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A pilot study of enhanced operation fit: The feasibility of a camp-based health intervention for ethnically diverse families of children with intellectual and developmental disabilities

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Abstract

Background: Obesity rates are higher in children with intellectual and developmental disabilities (DD) compared to typically developing (TD) children. In TD children, family-based (FB) interventions for obesity are the most effective interventions. Research addressing obesity interventions for children with IDD is limited.

Method: We adapted a community-based obesity intervention created for TD children for children with IDD and added a parent education component. The current study examined the feasibility of Enhanced-Operation Fit, a camp-based intervention created in order to reduce weight, and improve health behavior outcomes. Participants were 16 children (68.8% male; M_{age} = 13.15, SD_{age} = 1.62) and their parents.

Results: Results indicated that incorporating a daily parent education group limited recruitment potential, but showed promising preliminary improvements in parent feeding and child eating behaviors.

Conclusions: Health interventions for children with IDD are greatly needed and the current study may be a cost and time-efficient intervention to help address this public health crisis.

KEYWORDS
intellectual and developmental disabilities, intervention, pediatric obesity

1 | INTRODUCTION

Childhood obesity is a growing epidemic in our nation (Ebbeling et al., 2002; World Health Organization, 2000), and this epidemic is a greater concern for children with intellectual disabilities and developmental disabilities (Rimmer et al., 2010). Obesity rates are higher in children with intellectual disabilities and developmental disabilities in comparison with their typically developing (TD) peers (Krause et al., 2016; Segal et al., 2016). In a nationally representative dataset, rates of obesity in children with intellectual disabilities and developmental disabilities were found to be 28.9% compared to 15.5% for TD children (Segal et al., 2016). Children with intellectual disabilities and developmental disabilities may be particularly vulnerable to obesity due to complex behavioural, physical and psychosocial difficulties in this population of children (Curtin et al., 2010). These difficulties experienced by children with intellectual disabilities and developmental disabilities may be further compromised by obesity (Rimmer et al., 2010).

Children with intellectual disabilities and developmental disabilities are subject to similar risk factors for obesity as TD children/adolescents including increased consumption of high calorie, nutrient poor foods, increased sedentary behaviour (Lioret et al., 2009; Spear et al., 2007), parent weight status (Whitaker et al., 1997) and parent feeding behaviours (e.g. food restriction and control; Faith et al., 2004). However, these children may be particularly vulnerable to obesity due to additional factors. Physical limitations, medications with effects on appetite, sensory problems affecting nutritional choices, and increased behaviour problems placated with food have been associated with weight gain in this population (Curtin et al., 2010; Grondhuis & Aman, 2014). Children with intellectual

disabilities and developmental disabilities also tend to have a more sedentary lifestyle which likely contributes to their high rates of obesity (Granich et al., 2016). Social communication deficits in children with intellectual disabilities and developmental disabilities pose as additional barriers to physical activity and likely have a negative impact on involvement in sports and other physical activities (Curtin et al., 2014). Given the high rates of obesity, risk factors, and vulnerability to obesity, interventions addressing healthy behaviours are greatly needed for children with intellectual disabilities and developmental disabilities.

In TD children, family-based (FB) interventions for paediatric obesity are among the most effective interventions (Fonseca et al., 2012; Huelsing et al., 2010). Parents play a crucial role in the development of eating and physical activity habits in children, and addressing the family environment is especially important. Parents create a food and physical activity environment for children at home by modelling eating behaviours, selecting the foods for family meals and using feeding behaviours to encourage the development of a child's own eating behaviours (Savage et al., 2007). Parents also set a precedence for family priorities regarding physical activity (Fleming et al., 2008). FB interventions focus on improving child's dietary intake and physical activity through behavioural modification techniques (Janicke et al., 2014) including use of parent modelling, monitoring of dietary intake and physical activity, problem-solving, goal setting and stimulus control (Janicke et al., 2014). Parents are also encouraged to make similar healthy lifestyle changes as part of the intervention (Boutelle et al., 2012; Epstein, 1993).

Obesity interventions for children with intellectual disabilities and developmental disabilities have been limited, and there are more potential barriers to implementing health interventions with children with intellectual disabilities and developmental disabilities versus health interventions for TD children. Learning health information and practising behaviours may be more difficult for individuals with intellectual disabilities and developmental disabilities due to intellectual, social and communication deficits, which may require more focused and repeated teaching and supervision (Modell & Valdez, 2002). Fleming et al. (2008) developed the Health U intervention, a comprehensive, multi-component weight loss and health promotion programme for adolescents (ages 13–26) with Down Syndrome, which was developed based upon existing FB interventions for TD children (Fleming et al., 2008). This programme was examined in a randomized controlled trial design, which compared two 16-week interventions, both incorporating nutrition and exercise, and one which had a behavioural parent training (BPT) component. At a 6-month follow-up, participants in the nutrition and exercise plus BPT group had lower mean body weight than for the nutrition and activity only group. Additionally, while minutes of exercise increased for the nutrition and exercise plus BPT group, the nutrition and activity only group decreased in minutes of exercise from baseline to the 6-month follow-up. A similar trend was found at the one-year follow-up, but results were not statistically significant (Curtin et al., 2013). For children with ASD, a pilot study found that a 16-week, one hour per week parent-only obesity treatment was feasible and effective in reducing weight from baseline to post-treatment, but the study did not conduct a follow-up assessment (Matheson et al., 2019).

For young adults with intellectual disabilities and developmental disabilities, Pett et al. (2013) evaluated a 12-week, 3 h per week, healthy lifestyle intervention and found that all interventions (adult only, adult and parents, parent only) showed improvements in weight, blood pressure, and exercise maintenance at a 3-month follow-up (Pett et al., 2013). Additional types of health-based interventions with promising results include the use mindfulness for children with intellectual disabilities and developmental disabilities (Myers et al., 2018; Singh et al., 2011), and the use of technology (e.g. tablet) to deliver a nutrition-based weight-loss intervention for adolescents with intellectual disabilities and developmental disabilities (Ptomey et al., 2015). While a variety of health-based interventions have been implemented for children with intellectual disabilities and developmental disabilities, research is limited and additional research is needed.

For TD children and adolescents, camp-based interventions have shown positive outcomes. As the camp interventions are shorter in duration and conducted in a group format (Boutelle et al., 2015), it is possible that these types of interventions may be able to reach more families with limited resources. Camp-based interventions with combined nutritional and physical activity components have been shown to be effective in reducing weight in samples of TD children (Fonseca et al., 2012; Huelsing et al., 2010). Several camp-based interventions have been effective in reducing BMI *z*-score and increasing physical activity (Gately et al., 2000; Huelsing et al., 2010) However, to our knowledge, no intervention has evaluated a combined nutrition and physical activity camp-based intervention with parent behavioural training for children with intellectual disabilities and developmental disabilities and obesity.

1.1 | Current study

The current study aimed to develop and examine the feasibility of Enhanced Operation Fit (E-OF), a community, camp-based intervention for children with intellectual disabilities and developmental disabilities. E-OF was adapted for children with intellectual disabilities and developmental disabilities from Operation Fit, a community health intervention for TD children. Operation Fit has not previously been empirically evaluated; however, it was implemented in the community for several summers and was well received (Gutierrez et al., 2013; Sihotang et al., 2013). A parent education group was included in Enhanced Operation Fit in order to increase parent involvement in the intervention, which is consistent with prior research (Fonseca et al., 2012; Pratt et al., 2009). Given that very little research has addressed health behaviour interventions for children with obesity and intellectual disabilities and developmental disabilities, it is important to address the feasibility of implementing health interventions in this population. Previous camp-based health behaviour interventions for children with intellectual disabilities and developmental disabilities have been longer length in length (e.g. 6–8 weeks; Fonseca et al.,

2012; Gately et al., 2000; Huelsing et al., 2010), and evidence-based family interventions are time-intensive and costly to implement and disseminate (Boutelle et al., 2015). We sought to examine the feasibility of implementing a shorter, camp-based intervention with a parent education component, in order to address the need for feasible intervention in this population. The aims and hypotheses of the current study are as follows:

1. We aimed to create an adjunct parent health education group and examine the feasibility of incorporating this adjunct parent health education group to a community-based four-day-long health camp for children with intellectual disabilities and developmental disabilities. We hypothesized recruitment of at least 20 participants (child with a parent). We also hypothesized that the majority of parents would rate overall positive satisfaction with the intervention and would attend 75% or more of the groups.
2. While the current study was primarily a feasibility study, we also examined preliminary pilot outcomes at baseline and follow-up including child weight, parent feeding behaviours (Monitoring and Restriction) and child eating behaviours (Food Responsiveness and Satiety Responsiveness). We hypothesized that child weight would decrease between baseline and follow-up. For parent feeding behaviours, we hypothesized that parent monitoring would increase, and parent restriction of food would decrease from baseline to the four-month follow-up. For child feeding behaviours, we predicted decreased child food responsiveness and increased satiety responsiveness from baseline to the four-month follow-up.

2 | METHOD

2.1 | Participants

In order to participate in the E-OF intervention, children had to be ages 9–15 with a mild to moderate intellectual disability or a developmental disability and have a BMI percentile ≥85. A standard score of at least 45 on the receptive language section of the Kaufmann Brief Intellectual Assessment-II was required, which was administered at the pre-treatment assessment as described below. However, there were two participants with Standard Scores of 40 on receptive language that were enrolled in the current study, given that their low performance was likely due to noncompliance during testing. Upon observation, the receptive language of both children was sufficient to allow them to follow commands, request basic needs and follow instructions. Children were excluded from the study if they did not speak English or had any severe aggressive behaviours. Families were also excluded from the study if the parent did not speak English, or could not attend all four of the parent health education sessions.

The E-OF intervention included 16 children (68.80% male; 56.3% Hispanic) ages 9–15 (*M* = 13.15, *SD* = 1.62) with intellectual disabilities and/or developmental disabilities and 16 parents in the adjunct parent education group. The majority of the children were classified in the obese category (75%; Mean BMI %ile = 95.75, *SD* = 4.45). The primary child diagnosis was autism spectrum disorder (50.0%), while other diagnoses included Down syndrome (25.1%) and intellectual disability (18.8%) with 6.3% in the "Other" diagnosis category (DiGeorge syndrome). Three parents indicated that their children were diagnosed with a comorbid psychological disorder (18.8%); none of the parents of children with ASD, Down syndrome or DiGeorge syndrome reported that their children had a comorbid intellectual disability. Two children (12.5%) were reported to take psychotropic medication; one participant took Risperidone, while another participant took Abilify. Regarding intellectual functioning, the overall mean total Standard Score (SS) for IQ on the KBIT was 59.69 (*SD* = 18.93), ranging from 40 to 98 (<0.1 percentile to 45th percentile); 81.3% of participants scored lower than a 75 Standard Score on the KBIT (*n* = 13). The mean receptive language SS was 68.56 (*SD* = 22.18) ranging from 40 to 110 (<0.1 percentile to 21st percentile), and the mean expressive language SS was 56.88 (*SD* = 16.77; ranging 40–88 (<0.1 percentile to 75th percentile). For parents, most participants were mothers who identified as Hispanic (56.3%). Demographics of study participants are reported in Table 1.

TABLE 1 Demographics of children with intellectual and developmental disabilities enrolled in a camp-based health intervention

N = 16	
Child	
Age, *M* (*SD*)	13.15 (1.62)
Gender (% Male)	68.8 (11)
Diagnosis	
% Autism (*N*)	50.00 (8)
% Downs (*N*)	25.10 (4)
% ID (*N*)	18.80 (3)
% Other, DiGeorge syndrome (*N*)	6.25 (1)
Weight	
BMI percentile, *M* (*SD*)	95.75 (4.45)
% Obese	75.00
Parent	
Gender, % Mothers (*N*)	93.80 (15)
Ethnicity, % Hispanic (*N*)	56.30 (9)
Marital status, % married (*N*)	62.50 (10)
Income, % <20 K (*N*)	31.30 (5)
Weight	
BMI, *M* (*SD*)	33.82 (11.43)
% Obese	50.00

2.2 | Procedures

Procedures were approved by the Institutional Review Board at Loma Linda University. Participants for the E-OF intervention were recruited from the Inland Regional Center, a local agency that provides

services to individuals with a range of disabilities. Interested parents contacted our research team, and a phone screen was conducted. Eligible families participated in a pre-intervention screening assessment. At the pre-intervention screening assessment, all primary caregivers signed a consent form and all children signed assent forms. The pre-intervention screening assessment also consisted of short interview with the parent, child weight measurements and cognitive testing of the child. Cognitive testing was conducted using the KBIT-2 in order to ensure that the children were capable of understanding and fully participating in the camp. Parents and children were given questionnaires to take home to be completed prior to registration day.

Parents and children attended a registration day immediately prior to the camp intervention. Registration day consisted of collecting completed measures and questionnaires, weight measurements for parent and child, and a short interview with the child. Following registration day, children participated in the four-day intervention, which took place over the course of one week at the Drayson Center, a gymnasium associated with Loma Linda University. Participants were placed in small groups of three or four children based of relative level of cognitive and adaptive functioning. Psychology doctoral students served as group leaders, and two to three group leaders were assigned to each group in order to provide 1:1 or 1:2 support and behavioural management. Participants with an increased severity of behavioural difficulties were assigned a 1:1 psychology doctoral student in order to manage behavioural concerns and ensure participant safety. Group leaders were responsible for leading participants to and from activities and managing behavioural concerns.

Each day included nine hours of educational nutrition activities and physical activity that alternated throughout each day. Activities were no longer than 30–45 min each in order to maximize attention and engagement, and nutrition activities were interactive with concrete topics. For example, when discussing food groups, children participated in a relay in which they ran across the room to place plastic food models in the associated food group box. Exercise activities occurred both indoors and outdoors and included a variety of activities such as running on the track, obstacle courses, playing sports, scavenger hunt hikes and swimming. An example schedule of one day of camp is included in Figure 1.

During the last two hours of each day of camp, parents participated in a separate health education group. The parent health education group for E-OF was created based on the curriculum from the original S-OF camp, a consultation with the paediatrician who created S-OF, previous parent interventions for paediatric obesity (Boutelle et al., 2011) and studies on feeding/eating behaviours in children with intellectual and developmental disabilities (Cermak et al., 2010; Hinckson et al., 2013). Topics covered in the intervention included nutrition and physical activity education, and positive parenting behaviours specific to children with obesity. Parent groups alternated between didactics, discussion, activities and demonstrations. Some of the activities and demonstrations were consistent to activities in the child group, such as a portion size demonstration. Other activities and demonstrations included a sugar demonstration where parents had to guess how much sugar was in commonly eaten foods and a grocery list activity where parents were assisted in creating a healthy weekly family grocery list. Parents were also asked to fill out daily food monitoring records in which parents listed food and beverages consumed by both the parent and child for dinner after camp. In addition, following the didactic on managing mealtime behaviours, parents were asked to write any behavioural concerns that occurred during dinner that evening and how the parent responded, which was discussed during parent group the following day. Each parent group was led by graduate research assistants and were supervised by a licensed psychologist with expertise in obesity interventions. An example schedule of one parent education group is included in Figure 2.

The four-month follow-up assessment was conducted at the Loma Linda University Psychology Department and consisted of completion of questionnaires, parent and child weight measurements, and a brief structured clinical interview with the parent. The total time for the follow-up assessment was 30–45 min. Over the course of four months prior to the follow-up assessment, parents and children received bi-monthly email and short video reminders of healthy eating and physical activity topics discussed at the camp.

2.3 | Measures

2.3.1 | Demographic data

Demographic data were collected via parent interview at baseline.

2.3.2 | Aim 1 intervention feasibility measures

Intervention Feasibility was measured based on the following domains: Demand, Practicality and Implementation, and Acceptability (Bowen et al., 2009). Demand was assessed by examining how participants were recruited, and by attendance data collected at each session. Rates of attendance and attrition were recorded at each parent group, and reasons for absence were noted. Practicality and Implementation were addressed by discussing all resources and training necessary to run E-OF. For Acceptability, we measured parent satisfaction with treatment with a parent questionnaire and a brief structured interview focused on length, format, timing, content and overall satisfaction with the parent group.

Parent group feedback survey

Immediately following the completion of the last parent education group of E-OF (post-treatment), each parent was administered a feedback questionnaire. The questionnaire included eight open ended questions asking parents what aspects of the parent group that they liked most/least, what was most/least useful, what could be added or taken away from the parent group, and whether or not they would recommend OF and the parent group to other parents of children with intellectual and developmental disabilities. The

8:00 - 8:30 Check in
8:30 - 9:00 Stretching
9:00 - 10:30 Exercise Stations/Outside games
10:30 - 10:45 Snack→ fruit smoothie. Discussion on the importance of fruits and vegetables
10:45 - 11:25 Nutrition activity: Portion size goody bag game
11:25 - 12:00 Outside and inside games (depending on the weather)
12:00 - 12:20 Nutrition activity: Guess the food mystery game
12:20 - 1:00 Lunch → Whole wheat pasta and sauce with vegetables
1:00 - 2:00 Obstacle course in the gym
2:00 - 2:15 Free play/games
2:15 - 2:30 Change into swimsuits
2:30 - 4:15 Free swim and pool games.
4:15 - 4:30 Change into dry clothes, restroom, and water break.
4:30 - 4:45 Snack: Watermelon Fruit Pizza
4:45 - 5:00 Free time/games
5:00 Checkout with parents

FIGURE 1 Example schedule of one day at E-OF camp

2:45 – 3:00 Check in
3:00 – 3:45 Lecture and Discussion on importance of nutrition, food groups, and dietary recommendations.
3:45 - 4:00 Discussion on barriers to healthy eating in the home
4:00 - 4:20 Portion sizes demonstration and activity
4:20 – 4:45 Creating a healthy grocery list: Lecture and activity
4:45- 4:50 Discussion of homework: food monitoring worksheet
4:50 – 5:00 Quiz on topics discussed during parent education group

FIGURE 2 Example schedule of one day of the parent education group at E-OF camp

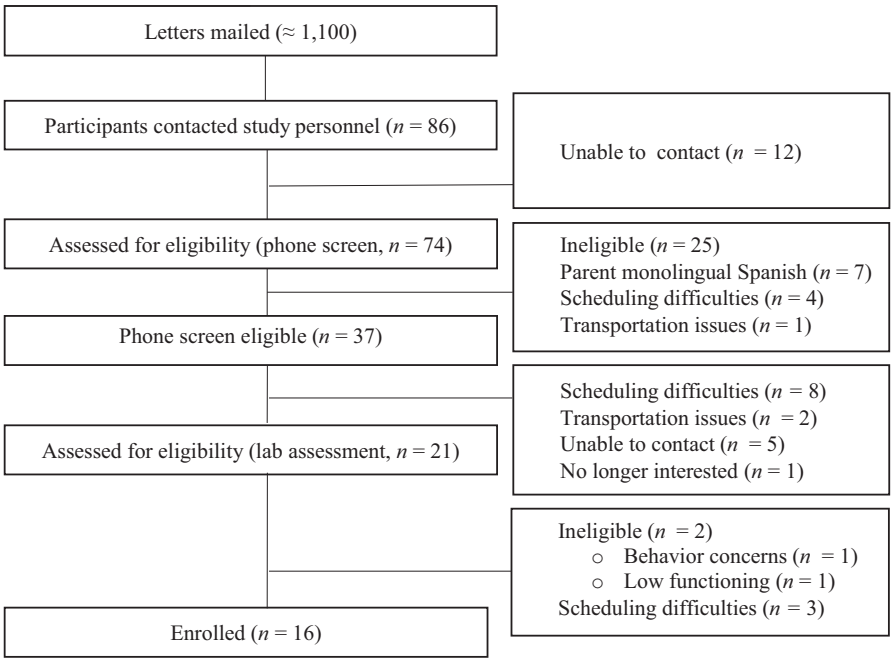

FIGURE 3 Consort diagram depicting recruitment in E-OF

questionnaire also included four questions in which parents were asked to respond to questions assessing increase in knowledge, effectiveness of the intervention and satisfaction with the intervention using a 5-point Likert scale.

Parent interview

A semi-structured interview was conducted with parents at the 4-month follow-up assessment in order to elicit parent feedback regarding the overall camp and the parent group. Questions asked parents about their general opinion of camp, feedback about logistics, aspects of camp that were beneficial and not beneficial, and obstacles they faced related to completing the camp. Parent interviews were conducted in a private room by psychology graduate students that were not involved in coordinating and recruiting parents for the intervention.

2.3.3 | Aim 2 preliminary outcome measures

All preliminary outcome measures were assessed at both baseline and the four-month follow-up.

Child Feeding Questionnaire (CFQ)

The CFQ is a 31-item parent-report instrument designed to assess parental feeding practices, as well as parents' perceptions and concerns about child weight on a 5-point Likert type scale (Birch et al., 2001). This measure has shown good internal consistency (Birch et al., 2001). The current study utilized the following subscales: Monitoring (α = .85) and Restriction (α = .68).

Child Eating Behaviour Questionnaire (CEBQ)

The CEBQ is a 35-item parent-report measure designed to assess eating styles related to obesity risk on a 5-point Likert-like scale (Wardle et al., 2001). The measure has been shown to reliable and valid (Carnell & Wardle, 2007). The current study utilized the Food Responsiveness (α = .87) and Satiety Responsiveness (α = .76) subscales.

Weight

Weight for the child was measured using a digital beam scale. Child BMI was calculated according to the following formula: [weight (in pounds)/(height (in)^2] × 703. Child BMI percentile was calculated by charting the child's BMI on BMI for age and gender graphs from the Center for Disease Control (CDC, 2017). Child BMI *z*-score was calculated using an online *z*-score calculator (Children's Hospital of Philadelphia, 2018).

2.4 | Data analytic plan

2.4.1 | Aim 1 Feasibility

The feasibility of the adjunct parent health education group was analysed based on standard feasibility criteria described above. Descriptive analyses were the primary statistical methods.

2.4.2 | Aim 2 Preliminary outcomes

Descriptive statistics were the primary method of analyses rather than parametric tests due to small sample size and low power. We examined outcome variables at both baseline and the four-month follow-up, as well as the relative size of the changes in outcome variables between baseline and the four-month follow-up.

3 | RESULTS

3.1 | Aim 1 Feasibility results

3.1.1 | Demand

Figure 3 depicts the participant flow and recruitment and retention for the current study. We used descriptive statistics to examine referral information and attrition data. Of those that enrolled in the camp, 94% (*n* = 15) were recruited through the Inland Regional Center; one participant was referred to the camp through his primary care physician (6%). The majority of children attended all four days of camp (68.8%, *n* = 11), 25% (*n* = 4) attended 3 days, and one participant attended only one day (6.3%). Similarly, the majority of parents attended all four days of the parent education group (68.8%; *N* = 11), 12.5% attended three days (*n* = 2), 6.3% attended two days (*n* = 1), and 12.5% attended one day (*n* = 2).

3.1.2 | Practicality and implementation

Resources necessary for E-OF included funding, personnel, time, facilities and two manuals (child intervention and the parent education group.) The cost of this intervention was approximately $75.00, per child, which covered facility fees, food, t-shirts and activity supplies (M. Baum, personal communication, 20 April 2016). An institutional seed grant was obtained in order to fund E-OF. However, the larger OF for TD children was funded through a combination of local agencies and institutional resources including the San Bernardino county department of health, the state-funded health plan and a federally qualified health centre within Loma Linda University (Social Action and Community Health System). The intervention required a relatively large number of personnel including five medical students to lead physical activities, and five nutrition students to lead nutritional lessons and prepare food. Approximately twenty psychology doctoral students helped to manage child behaviours and provided 1:1 and 1:2 supervision of the participants. In addition, one medical student was identified as the camp leader and was responsible for management of personnel, training and scheduling. Paediatric medical residents were present during lunch time in order to administer medications as needed.

Qualifications for all personnel included relevant expertise in their specific discipline and training. Medical and nutrition students

received one week of didactics and preparation time for the camp. A paediatrician served as the director of the camp and provided supervision for the medical and nutrition students, and paediatric residents. All personnel involved in the daily intervention activities received a one hour training in working with children with intellectual disabilities and developmental disabilities. Psychology doctoral students were supervised as needed by a licensed clinical psychologist, and parent group leaders were supervised by a licensed clinical psychologist with expertise in obesity.

3.1.3 | Acceptability

Following the final day of the intervention, parent participants filled out a parent education group satisfaction survey. We used descriptive statistics to examine data from the satisfaction survey. All of the parents indicated that their knowledge of both health and nutrition knowledge, as well as competence in handling mealtime challenges, improved as a result of the parent education group (Mostly (4) = 25%, *n* = 3; Definitely (5) = 75%, *n* = 9; *M* = 4.75, *SD* = 0.45). Overall, parents indicated that they believed that the parent education group would be beneficial for other parents of children with intellectual disabilities and developmental disabilities (Mostly (4) = 16.7%, *n* = 2; Definitely (5) = 83.3%, *n* = 10; *M* = 4.83, *SD* = .39), and 91.7% of parents noted that they were "Definitely" satisfied (*n* = 11) with the parent education group (Mostly (4) = 8.3% *n* = 1; *M* = 4.92, *SD* = 0.29). All of the parents (100%) indicated that they would recommend E-OF to other parents of children with intellectual disabilities and developmental disabilities.

At the four-month follow-up assessment, eight parents participated in a parent feedback interview. When asked what they liked most about the parent group, half of the parents indicated that they enjoyed learning health information (*n* = 4; 50%), and most parents indicated that they liked connecting with other parents and hearing about other parent's experiences (*n* = 7; 88%). Several parents also indicated that the hands-on demonstrations and activities were informative and helpful (*n* = 3; 38%). Feedback regarding what parents liked the least about the parent group was that the group was not long enough (*n* = 3; 38%). Additional parent feedback included environmental factors such as the room being too small (*n* = 3; 38%), uncomfortable chairs (*n* = 1; 13%) or too many questionnaires (*n* = 1; 13%).

3.2 | Aim 2 Preliminary outcome results

Preliminary outcome data are presented in Table 2. Given the small sample size for our follow-up assessment (*n* = 8), we were unable to use parametric analyses. We used descriptive statistics to examine the preliminary outcome data. Child satiety increased from baseline to follow-up. Food responsiveness decreased between baseline and follow-up. For parent feeding behaviours, both monitoring and restriction increased from baseline to follow-up. Child BMI z-score decreased slightly between baseline and the four-month follow-up.

TABLE 2 Child eating and parent feeding behaviours at baseline and a four-month follow-up after a camp-based health intervention for children with intellectual and developmental disabilities

	Baseline		Four-month Follow-up	
	N	*M* (*SD*)	*N*	*M* (*SD*)
CEBQ satiety	17	2.15 (0.69)	9	2.53 (0.49)
CEBQ food responsiveness	17	3.84 (0.72)	9	3.20 (0.97)
CFQ monitoring	18	4.00 (1.13)	9	4.37 (0.86)
CFQ restriction	18	4.19 (0.45)	9	4.60 (0.44)
Child BMI *z*-score	17	2.14 (0.66)	9	2.04 (0.80)

4 | DISCUSSION

Among children with intellectual disabilities and developmental disabilities, rates of obesity are higher in comparison with TD children (Krause et al., 2016; Segal et al., 2016). While there have been numerous studies addressing health and obesity interventions for TD children (Fonseca et al., 2012; Huelsing et al., 2010), there have been limited studies targeting health behaviours and obesity in children with intellectual disabilities and developmental disabilities. E-OF was developed in order to address the need for health interventions for children with intellectual disabilities and developmental disabilities and to assess the feasibility of implementing a camp-based community intervention for children with intellectual disabilities and developmental disabilities that includes a parent education group.

Given that this study is one of very few interventions to address health behaviours and obesity in children with intellectual disabilities and developmental disabilities, the primary focus of this pilot study was to assess the feasibility of a novel community-based intervention (Aim 1). While 37 families were phone screen eligible, only 21 elected to participate in the lab assessment. Of the 19 eligible in the lab assessment, 16 were still interested in participating in the intervention after completing the assessment, which is lower than we hypothesized would participate in Aim 1. One of the primary reasons parents gave for declining to participate in E-OF was scheduling difficulties with regards to participation in the parent education group. Specifically, of the 37 participants that were eligible based on the phone screen, 11 cited scheduling difficulties as reasons for inability to participate in the parent group. Parents of children in E-OF were required to attend a parent health education group between 3:00 pm and 5:00 pm at the end of each day of camp. Given that this time falls at the end of a typical work day, it was difficult for many parents to commit to attending four days. Participation in E-OF required a relatively high level of commitment from parents and several parents that commuted long distances committed to staying in the area during the day in order to make participation feasible. Due to the high level of commitment required for the parent group, recruitment was limited, and many families were unable to enrol in the camp who would otherwise be eligible.

While we had recruitment difficulties, participating parents rated the intervention as acceptable, and 100% of participating parents reported that they would recommend E-OF to other parents of children with intellectual disabilities and developmental disabilities. Additionally, the majority of parents (81.3%) attended over 75% (at least 3 of 4) of the four camp sessions, which is consistent with our hypothesis for Aim 1. Reasons for parent group absences included personal, family and scheduling emergencies. Given our recruitment difficulty but high acceptability among participating parents, it is possible that more parents would attend if parent education sessions were held outside of work hours. Providing childcare during this time would likely improve participation in the parent group. Alternatively, offering the parent education component online or virtually may make it more feasible for parents to attend.

It is also possible that parent perception of the importance of a healthy lifestyle intervention versus perception of the immediacy of other concerns related to having a child with intellectual disabilities and developmental disabilities played a role in recruitment and commitment to participation. Children with intellectual disabilities and developmental disabilities typically display increased behaviour problems as compared to TD children (Baker et al., 2002). Given that behaviour problems have immediate consequences for parents, addressing these concerns is likely a high priority for parents. Conversely, the consequences of obesity are often more long term, which may be perceived as less urgent to parents that are dealing with frequent child behaviour problems that are acutely problematic. Additionally, parents of children with intellectual disabilities and developmental disabilities typically exhibit higher levels of stress than parents of TD children (Baker et al., 2003), which may impact motivation for an intervention with a high level of commitment.

While we were unable to examine outcomes using parametric analyses, our preliminary descriptive data do suggest that parent feeding, child eating behaviours and child weight may improve at a four-follow-up. However, the results of Aim 2 are preliminary and should be interpreted with caution. Regarding child eating behaviour outcomes, parents reported that their children had increased satiety and decreased food responsiveness at the four-month follow-up, which is consistent with our hypothesis in Aim 2. Research has shown that children with intellectual disabilities and developmental disabilities are less sensitive to satiety cues and more responsive to external food cues in the environment (Webber et al., 2009). Low sensitivity to satiety and increased responsiveness to external food cures are also associated with increased risk for obesity (Webber et al., 2009). Related to food responsiveness, one topic discussed was creating a healthier food environment in the home. Teaching parents how to alter environmental cues and create a healthier food environment at home (e.g. only placing healthy foods in sight) possibly helped to decrease child instinct to eat in response to environmental food cues, and increased their responsiveness to their own hunger cues.

Regarding parent feeding behaviours, parent monitoring increased between baseline and follow-up, which is consistent with our hypothesis in Aim 2. Food monitoring was discussed and practiced in the parent group of E-OF, and research has shown that parent monitoring is an important component of FB interventions (Janicke et al., 2014). However, parent restriction increased between baseline and follow-up, which is inconsistent with what we expected. We would expect a reduction in restrictive feeding practices, given that literature has shown that restrictive feeding practices do not reduce intake of restricted foods and have been associated with lower inhibitory control and increased weight in children (Rollins et al., 2014). However, parents of children with intellectual disabilities and developmental disabilities typically display more directive parenting practices, and children with intellectual disabilities and developmental disabilities often require more directive parenting (Fenning et al., 2007). It is possible that since children with intellectual disabilities and developmental disabilities require more directive parenting (Fenning et al., 2007), these parents are also more hands on and directive with regard to restricting and monitoring feeding behaviours.

Regarding child weight, child BMI *z*-score decreased slightly at a four-month follow-up, which is partially consistent with our hypothesis in Aim 2. It is possible that a more intensive intervention may be required for long-term weight loss and maintenance. Previous effective camp-based interventions for TD children were longer in duration than E-OF (Fonseca et al., 2012; Huelsing et al., 2010), which is a limitation in the current study. This longer duration prior to a follow-up assessment may be necessary for long-term weight outcomes and future studies should examine outcomes at a six-month or one-year follow-up. While these results are preliminary, they do suggest some improvements in important parent feeding and child eating behaviours that could impact long-term health in families with children with intellectual disabilities and developmental disabilities and obesity.

4.1 | Limitations and future directions

There were several limitations to the current study. As previously discussed, the primary limitation to our study was a small sample size. However, given that this is a pilot study, these results allow us to examine the feasibility of a community, camp-based health intervention in order to inform future health interventions for children with intellectual disabilities and developmental disabilities. One limitation for recruitment was our inability to include monolingual Spanish-speaking families in the intervention. Given that the Inland Empire in Southern California includes a high prevalence of Hispanic and Spanish-speaking families, offering a group in Spanish may improve recruitment feasibility and generalizability. However, a strength of our study is our diverse sample, which consisted of primarily Hispanic families.

Sample retention was also a limitation of the study. Only 50% (n = 8) of parents responded to requests to attend follow-up. It is possible that parents were busy, and did not perceive the monetary compensation as motivation enough to attend the follow-up session. While informational emails were provided bi-monthly in order to serve as reminders to continue to incorporate skills

learned during the intervention, more consistent follow-up with parents including phone calls, sending letters and emails throughout this four-month period may have improved attrition at follow-up. Additional factors that may improve participation at follow-up include scheduling the follow-up session at the end of camp and doing follow-up assessments in families' homes. Future studies should also consider efforts to increase group engagement and cohesiveness, which has been shown in other intervention studies to decrease attrition rates and improve effectiveness of interventions (Berg et al., 2009; Staiano et al., 2013). Specifically, involving parents in more problem-solving activities as homework and having parents lead discussion on problem-solving barriers to healthy lifestyles may help increase group cohesion. Additionally, encouraging communication and interaction between families following the end of group may increase motivation for continued participation. With high cohesion among participants, incorporating a group follow-up session may contribute to motivation to participate in follow-up.

5 | CONCLUSION

Given the high rates of obesity in children with intellectual disabilities and developmental disabilities (Segal et al., 2016), known physical and mental health consequences of obesity (Rimmer et al., 2010) and limited health and obesity interventions for children with intellectual disabilities and developmental disabilities, examining health and obesity interventions for this population is critically important. The current study highlighted important feasibility considerations to inform future health and obesity interventions for children with intellectual disabilities and developmental disabilities including addressing barriers to parent participation and implementing efforts to increase participation in follow-up assessments. Additional health and obesity interventions are greatly needed in this population, and this camp-based approach may be a cost-effective and time-efficient way to help improve this public health crisis.

CONFLICT OF INTEREST

Catherine Sanner declares that she has no conflict of interest. Cameron Neece declares that she has no conflict of interest. Sylvia Herbozo declares that she has no conflict of interest. Marti Baum declares that she has no conflict of interest.

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