity and diet behavior and enables a feedback loop of gathering and receiving personal data to make progress toward weight-related goals.

Social Support

Social support has been identified as an important factor in the adoption and maintenance of physical activity behavior (66,114). For adults living with excess weight and adiposity, various aspects of support are useful for lifestyle changes (120,121). Further, emerging evidence indicates better weight loss for programs delivered via group-based weight loss treatments compared to those offered individually (122–124). Group dynamics, role modeling, and peer-led problem solving are important active ingredients that can extend to physical activity behavior.

Affective Experiences From Physical Activity

A higher body mass is a risk factor for reduced participation in physical activity (125–128). Compared to their nonobese counterparts, individuals with excess weight and adiposity are less likely to start an exercise program (129) and more likely to drop out (130,131). Interventions designed to increase physical activity typically target cognitive mediators of behavior change, such as providing education about the health benefits of regular physical activity and the risks associated with obesity, identifying perceived barriers and developing plans for overcoming them, and setting goals (132). These interventions are typically met with modest success (133). "Dual-process" theories have reemphasized the importance of affective experiences in generating and sustaining motivation (134,135). Individuals with obesity report feeling worse in response to exercise than their counterparts of healthy weight or those with overweight, and enjoy exercise less (136–140). This is presumed to be caused by a multitude of co-acting factors (141), including added physiological stress due to the additional body mass (142), dyspnea (143), joint pain (144), fear of injury (145), and perceptions of obesity bias and stigmatization (146). In addition, unrealistic expectations for weight loss may contribute to a sense of failure (147).

Consensus Statements

- Encourage the use of self-monitoring techniques that are appealing to users and that provide relevant feedback to promote physical activity. This could include a variety of approaches that include wearable devices and the possible use of artificial intelligence (AI) technology.
- Promote the different forms, channels, and methods for ongoing support of physical activity. This can be through online communities, personal networks, and community-based partnerships and outlets that are safe, diverse, and inclusive.
- Because affective experiences may constitute an important barrier to physical activity participation in persons with excess body weight and adiposity, strategies should be considered to preemptively address possible contributing factors that include reconsidering the physical and social environment. Such strategies should be inclusive (148), recommending non–weight-bearing forms of activity when appropriate while also promoting autonomy (149), incorporating gamification (150), avoiding stigmatizing language (151), supporting realistic weight-loss expectations (152), and focusing on holistic health and well-being should be considered.

SUMMARY

The perspectives presented provide an update to prior position statements and consensus papers of ACSM regarding the importance of physical activity within the context of body weight regulation and regulation of body composition. This also includes new perspectives on other clinical and public health considerations pertinent to body weight regulation and adiposity-related health conditions (Fig. 1). In addition to the

TABLE 1. Areas for Future Research in Each of the Topical Areas.

Topical Area	Potential Areas for Needed Research
Medical treatment of excess body weight and adiposity	• To define the dose (duration, frequency, intensity) of physical activity that elicits various health benefits, which may include weight and body composition, in combination with antiobesity medications or metabolic/bariatric surgery • To examine the mode specific benefits of physical activity when combined with antiobesity medications or metabolic/bariatric surgery • To understand individual variability in response to physical activity with antiobesity medications or metabolic/bariatric surgery • To examine if there are antiobesity medication-specific or metabolic/bariatric surgery-specific strategies needed to effectively enhance initiation and sustained engagement of physical activity with either antiobesity medications or metabolic/bariatric surgery
Physical activity contributions to the prevention and treatment of excess body weight and adiposity	• To examine factors that contribute to the variability in response to different modes, doses, intensities, and timing of physical activity for effects on body weight, body composition, and other health outcomes in persons with overweight or obesity • To conduct appropriately designed prospective and randomized studies to examine whether physical activity bout duration, while controlling for total energy expenditure, influences body weight, body composition, and other health outcomes in persons with overweight or obesity • To conduct appropriately designed prospective and randomized studies to examine whether time of day for exercise participation, while controlling for total energy expenditure, influences body weight, body composition, and other health outcomes in persons with overweight or obesity • To conduct studies that include supervised exercise or objectively measured exercise and physical activity to quantify and confirm the completion of prescribed modes, doses, intensities, bout duration, and time of day • To conduct studies to explore factors that contribute to variability in weight and body composition changes in response to exercise
Physical activity intensity considerations	• To examine the effects of light-intensity physical activity, compared to moderate-to-vigorous intensity physical activity of equal energy expenditure, on the effects of body weight, body composition, and other health outcomes in persons with overweight or obesity. • To examine whether intensity of physical activity influences engagement and sustainability of physical activity in persons with overweight or obesity, and the individual factors that may be associated with engagement and sustainability of physical activity (e.g., body image dissatisfaction, affective response) • To examine the health and psychosocial effects of shifting sedentary time to other intensities of physical activity, including light activity, and resulting body weight regulation and health benefits
Physical activity mode considerations	• To examine different modes of physical activity, which elicit equal energy expenditure, for their effects on body weight, body composition, and other health outcomes in persons with overweight or obesity • To examine the effects of multi-mode, compared to single mode, physical activity approaches for their effects on body weight, body composition, and other health outcomes in persons with overweight or obesity • To examine if the order of sequentially adding different modes of physical activity to an intervention has differential effects on body weight, body composition, and other health outcomes in persons with overweight or obesity
Dietary considerations	• To examine weight loss variability in response to various dietary approaches to determine if precision nutrition recommendations are feasible and effective • To examine whether specific diets result in health benefits beyond weight loss and reductions in adiposity
Physical activity and the regulation of energy intake and eating behavior	• Studies have predominately focused on the effects of increasing exercise and physical activity on appetite control, and little is known about the specific effects of sedentary behavior and experimentally induced reductions in physical activity on appetite • Longer-term exercise training studies are needed that integrate the metabolic and physiological adaptations to exercise training with the psychological and behavioral responses of individuals to better understand the inter-related homeostatic and hedonic mechanisms and contextual factors that shape compensatory eating behavior • Understanding individual variability in exercise-induced appetitive responses and susceptibility to weight loss remains key to the design of strategies that counter compensatory eating behaviors. This requires studies that use appropriate research designs and statistical approaches to differentiate inter- from intra-individual variability and assess whether such variability is reproducible or amenable to change
Population- and individual-specific considerations	• To refine the population- and individual-specific dose, intensity, and mode of physical activity that is effective for body weight regulation, treatment of excess body weight and adiposity, and treatment of adiposity-related health conditions • To identify factors that contribute to variability in physical activity engagement and participation across populations and individuals, and to implement inclusive and equitable strategies that are specific to these factors to enhance physical activity • To identify biological, behavioral, and environmental factors within populations and individual sectors that contribute to heterogeneity in response to physical activity for regulating body weight, treating excess body weight and adiposity, and treating adiposity-related health conditions
Strategies for supporting engagement and sustainability of physical activity	• To evaluate ways to enhance the affective experience of physical activity for persons with excess body weight and adiposity, including changing the activity itself (e.g., non–weight-bearing modalities, intermittency, self-selection of intensity, size-appropriate exercise equipment), the associated cognitive appraisals (e.g., gamification, encouraging autonomy), the physical environment (e.g., heat, humidity), and the social environment (e.g., social support, removal of perceived threats). • To examine individual psychosocial factors such as body image dissatisfaction, or affective response to intensity of physical activity, to tailor individual exercise and physical activity prescriptions to decrease sedentary time, increase activity levels, and positively impact health outcomes • To conduct prospective studies to examine the strategies individuals use to support engagement and adherence to physical activity and reductions in sedentary behavior (digital support, tracking, interpersonal support, physician check in, health care guidance and recommendations)

consensus recommendations provided, ACSM also recognizes the need for research (Table 1) to advance the scientific evidence in support of clinical and public health prevention and treatment approaches. Within this context, ACSM advocates for physical activity to be a key element of prevention and treatment efforts for excess body weight and adiposity, with a focus on implementation of inclusive approaches to facilitate adoption and sustained engagement of physical activity of all persons. This includes providing access to environments, facilities, equipment, and evidence-based programs in support of physical activity in an equitable manner for all persons. This should consider physical activity interventions as a covered benefit by employers and other payers of health care. ACSM also supports the inclusion of appropriately trained and certified exercise professionals within clinical, public health, and health-fitness teams to contribute to physical activity approaches targeting prevention and treatment of excess body weight and adiposity. Moreover, ACSM advocates those approaches focused on prevention and treatment of excess body weight and adiposity, which includes physical activity, be considered within the context of holistic health and well-being, and involve shared decision making between the patient and healthcare provider.

J. M. J.: Scientific advisory board for Wondr Health, Inc. and research funding from Epitomee Medical, Inc.; C. M. A.: Advisory boards for Altimmune, Inc., CinFina Pharma, Inc., Cowen and Company, LLC, EPG Communication Holdings Ltd., Form Health, Inc., Gelesis, Srl., L-Nutra, Inc., NeuroBo Pharmaceuticals, Inc., Novo Nordisk, Inc., OptumRx, Inc., Pain Script Corporation, Palatin Technologies, Inc., Pursuit By You, ReShape Lifesciences Inc., Riverview School, Roman Health Ventures Inc, Veru Inc, and Xeno Biosciences, and research funding from GI Dynamics, Inc.; D. J. B.-A.: No disclosures; A. P. C.: Research funding from Allurion Technologies and Eli Lilly; J. E. D.: No disclosures; P. E.: No disclosures; M. H.: No disclosures; E. V. L.: No disclosures; M. A. N.: No disclosures; S. L. V.: No disclosures.

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Click here (http://links.lww.com/TJACSM/A263) to download a slide deck summarizing this ACSM consensus statement.

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