

Perceived Facilitators, Barriers, and Changes in a Randomized Exercise Trial for Obese Youth: A Qualitative Inquiry

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Background: Purpose was to examine experiences of obese youth aged 14 to 18 years during their participation in the Healthy Eating, Aerobic, and Resistance Exercise in Youth (HEARTY) randomized controlled exercise trial. **Methods:** A longitudinal qualitative approach was used to investigate youths' experiences across time points in the trial: 3-weeks (run-in phase; n = 44, 52% males), 3-months (midpoint; n = 25), and 6-months (end of intervention; n = 24). Participants completed telephone interviews on perceived exercise facilitators, barriers, outcomes, and program preferences. Responses were subject to content analyses and are reported as frequencies. **Results:** Participants joined the trial initially to lose weight, but focused more on fitness over time. Exercise behavior was influenced by a sense of achieving results, and by family and peers (ie, supportive comments, transportation). At 6-months, the most commonly perceived changes were improved fitness (50%) and appearance (46%). Suggested changes to the HEARTY trial included initial guidance by a trainer, and more varied and group-based activity. **Conclusions:** Exercise facilitators, barriers and perceived changes in an exercise trial are reported. Access to a gym, initial direction by a trainer, variety, and group-based activities were reported as desired components of an exercise intervention. Findings also point to the importance of involving family and peer supports.

Keywords: qualitative, physical activity, obese youth

The increase in prevalence of obesity in youth¹ has led to the study of effective prevention and treatment strategies. There are a number of health complications related to obesity during adolescence, including insulin resistance,² poor lipid profiles,³ and increased blood pressure.⁴ Obese adolescents are more likely to become obese adults,^{5,6} with the associated excess risk for chronic disease, disability, and premature mortality.⁷ In addition, obese youth experience stigma,⁸ weight-related teasing,⁹ unhealthy weight-control strategies that can cause an increase in weight over time,¹⁰ low self-esteem, embarrassment participating in physical activity and playing

sports,¹¹ and worse body dissatisfaction.^{12,13} All of this points to a need to support obese youth in affecting change in both physical and psychological well being.

Participation in an exercise intervention has been shown to alleviate some of the health consequences of obesity and to improve overall well-being¹⁴⁻¹⁹ at least in the short-term. Unfortunately, results suggest limited long-term benefits from participation in an obesity intervention.²⁰ Findings are mixed when considering the efficacy of both single-level (ie, participation in an exercise program) and multilevel approaches (eg, community, school and/or family levels).^{15,21} Thus, it is important to continue to study the most "effective" components of an exercise intervention in yielding both short- and long-term benefits. Although findings from exercise intervention trials may be limited in their generalizability (ie, it is unlikely for community-based programs to be able to provide the structure and type of facilities accessible in exercise trials), they frequently guide program development.

To better serve obese adolescents' needs, it is imperative that we gain a better understanding of participants' experiences in an exercise research trial, including their perceptions of their participation, the factors that both facilitated and served as barriers to their participation, and their perceptions of success. Rarely are youth asked directly how they would design an exercise intervention.

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The purpose of the current study was to investigate adolescents' experiences during their participation in the Healthy Eating, Aerobic and Resistance Exercise in Youth (HEARTY) randomized controlled exercise trial.²² In this trial, postpubertal, previously sedentary overweight youth, aged 14 to 18 years, were randomized to 1 of 4 conditions: aerobic exercise + dietary changes; resistance exercise (weight training) + dietary changes; aerobic + resistance exercise and dietary changes; control (dietary changes only, without an exercise program). Participants in the trial received free memberships to a fitness facility for 6 months, and were expected to exercise 4 times per week. They were directly supervised by a personal trainer at least twice per week during an initial run-in phase of 4 weeks, at least once a week for the next 4 weeks, and then at least biweekly. In some cases, participants saw different trainers on different days due to scheduling issues. They met with the study dietician who remained consistent through the study, individually at baseline, 3, and 6 months after enrolment to establish dietary goals, discuss lifestyle changes, and for reinforcement of goals. Participants also attended 2 additional 1-hour group sessions, where they discussed healthy eating, menu planning, and explored barriers to healthy eating.

The current study was derived from 2 complementary theoretical frameworks: Self-Determination Theory and Social-Cognitive Theory. Self-Determination Theory is a motivational framework used to understand health behavior change, including physical activity.^{23–25} According to Self-Determination Theory, greater self-determined behavior is associated with intrinsic goals, where participation in the activity is deemed inherently rewarding and consistent with one's beliefs and values. When actions are controlled by external contingencies, or when goals are extrinsic—designed to achieve something separate from the activity (ie, wealth or fame, avoidance of guilt, or lack of motivation/amotivation)—less self-determined behavior, and therefore less compliance or maintenance of the health behavior results.^{26,27} Self-Determination Theory also proposes the concept of universal needs, including need for autonomy (personal control), need for relatedness/connection with others, and need for competence (skills, knowledge). Intrinsic goals are developed in line with these needs and are therefore inherently rewarding to pursue. Social-Cognitive Theory proposes that personal or cognitive factors (eg, expectations), behavioral factors (eg, self-efficacy) and environmental factors (eg, social norms) are reciprocal, interactive determinants of health behavior. In the current study, we focused on 2 highly supported constructs: self-efficacy (ie, confidence in one's ability to participate in exercise despite obstacles) and outcome expectations (ie, perceptions of outcomes that result from participating in exercise) and their influence on exercise behavior.^{28–30}

Drawing upon these theoretical frameworks, we used a qualitative approach to investigate adolescents' reasons for participating in the trial; their expectations; perceived facilitators and barriers to participation; and perceived changes or results, at the beginning (3-weeks), midpoint

(3-months), and end (6-months) of the trial. In addition, we were interested in participants' experiences at various time points, in terms of their general impressions of the program, preferred features of HEARTY, suggested improvements, and the type of exercise intervention they would design.

Consistent with Self-Determination Theory, we anticipated that factors relating to autonomy and perceived competence (ie, achieving results and increased ability to do the exercise routine), would emerge as facilitators of participation in the trial, and would be related to perceived outcomes as suggested in Social-Cognitive Theory. Since the direction provided by personal trainers should improve competence in executing exercises properly, the addition of a personal trainer in this trial was anticipated to facilitate participation. No hypotheses were generated regarding possible changes to the design of the trial, or by extension, how participants would design their own exercise program. In the current study, we elected not to examine differences between males and females. In previous research, associations between motivational theory constructs and exercise behavior appear invariant across gender.^{31,32} As noted by Gillison and colleagues,³¹ Self-Determination Theory as a model of motivation assumes universality; and while "mean values of constructs would differ as a function of gender . . . the pattern of association would be consistent."

Methods

Eligible participants were between the ages of 14 and 18 years, with a body mass index (BMI; kg/m²) >85th percentile for age and gender. These youth were recruited for the HEARTY trial through advertisements on public transportation, at schools, and on radio, or were identified by their physicians, who were informed about the study via letters, advertisement, and word of mouth. The current study was reviewed and approved by the Research Ethics Boards at the Children's Hospital of Eastern Ontario and the Ottawa Hospital, and written informed consent was obtained from all participants and/or their parents, depending on age. Participants were approached by the Study Coordinator about their interest in the current study. Since interviews were conducted across several time points, verbal consent was obtained before the beginning of each interview.

Participant responses were subject to directed content analysis. This approach allows for the identification of responses that are consistent with theory as well as unique to the population, and was deemed appropriate since empirical research on determinants of exercise behavior in youth supports Self-Determination Theory and Social-Cognitive Theory, yet little to no research has focused exclusively on the experiences of overweight youth in an exercise trial.³³ In directed content analysis, existing theory focuses the research question, provides predictions about variables of interest, and the relationships among variables, and helps determine the initial coding scheme.³³ Data that are not coded under the

theory-driven categories are identified and determined to be either a new code, or an example under an existing category.

A semistructured telephone interview was developed containing 20 open-ended questions derived from the above-mentioned frameworks in addition to more general questions targeting their experiences in the program, such as “What were your reasons for joining the study?” and “What do you feel has changed since you’ve been participating in the trial?” The interviewer prompted the participant for clarification to explore particular experiences and to facilitate a better understanding of responses (ie, “What did you mean by that?”). A trained research assistant (H.M.) conducted the telephone survey across all time points in the trial (ie, 3-weeks, 3-months, and 6-months) for all participants. The same questions were posed at each time point. Interviews were audiotape-recorded and then transcribed *verbatim*.

Statistical Analyses

Descriptive statistics (frequencies, means, ranges) were used to describe participants’ demographic characteristics. Study variables (eg, reasons for participating in the program, program expectations, perceived facilitators, barriers, outcomes, satisfaction, and preferences) were subject to directed content analyses, as described above.³³ Following this approach, a list of categories consistent with Social-Cognitive Theory²⁸ (eg, facilitators, barriers, and outcome expectations) and Self-Determination Theory²³ (eg, role of supports) was developed. Two researchers independently reviewed participants’ responses. Responses were coded based on categories in the list. Data that were not coded under the theory-driven categories were identified and determined to be either a new category that captured the response or an example of an existing category. Reliability of ratings between the 2 reviewers exceeded 0.80. Any discrepant items were discussed and resolved by consensus. The percentages of youth endorsing the themes are reported.

Participants included in the analyses were those who completed at least 2 out of the 3 possible interviews (ie, 2 of 3-week, 3-month, 6-month), to ensure that responses reflected the experiences associated with participating in at least 3 months in the trial. As the HEARTY trial is ongoing and the protocol calls for us to be blinded to specific randomized allocations before completion of the trial, comparisons were not made between types of exercise (aerobic only, resistance only, or combined aerobic and resistance).

Results

The mean age of participants was 16.7 years (SD = 1.6; ranging from 14–19). Sex was evenly distributed (52.2% male). At baseline (ie, 3-weeks), the mean body mass index (BMI; kg/m²) for male and female participants was 34.3 (SD = 4.4, ranging from 27.3–44.3) and 36.6 (SD = 5.0, ranging from 30.7–43.9), respectively. All

participants met the minimum sex- and age-specific cut-off point for obesity.³⁴ Participants were evenly distributed across the different exercise modalities. The majority of youth were Caucasian (87.5%; 56/64). None of the youth had completed an exercise intervention previously. Sixty-four participants initially agreed to participate in the current study. However, 7 did not complete the study (ie, complete at least 2 of the 3 interviews). In addition, data from 13 participants were not used due to technical difficulties at the time of interview recording and/or transcription. The final sample consisted of 44 participants at baseline (3-week) which included all participants (ie, participants in the 4 conditions). The additional time points, at 3-months and 6-months, included only participants randomized into 1 of the 3 exercise conditions [ie, aerobic exercise + dietary changes, resistance exercise (weight training) + dietary changes, or aerobic + resistance exercise and dietary changes].

Reasons for Participating

Initially (at 3-weeks), participants reported joining the study for the purpose of weight loss (41%), to improve health (39%), and because the trial was suggested by a family member, friend, or physician (34%). Participants were asked at later time points to report their initial reasons for participating in the trial. At 3-months, weight loss, improved health, and access to the structured exercise program were identified as their reasons to participate. At 6-months, weight loss and improved fitness (ie, both 54%) were identified as reasons to participate, followed by a desire to improve their health.

Participants often offered several reasons for joining: “Basically, because I had gotten to the point where I wasn’t trying, like I had tried before to lose weight and I don’t know, like, I saw it (advertisement) like on the bus and I was more or less ‘well you know what, why not give it a try.’ You know because I did want to lose weight and you get back to what I was before and to top it all off I do have a cruise in December” (participant at 3-weeks); “I just wanted to like lose weight and be able to feel good in my clothes and stuff” (participant, 3 months); “I just really wanted to start going to the gym and I heard that I could get a free membership so I’m like, o.k., why not?” (participant, 6-months). A typical response capturing a suggestion from a parent or physician included “I decided to try to get in better shape, and because my mom introduced me to the program. I thought it would help my health and weight and, at the same time, help with the study as well” (participant, 3-weeks); “Because I’ve reached the highest point of my weight—it wasn’t too healthy and I went to the doctor one day and he thought it would be a good idea for me to join the program and see how I liked it and see if it would work with the thyroid problem that I have” (participant, 3-weeks).

The most commonly identified outcome expectation of the trial was weight loss, stated by approximately 40%. Over time, participants began to more frequently report improvements in health and fitness as program

expectations (see Table 1). Many of the youth indicated that they had no expectations of their participation in the program (ie, 36%, 57%, 33% across the time points respectively).

Perceived Facilitators and Barriers to Exercise Participation

Table 2 describes qualitative responses from participants regarding perceived facilitators of a structured exercise program. Participants described achieving their goals (ie, typically weight loss) as a main facilitator across the trial time points (57%, 48%, 42% at 3-weeks, 3-months, and 6-months, respectively). At 3-weeks, youth identified the following exercise facilitators from most to least frequently: achieve results/goals, family supportive comments, and enjoyment. At 3- and 6-months into the trial, youth continued to report that achievement of results/goals, family supportive comments, and motivation/drive facilitated their participation.

Across time points, participants frequently provided responses, such as “Just seeing results . . . like losing weight,” in response to the question of what helps you to attend your gym sessions. “I’ve been doing it for a month already and I’ve lost 11lbs so that’s definitely kept me motivated. So that stuff is keeping me going because I know if I keep it up I’m just going to keep losing more weight” (participant, 3-weeks). “Results that I’m seeing . . . like my strength and cardio and stuff, already

I can see a little results so I guess it just makes you want to go and achieve more” (participant, 3-weeks). “Just the progress you see, extra energy also” (participant, 6-months).

Family support played an important role in affecting whether youth attended their gym sessions across all time points, although this number decreased slightly over time (eg, from 78% at 3-weeks; 68% at 3-months, to 58% at 6-months). Ways in which family members provided support varied, and appeared to serve as both facilitators and barriers to participation. Specific comments from family members were most commonly positive: “They motivate me to go, and say I can do it, you know” (participant, 3-weeks). Many suggested both motivational and practical supports: “My mom puts pressure on me to go, she’s always like . . . get your coat, we’re going” (participant, 3-weeks). “They give me rides . . . and remind me to keep going” (participant, 3-months); “Well, just the way they encourage me and they are my main source of transportation” (participant, 6 months). Some youth reported no familial influence, or lack of support in this role, which may be a barrier: “They don’t really encourage or discourage me anymore”; “They’re like . . . unaware”; “They usually don’t say much.”

A minority of participants reported personal motivation/drive as an exercise facilitator, 9% described this as a facilitator at 3-weeks, 16% at 3-months, while 25% reported this at 6-months. This was qualified as: “It’s up to me, my drive to get there”; “Self-motivation like just

Table 1 Reasons for Participating in, and Expectations of, an Exercise Intervention for Obese Youth

	3-week (N = 44)	3-month (N = 23)	6-month (N = 24)
	n (%)	n (%)	n (%)
Reasons to participate			
To lose weight	18 (41)	11 (48)	13 (54)
Improved overall health	17 (39)	7 (30)	7 (29)
Improved fitness	7 (16)	2 (9)	13 (54)
Suggestion by others ^a	15 (34)	4 (17)	2 (8)
To change appearance	6 (14)	4 (17)	4 (17)
Program characteristics	10 (23)	5 (22)	3 (13)
Research participation	4 (9)	2 (9)	1 (4)
To better self-esteem	1 (2)	1 (4)	1 (4)
Program expectations			
Weight loss	19 (43)	8 (35)	9 (38)
Improved overall health	5 (11)	3 (13)	6 (25)
Improved fitness	4 (9)	1 (4)	5 (21)
Increased motivation	3 (7)	1 (4)	1 (4)
To see change appearance	3 (7)	2 (9)	2 (8)
To better self-esteem	2 (5)	1 (4)	0 (0)
No expectations	16 (36)	13 (57)	8 (33)

Note. Patient responses are taken from qualitative analysis; see text for sample responses. Multiple responses are possible.

^aFamily, friend, or physician suggested participation.

Table 2 Perceived Facilitators, Barriers, and Outcomes of Participation in an Exercise Intervention for Obese Youth

	3-week (N = 44)	3-month (N = 25)	6-month (N = 24)
	n (%)	n (%)	n (%)
Perceived facilitators			
Achieve results/goals ^a	25 (57)	12 (48)	10 (42)
Family supportive comments	9 (20)	8 (32)	8 (33)
Family member join gym	2 (5)	2 (8)	0 (0)
Enjoyment	7 (16)	3 (12)	5 (21)
Peer supportive comments	3 (7)	3 (12)	3 (13)
Participation in a research program	6 (14)	4 (16)	1 (4)
My motivation/drive	4 (9)	4 (16)	6 (25)
Personal trainer	1 (2)	1 (4)	0 (0)
No facilitators	0 (0)	0 (0)	2 (8)
Perceived barriers			
Transportation	7 (16)	5 (20)	9 (38)
Not enough time	8 (18)	3 (12)	5 (21)
Conflict with schoolwork	16 (36)	6 (24)	7 (29)
Conflict with job/chores	6 (14)	4 (16)	2 (8)
Conflict with social obligation ^b	5 (11)	6 (24)	6 (25)
Not in the mood/low motivation	12 (27)	4 (16)	6 (25)
Fatigue	9 (20)	4 (16)	4 (17)
Crowded gym	3 (7)	0 (0)	0 (0)
Weather (raining/heat)	4 (9)	8 (32)	1 (4)
Health/injury	2 (5)	5 (20)	3 (13)
Nothing	0 (0)	1 (4)	1 (4)
Perceived outcomes			
Weight loss	14 (32)	11 (44)	7 (29)
Improved fitness ^c	25 (57)	11 (44)	12 (50)
Increased confidence	10 (23)	4 (16)	3 (13)
Change in appearance	12 (27)	8 (32)	11 (46)
Improved health	4 (9)	4 (16)	1 (4)
No outcome/change	5 (11)	6 (24)	3 (13)
More social at gym	1 (2)	1(4)	1 (4)

Note. Patient responses are taken from qualitative analysis; see text for sample responses. Multiple responses are possible.

^a Examples are results I'm seeing, weight loss.

^b Social activity or obligation to family/friends.

^c Examples are feel in better shape, have more energy.

telling myself I have to do it. It's a good thing to do and to just go."

Participants identified a variety of barriers to their participation in the program (see Table 2). At 3- weeks, the most frequently endorsed barriers were scheduling conflicts with schoolwork (36%), lack of motivation (27%; eg, "I just didn't feel like it; I didn't have any motivation to get myself there"), and fatigue (20%). At 3-months, participants found the following to be barriers:

bad weather (32%), conflict with schoolwork (24%), and social obligation to family or friends (24%). At 6-months, the most frequently noted barriers were transportation difficulties (38%), conflict with schoolwork (29%), social obligations (25%), and lack of motivation (25%).

Sample responses of competing obligations or difficulties with transportation included "Probably family plans" (participants, 3-weeks); "It depends on if I have a lot of homework, if my parents can drive me there,

weather” (Participant, 6-months); “sometimes, my parents and friends because like I don’t really have time for them anymore because I’m trying to get a job too” (participant, 3-months). In terms of motivation, participants typically simply stated “low/lack motivation,” or elaborated about steps toward exercise: “If I go straight from school it’s not hard at all to go, but if I get home and change and watch TV or go on the internet, like there’s no way I’m going to the gym” (participant, 3-months). Regarding weather as a deterrent: “Well the heat right now is really hard because I get really hot really fast so you know . . . just knowing that it’s going to be as hot today as yesterday, it’s like I don’t want to go” (participant, 3-months).

Role of Trainer and Peers

In addition to family support, personal trainers and peers were also identified by youth as influencing their participation. 80% of youth at 3-weeks, 68% (17/25) at 3-months, and 42% (10/24) at 6-months suggested that their personal trainer played a role in their participation in the program. Sample responses at 3-weeks, and 3-months included “She’s (personal trainer) cheerful and encourages me”; “I need to keep my appointments, I’m not going to . . . stand them up”; “I enjoy the help”; “Just her encouragement and she tells me how I’m doing things.”

Over time, some youth stated that the trainers played little to no role in their participation: 20% of youth at 3-week, 32% at 3-month, and 58% at 6-months. At 6-months, example statements included “I don’t need a trainer as much as I used to . . . I know what I need to do now”; “I don’t see my trainer as often as I used to . . . but once in a while if she’s there I’ll talk to her and I’ll just run over my work-out schedule, but I don’t really use it” (participants, 6-months).

Across the various time points, a third (eg, 35%, 32%, and 37%, respectively) of youth said that a friend affected whether they attended the workout sessions. Sample responses included “It’s boring to work out alone”; “It’s fun to have someone to talk to, it makes time go by faster”; “We see who lifts more.”

Perceived Results or Changes

Table 2 presents the perceived results of participation in the exercise intervention. The most consistent perceived change was improved fitness. At 3-weeks, youth reported improved fitness (57%), weight loss (32%), change in appearance (27%), and increased confidence (23%) as initial outcomes. At 3-months, the following changes were reported: weight loss and improved fitness (each 44%), change in appearance (32%), and no outcome/or change (24%). Few perceived an increase in their overall health. At 6-months, participants continued to report improved fitness (50%) and a change in appearance (46%), despite that fewer youth reported changes in weight.

Regarding perceived changes in fitness, participants noted “I’ve gotten more active . . . and can do more

things”; “I can lift more (weights)”; “Just that I’m actually active; and that I know I can do things. . . . If someone asks me to do something, I don’t feel like I’ve been sitting on the couch for 3 days. I’m sort of up for anything now” (participant, 3-months). In terms of appearance, participants stated “My clothes fit better”; “My face is not as chubby.” One participant stated “Well . . . I feel better, like, I don’t know how to explain it, it’s just better than I used to be” (participant, 6-months).

Participant Satisfaction and Design Suggestions

Almost all of the participants reported feeling satisfied with their participation in the trial (98%). Table 3 presents participant satisfaction with various aspects of the program and suggested improvements. At 3-weeks, participants reported enjoying the following aspects of the program: structure of the program and/or free membership (68%), personal trainer (32%), feeling healthier (23%), and participating in research (4%). At 3-months, participants continued to enjoy the free gym membership, feeling healthier, while slightly fewer reported enjoying the trainer (20%). A similar pattern was maintained at 6 months. Many described enjoying access to the gym, “I can pick my own hours”; “I like the fact that I can go to a gym.” Of 22 participants interviewed at 3 and 6 months, half said that they were not dissatisfied with the program in any way (59 and 50% respectively), while some wanted to lose more weight (27% and 22%).

Nearly half of participants described feeling that there was little that they would change about the structured exercise program in the current trial. Some participants appeared to find the testing and assessment measures as part of the trial cumbersome. Other participants endorsed wanting more choice and variety in their exercises (32%, 28%, and 21%, respectively).

When asked how they would design an exercise intervention, many participants suggested including a group-based or team activity. Participants also suggested the following as important aspects in an ideal program: trainer involvement at program outset, group-based or team activities, and engaging in both aerobics and resistance exercise, or resistance exercise only. Early in the trial, about one-third of participants reported their preferred exercise program design to be similar to the existing trial design; only 17% suggested this approach at the end of the intervention.

In terms of design, sample responses were “Well definitely I like the combination with the cardio and the weights”; “It would be a bit of everything. Cardio, weights, and then even do some sports on the side as well” (participants, 3-months); “Oh it would probably be in a group, only a small group though not too big, and I would have swimming in it” (participant, 3-weeks); “I really like the gym. I like the way that you can see the improvements on your body and you can feel them as well” (participant, 3-months).

Table 3 Suggested Improvements and Design of an Exercise Intervention for Obese Youth

	3-week (N = 44)	3-month (N = 25)	6-month (N = 24)
	n (%)	n (%)	n (%)
Suggested improvements to trial			
More choice/variety in exercises	14 (32)	7 (28)	5 (21)
Less testing	8 (18)	4 (16)	6 (25)
Access to pool	6 (14)	2 (8)	1 (4)
Bus pass	1 (2)	3 (12)	3 (13)
Nothing	22 (50)	11 (44)	11 (46)
Fewer sessions/week	1 (2)	2 (8)	0 (0)
Design program			
Combine both aerobics and weights	8 (18)	3 (12)	6 (25)
Weights only	6 (14)	4 (16)	4 (17)
Cardio only	3 (7)	3 (12)	2 (8)
Group-based or team activity	12 (27)	11 (44)	6 (25)
Trainer initially	17 (39)	10 (40)	13 (54)
Trainer present every session	6 (14)	0 (0)	2 (8)
Similar to the present HEARTY trial exercise programs	11 (25)	9 (36)	4 (17)

Discussion

The purpose of this qualitative study was to investigate overweight and obese adolescents' experiences in a randomized controlled structured exercise intervention with a dietary component. Findings on exercise facilitators and barriers are consistent with self-determination theory and social-cognitive theory and highlight important contextual factors. They also point to the importance of family and peer involvement in supporting youth undergoing physical activity and dietary changes.

Consistent with previous research, participants in the HEARTY trial were primarily interested in joining the trial to lose weight, and weight loss was an expected outcome of their participation. Many youth tend to view weight loss as the main health benefit of exercising.^{35,36} A new finding in this study was that participants appeared to gain a stronger sense of the importance of fitness for health—separate from weight loss—over the course of the trial. Improved fitness was cited as a reason to participate and as an expectation of the trial increasingly across all time points. Improved fitness was also cited as a perceived outcome (50%) after 6 months in the trial, where fewer youth cited weight loss (29%). The fact that participants became more oriented to changes in their fitness is important. Given that exercise can attenuate obesity related comorbidities, increased fitness is a worthy pursuit even in the absence of actual weight loss.

In addition, as postulated by Self-Determination Theory, improved fitness represents an intrinsic goal. Whereas exercising for weight loss or to change one's appearance are considered extrinsic goals which typically

result in less self-determined behavior. Furthermore, youth in this trial reported that they lacked the motivation to go to the gym, which is synonymous with the concept of "amotivation" in the Self-Determination Theory which has been shown to be significantly related to negative health outcomes and health behaviors.^{26,27} Significant weight loss is difficult to attain for obese youth (particularly if the expectation is to lose weight quickly), and it has been shown that unrealistic weight loss goals can serve to undermine healthy behavior change.³⁶ For many obese youth, improving fitness may be a more realistic goal and one that can yield a greater sense of personal control. Therefore, it is promising when youth in the study described feeling positive about being able to do the exercise required in the trial: "I know I can do things now." A greater sense of personal control, in combination with actual improved outcomes in fitness, is likely to result in persistence in the trial and with exercise behavior post study.

The HEARTY intervention protocol included many appealing components such as a free gym membership and the use of personal trainers assigned to each participant. Trainers played an important role in the trial (ie, met with the youth twice a week during run-in, weekly for the next 4 weeks, then at least every 2 weeks for the remainder of the intervention). While they did not provide exercise counseling or motivational enhancement per se, trainers introduced the youth to their exercise routine and were present for most exercise sessions. This ensured safety of the participant, as well as treatment fidelity, and likely also served to increase confidence in the participants that they were performing the exercise properly. Some youth reported a sense of accountability ("I didn't

want to stand them up”). Overall though, findings were mixed regarding trainer impact.

Initially, access to a personal trainer was listed (under the theme of program characteristics) as attracting participants to the study. Participants also felt that trainers increased their confidence in using the exercise equipment properly; this is important in that perceived competence is a known theoretical predictor of greater exercise adherence and motivation.³⁷ Over time, however, participants were more comfortable using the equipment on their own. Most participants did not spontaneously describe the trainer as facilitating their involvement in the trial—in contrast to what we initially anticipated. When asked directly whether the trainer played a role in their participation in the trial, most (80%) said yes initially, whereas, at 6-months, less than half (42%) said they played a role. Furthermore, when asked how they would design a trial, 17% of participants indicated that they would choose to follow HEARTY’s program. These findings suggest that with trainer involvement in the beginning, participants developed the confidence to exercise on their own later on, however, trainer impact lessened over time.

That trainers played less of a role, while personal motivation appeared to increase over time, parallels the prediction of self-determination theory of a transition from initially extrinsic to intrinsic motivators in exercise adoption.²⁵ However, trainers may have also served as mentors and this attachment might have worked to facilitate participants’ exercise adherence. Unfortunately, due to employee turnover, scheduling conflicts and other practical considerations, some participants were not always paired with their usual trainer, and this likely diminished the trainers’ role. A stronger connection with the trainer may have increased their impact. In addition, trainers did not provide individualized counseling (ie, such as how to overcome barriers to exercise), nor were they trained to specifically counsel obese youth, thus, although costly, a more specialized exercise counselor may have served to better meet these participants’ needs.

Consistent with our hypothesis and theoretical constructs, increases in skill level and the experience of achieving results, in terms of weight loss and improved fitness, facilitated continued participation in the trial. Exercise facilitators identified by youth were consistent with research on the role of family and peer influence on weight and activity-related behaviors.^{38–40} For many participants in the study, family appeared to be an important influence, both in terms of directly facilitating transportation to the gym, and indirectly, through supportive comments. Some of the youth noted that their parent(s) joined the gym as well, and were pleased about that (despite that in their responses teens noted that parents eventually stopped attending). A third of participants said that their friends played a role in their participation, and said that having friends attend their sessions made exercise more fun and bearable. These findings support suggestions that promoting quality peer interactions in the obesity intervention setting may help to increase the impact of

the intervention.⁴¹ A peer-support or buddy system was not built into the trial, and these findings suggest that youth would value this.

Common barriers to participation in the trial were cited (ie, transportation, weather, time constraints) as noted in other research.^{35,42,43} These barriers appear to be present regardless of whether youth participate in a highly structured exercise intervention (the HEARTY trial), or a design which includes variety and intermittent exercise.³⁵ Many youth reported more than 1 barrier in their responses, and these worked incrementally to deter attendance. In reviewing participants’ responses, the presence of a contextual factor (ie, bad weather, lack of transportation) often enhanced personal reasons (ie, lack of motivation, low energy) for not attending. In these instances where more than 1 barrier was noted, youth reported that they simply did not attend. At other times, personal motivation or supportive comments/encouragement from family was described as helping to overcome these barriers. Participants explained that they “just did it” to overcome barriers, or “relied on family support.”

At 6-months, 3 main barriers were cited by at least a quarter of all participants: transportation, conflict with schoolwork, social obligation or feeling “not in the mood”/lack of motivation. Adolescents live within a system and are typically dependent on this system (ie, support from parents for transportation, buying healthy foods) to facilitate and sustain their health behavior change. In a very practical way, parents were both facilitators and barriers to participants’ attendance at the gym depending on their ability to provide these opportunities (ie, transportation). Parents likely also served as facilitators or barriers depending on how their support was perceived by youth. When youth feel connected within a supportive family where family members are knowledgeable about healthy exercise and eating behaviors, they are more likely to be successful in sustaining changes in health behavior.⁴⁴ In some cases, peer or family supports served to help youth overcome barriers. In other cases, lack of relatedness and support seemed to place more strain on adolescent’s autonomy in determining their participation—as revealed in the comment, “It’s up to me . . . my parents are . . . unaware.” It is important to consider how to best support those youth who must rely on their own autonomy (intrinsic and extrinsic motivators) for continued participation in an exercise trial. By design, many aspects of a randomized controlled trial (RCT) are compromising of autonomy, such as not having a choice in the group assigned to (aerobic or resistance-only or combined group), and not having the chance to change or introduce variety in exercise. This represents an additional challenge for youth not supported by their families.

Participants reported weight loss as a perceived outcome of the trial. As the HEARTY trial is still in progress and we were blinded to randomized group assignments and postrandomization body composition and metabolic data, it is unclear whether this perception is consistent with the quantitative data. Over time, youth were more likely to endorse improved fitness as a perceived outcome

of the trial. A change of focus toward fitness may have been reinforced by changes that were evident to the youth through physical testing, or may reflect improved knowledge about the effects of exercise participation. At later time points, perceived weight loss was endorsed less frequently by youth. This may be consistent with their actual weight loss, which many of them reported to have leveled off after 3 months. It is also possible that the youth may have felt that they did not meet their expectations for further weight loss (after a longer period of time in the trial), as was expressed by some participants. Again, this finding may also reflect a change in their goals of focus over time (ie, less weight-focused, more fitness focused). Despite some leveling off of weight loss, participants perceived their clothes to fit better and felt better about their appearance overall at both 3- (32%) and 6-months (46%).

In contrast to previous research on the short-term benefits of exercise in youth and adults, participants in the current study did not spontaneously endorse improved mood as a benefit of participation. This may reflect a true lack of effect in this domain, or may be partially explained by the concerns raised when youth were asked how they would change the trial. In their responses describing an ideal exercise program, youth suggested more group-based activities, and more variety in the exercise types. It is also possible that less autonomy in the context of the design of the trial resulted in less enjoyment of the trial. Many of the participants enjoyed the structure of the trial, and this enjoyment appeared to facilitate their continued participation. For others, the ability to choose their preferred exercise activity (not possible in the context of the RCT) may have been more consistent with the development of intrinsic exercise goals and therefore more enjoyment and greater self-determined motivation. Thus, findings suggest the need to incorporate more opportunities to improve mood/enjoyment in an exercise intervention perhaps by providing more opportunities for peer interaction or variety in their exercise "assignment."

When asked how they would design an exercise program, youth suggested building in a group-based component, increased variety (ie, sports), and the combination of the 2 types of exercise: aerobic and resistance training. Previous research has shown a lower attrition among overweight youth undergoing resistance training, compared with aerobic training, which may be due to a number of factors, including possibly increased preference,³⁷ reduced time commitment, and more rapid changes in body composition. Our participants' comments about an ideal exercise program do not suggest a particular preference for resistance training over aerobic exercise among overweight youth, and in fact, support the combination of the above. However, aggregate data are presented and therefore, do not report results by condition or exercise modality.

A limitation of the current study was the reliance on telephone interviews. This method was found to be the most efficient way of reaching the participant, who did not wish to come in for another appointment and whose e-mail addresses often changed. It was challenging to

establish rapport through this medium. It is possible that youth may have been more open through an internet-based forum, whereas face-to-face interviews may have been more helpful in terms of establishing rapport. All participants in the trial received dietary consultation; so their perceived outcomes may reflect the influence of activity, diet changes, or both. In addition, youth participated in the interviews at different times of the year, with varying demands in terms of school, social obligations, and different weather conditions, all of which may have affected their desire to attend the gym. For example, interviews during the winter may have been heavily biased by difficulty with transportation while hot humid weather in the summer may have impacted participants' participation.

The use of theory to inform the interview questions and probes may have led to cueing. Some participants may have answered in a certain way, or agreed with the questions to please the researchers (ie, agree when asked whether there was a role for a particular support when they did not experience this).³³ Due to the repeated interviews, previous knowledge of questions may have also narrowed participants' account of their experiences. In addition, for some theoretically driven categories, the frequencies of responses were low, making them difficult to interpret. Given the low frequency of responses for certain themes, we suggest that there may be a role for additional research using a more exploratory approach (eg, conventional content analysis; use of focus groups) in better understanding the challenges to exercise in this population. To better understand adolescents' experiences in participating in such an exercise trial, future research should also examine participant differences across exercise conditions, and gender. Finally, although findings from the current study may be used to guide the design of future trials, they are limited in generalizability in that aspects of the HEARTY trial would be difficult to replicate in the community (eg, free gym membership and personal trainer).

Our findings reflect a qualitative inquiry of the experiences of obese adolescents in a randomized controlled exercise intervention. Participants were positive about their experience in the HEARTY trial overall and with their results (ie, improved fitness, changes in appearance, and initial weight loss). A gym membership and access to a personal trainer, at least initially, were desired components of the current trial. Findings of the current study support Self-Determination Theory and Social-Cognitive Theory tenets, since for example, increased exercise competence facilitated participation in the trial, and youth appeared to move away from extrinsic goals toward intrinsic motivators over time. Findings from the current study also support both theoretical (ie, need for increased relatedness) and practical (eg, transportation) reasons for including family and peers in an exercise intervention. Although in the HEARTY trial many financial barriers to exercise adoption and adherence were overcome (eg, free membership to a gym; direction from a personal trainer at no cost), findings show that participants continued to

require support of family and peers to attend their gym sessions. Finally, in their ideal version of an exercise program, participants suggested adding more variety in exercise type and more group-based physical activity with peers.

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