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Pilot evaluation of a behavioral weight loss program for adults with physical disabilities: State of Slim Everybody usability and feasibility

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Abstract

Background: People with physical disabilities (PWD) have a higher prevalence of obesity than populations without disability, but most evidence-based weight loss programs have not included this population. The *State of Slim* (*SOS*) program is an evidence-based weight loss program that has demonstrated success in producing weight loss in populations without disability, but it has not been adapted for or evaluated in PWD.

Methods: The SOS program was systematically adapted using the evidence-informed Guidelines, Recommendations, and Adaptations Including Disability (GRAIDs) framework. A total of 35 participants enrolled in the *State of Slim Everybody* program. The program was offered entirely online. Body weight, attendance, and food log completion were also tracked weekly. The program length was 16.5 h and included weekly group instruction, with optional one-on-one sessions provided upon request. Following completion, participants completed post-evaluation surveys on overall satisfaction with the program. The primary outcomes were program effectiveness (i.e., body weight), usability, and feasibility.

Results: Thirty-two out of 35 participants completed the program, representing a retention rate of 91.4%. Average weight loss was 10.9% (9.9 $\pm$ 0.7 kg ($t(31) = -13.3$, $p =< 0.0001$)). On a 1 (dissatisfied/completely useless) to 5 (very satisfied/completely helpful) Likert scale, the average score for overall program satisfaction was 4.8 $\pm$ 0.1 and program helpfulness 4.6 $\pm$ 0.1.

Conclusion: The *State of Slim Everybody* program demonstrated significant weight loss and good usability and feasibility in PWD. Existing adaptation frameworks can be used to create inclusive health promotion programs for adults with physical disabilities.

KEYWORDS
inclusion science, physical disability, program evaluation, weight loss

1 | BACKGROUND

Currently, over 25% of the population identifies as having a disability,[1,2] a drastic increase from 8% in 1999.[3] Physical disabilities can include spinal cord injuries, multiple sclerosis, cerebral palsy, hearing and visual impairments, amputations, and many more.[1] These disabilities can impact physical functioning, movement, memory, communication, mental health, and social relationships among others.[1,4] It is well documented that the prevalence of obesity is higher among people with physical disabilities (PWD),[1,5,6] and the risk of developing obesity is associated with increased severity of limitations related to the disability.[7] Among PWDs, additional obesity-related consequences exist, including increased pain, depression, fatigue, further declines in mobility, and decreased self-rated quality of life.[6] For PWD with obesity, intentional weight loss has been associated with improvements in obesity related chronic conditions as well as improvements in pain management, increased mobility, and improvements in performing activities of daily living.[8–12]

While it is evident that PWD can benefit from intentional weight loss, most weight loss programs are not designed to mitigate barriers that this population commonly faces when attempting to improve their health. Typically, weight loss programs range from 12 weeks to 6 months of the active weight loss phase[13–16] and include dietary and exercise components,[17–22] and self-monitoring activities, such as regular self-weighing,[12,18,19] often preventing PWD from fully participating. Barriers to weight loss and weight management include lack of accessible equipment for food preparation or exercise, transportation-related barriers, altered metabolism from the disability, and lack disability training regarding weight loss for personnel.[23–27] Recently, program adaptation frameworks have been created using a systematic process for adapting the core components of health promotion programs to be inclusive of PWD.[28] However, this process has not yet been fully applied to an existing evidence-based weight loss program to include this population.

The *State of Slim* (*SOS*)[29] program has demonstrated significant weight loss in populations without disabilities. It is a 16-week behavioral weight loss program that has been delivered in-person and virtually and has produced a 7.7%–11.7% weight loss in people without disability.[30,31] Using this program, along with a set of evidenced-informed Guidelines Recommendations, and Adaptations Including Disability (GRAIDs)[28] and National Center on Health, Physical Activity, and Disability (NCHPAD) Adaptation Process (NAP), this program was adapted to create the *State of Slim Everybody* (*SOS Everybody*) weight loss program. The purpose of this program evaluation was to evaluate the feasibility, usability, and preliminary effectiveness of the *SOS Everybody* weight loss program in PWD.

2 | METHODS

2.1 | Participants

Participants were recruited through NCHPAD by contacting former community program participants and posting on NCHPAD social media accounts. Participants were eligible if they were at least 18 years of age, with overweight or obese (Body Mass Index (BMI) $\geq$ 25 kg/m^2), had a self-reported physical disability or mobility impairment or used an assistive device for ambulation, and were willing to participate in all program components. Exclusion criteria included medical conditions that would make it unsafe to follow the diet or exercise program, including congestive heart failure, chronic kidney disease, uncontrolled hypertension, eating disorders, or uncontrolled thyroid conditions. Participants were also excluded if they had recent weight changes exceeding 7 kg in the previous 3 months, were taking medications for the exclusive purpose of weight loss, or were currently or recently (within 6 months) pregnant. The program was completed in two cohorts with the first cohort beginning in February 2023 and the second cohort beginning in July 2023.

After expressing interest in the program, the study staff sent a link to a 15-min video describing the program along with the phase 1 food list. The purpose of distributing these materials was to allow participants time to review program expectations and to read over the list and see if they would be able to follow the program. If participants were still interested, they contacted the study staff again and a phone screen was set up. During the phone screen, study staff read more information about the program in the form of a short script, and participants were provided time to ask questions about the program. Participants then underwent the eligibility screening by phone.

2.2 | State of slim weight loss program

The *SOS* program is directed by a trained coach. *SOS* coach training involves either participating in a training program led by Dr. Holly Wyatt or observing and serving as an assistant coach in previous iterations of the *SOS* program and passing an evaluation by previous coaches to determine readiness. No prior background in health coaching is required. The diet plan is a 16-week program that is low in fat and high in protein and emphasizes non-starchy vegetables and whole-grain carbohydrates.[29] The plan consists of three distinct phases in which participants choose from specific food options. Phase 1 is the shortest phase lasting 2 weeks, phase 2 is 6 weeks, and phase 3 is 8 weeks. During each phase, participants were given allowable food lists along with portion sizes and were asked to complete food logs that were submitted to the coach for review. The SOS diet plan also consisted of five diet rules that participants were asked to follow during each phase: (1) Eat five to six times per day. (2) Eat breakfast within 1 hour of waking. (3) Do not count calories; instead, measure portions. (4) Have the right protein mix at each meal (one carbohydrate and one protein at each meal). (5) Eat a healthy fat twice a day.

The exercise component of the program started with the recommendation of 10 min of moderate-intensity physical activity per day and gradually increased to 70 min per day, 6 days per week of moderate-intensity physical activity. Participants in the program

met weekly via Zoom in a group class format lasting 60 min per session and led by the coach. On the morning of each class, participants were asked to use the provided scale and send a picture of their current weight to the coach.

2.2.1 | Group dynamics

A central feature of the *SOS* program is community building and creating a mindset and environment supporting weight loss. Each week, participants were paired with another classmate with whom they communicated throughout the week. Participants were also given homework assignments to post in the online community, such as sharing recipes, meals, or workout ideas. During the first week of class, the group also determined a team name and a group weight loss goal, which the coach updated progress on each week. Occasionally, the team was also given "team building" tasks typically related to a diet or physical activity goal that they needed to meet as a group (e.g., walking a certain number of miles in a week or posting a certain number of adapted exercise examples). These team-building goals were designed to build a sense of community among the team members. During class sessions, the coach shared lessons on building emotional resiliency, creating positive habits and mindsets, shifting physical and social environments, and purpose and identity alignment, all with the goal of enhancing the program's success.

2.2.2 | SOS adaptations

The SOS program was adapted using evidence - informed GRAIDs and NCHPAD NAP (Ancillary Materials in Supporting Information S1). The nine steps of the NAP in which the GRAIDs are embedded with examples related to this program are listed in Table 1.

Components of the base diet program were adapted, including the addition of microwave-friendly meals, and the opportunity for additional modifications on an as-needed basis. All participants were sent adapted cooking tools, modified workout examples including seated and standing exercises, and wheelchair users received an accessible scale for the weekly weigh-ins. For the Zoom calls, closed captions were made available for participants and the coaches used a standardized background designed to reduce distraction and improve visibility for participants with low vision. The weekly curriculum was also modified to be inclusive of participants with low vision, including increasing font size, using an inclusive font, adding alternative-text to all images, and improving font color contrast as needed. All materials were also made available online to participants in a screen reader friendly format. Finally, all coaches were mandated to undergo inclusive language training to encourage the use of disability sensitive language and to increase disability inclusion.

Prior to starting the program, participants were sent a box of materials to support their participation in the program, including weekly class curriculum materials in labeled weekly envelopes, the SOS book, resistance bands, a weight scale, protein powder samples,

TABLE 1 Adaptation process.

Step number and instructions	Program specific information
Step 1. Identify core components of the program.	A literature review of weight loss programs for PWD was conducted along with a review of literature of the SOS program.
Step 2. Identify barriers and gaps to inclusion within the program.	A list of barriers to participating in a weight loss program was grouped into the following domains: Built environment, services, instruction, and equipment.
Step 3. Prepare adaptations to the program.	Following identification of barriers, evidence-based solutions were created for each barrier using literature searches, feedback from NCHPAD inclusion specialists, and PWD.
Step 4. Integrate the adaptations into the program.	Adaptations were embedded into the existing program content and materials.
Step 5. Review of program adaptations by NCHPAD/Lakeshore content expert.	A meeting was held with adaptation content experts to review the proposed adaptations and make further adjustments as needed.
Step 6. Review of program adaptations by program developers/ implementors.	A meeting was held with the creator of the SOS program to review proposed adaptations and ensure integrity of the program was maintained.
Step 7. External review with at least 2 NCHPAD committee members.	Two NCHPAD inclusion specialists used the appraisal of guidelines for research & evaluation instrument (AGREE II) scoring criteria[32] to grade the program for appropriateness for the target population across the following categories: Scope and purpose, clarity and presentation, applicability, inclusion, and overall quality.
Step 8. Consolidate and embed feedback.	The author consulted with a NCHPAD expert information specialist to finalize program. For this step, all feedback was gathered and incorporated, and a final program was created.
Step 9. Written endorsement by original program developer.	The program creators provided endorsement for the adapted program to be used in PWD.

Abbreviations: NCHPAD, National Center on Health, Physical Activity, and Disability; PWD, people with physical disabilities; SOS, State of Slim.

and adapted cooking tools. They also received a binder that included sample workouts, select recipes, and weight tracking sheets where participants could also place weekly materials once they were complete.

2.3 | Outcome measures

Outcome measures were based on examining effectiveness, feasibility, and usability. Effectiveness was assessed by the amount of weight loss. Individual weight loss percent of those that completed the program was calculated by dividing the number of kilograms lost by individual staring weight (kg) and multiplied by 100. Feasibility outcomes included program retention and engagement. Participants were considered "retained" if they maintained participation until the end of the program and did not ask to be removed. Engagement in the program included attendance in the weekly group sessions, sending in their weight each week, and completing food logs for the first 8 weeks of the program. Program usability was assessed with an online survey completed at the end of the program. The survey consisted of 16 items - five items assessed the satisfaction of different aspects of the program and 11 items assessed the helpfulness of program components. Items were assessed using a five-point Likert scale with values ranging from 1 (very dissatisfied/completely useless) to 5 (very satisfied/completely helpful).

2.4 | Statistical analyses

All analyses were completed using SAS (version 9.4, 2002–2012 by SAS Institute Inc., Cary, NC, USA). Descriptive statistics were used for all demographic characteristics and analyses of feasibility and usability. Changes in weight were evaluated using paired sample *t*-tests. Approval for this program evaluation was provided by the University Institutional Review Board (#300008580).

3 | RESULTS

Table 2 presents participant demographic information. Participants were allowed to select multiple disabilities or assistive devices used. Out of the 35 participants who started the program, 68.6% (n = 24) used an assistive device for ambulation. Thirteen participants (37.1%) used either a power or manual wheelchair. The most common disability was stroke (n = 13, 37.1%), followed by multiple sclerosis (n = 7, 20.0%) and traumatic brain injury (n = 5, 14.3%). The participants' mean age was 52.8 ± 1.9 years and most (82.9%) identified as female.

TABLE 2 Participant characteristics.

Variable	*n* = 35
Age y, *M* (SE; range)	52.8 (1.9; 25–82)
Race, *n* (%)	
Black or African American	5 (14.3)
White or Caucasian	27 (77.1)
Asian	1 (2.9)
More than one race	1 (2.9)
Other	1 (2.9)
Ethnicity, *n* (%)	
Hispanic or Latino	0 (0.0)
Not Hispanic or Latino	35 (100.0)
Gender, female, *n* (%)	29 (82.9)
Primary disability, *n* (%)	
Stroke	13 (37.1)
Multiple sclerosis	7 (20.0)
Traumatic brain injury	5 (14.3)
Arthritis	2 (5.7)
Spinal cord injury	2 (5.7)
Cerebral palsy	2 (5.7)
Amputation	2 (5.7)
Chronic pain	2 (5.7)
Gene disorder	1 (2.9)
Guillain-Barre syndrome	1 (2.9)
Cancer	1 (2.9)
Other	4 (11.4)
Assistive device used, *n* (%)	
None	11 (31.4)
Cane	9 (25.7)
Manual wheelchair	8 (22.9)
Power wheelchair	5 (14.3)
Rollator	5 (14.3)
Ankle foot orthoses	4 (11.4)
Walker	4 (11.4)
Caregiver	3 (8.6)
Scooter	1 (2.9)
Other	3 (8.6)

Note: Participants could select more than one primary disability and assistive device used.
Abbreviations: M, mean; SE, standard error; y, years.

3.1 | Effectiveness

Figure 1 illustrates individual changes in weight during the program. One participant did not report a weight for the last 3 weeks of class, and therefore was excluded from this analysis. Participants lost weight ranging from 0.6 to 20.0 kg. Participants lost an average of 9.9 ± 0.7 kg (t (31) = −13.3, $p \leq 0.0001$), representing an average

weight loss of 10.9%. Thirty of the 31 participants (96.8%) achieved a weight loss of ≥5% of their starting weight, and 17 of these participants (54.8%) achieved a weight loss of ≥10% of their starting weight.

3.2 | Feasibility

Regarding retention, 32 out of the 35 participants completed the 16-week program with a retention rate of 91.4%. All participants who discontinued participation did so at either week one or week two of the program. Other measures of feasibility are presented in Table 3. On average, participants attended 14.8 out of 16 sessions (92.0%) and weighed in 15.8 out of 16 weeks (98.6%). Completion of food logs was lower, with an average of 5.1 out of 8 food logs completed per participant, representing a 63.7% completion rate.

3.3 | Usability

Scores related to program usability are presented in Table 4. A total of 29 participants completed the post-program survey (90.6%). The average for all scores was above 4 out of 5, with the highest scores for satisfaction with the program's ability to help lose weight (4.8 ± 0.1) and satisfaction with the overall program (4.8 ± 0.1). The lowest score in the satisfaction domain was with the program's appropriateness for participants' specific disability, scoring 4.2 ± 0.3. For this domain, one participant selected a two out of five and noted that the program did not have accommodations appropriate for their cognitive disability, which coincided with their physical disability. For program helpfulness, the overall program was rated a 4.6 ± 0.1, and the lowest rated item was the online "wish list" with examples of program-friendly materials for purchase (4.2 ± 0.2). The welcome box, printed curriculum, online curriculum, exercise equipment and handouts, weekly coaching calls, food logs, and weight scale all rated a 4.4 out of 5.

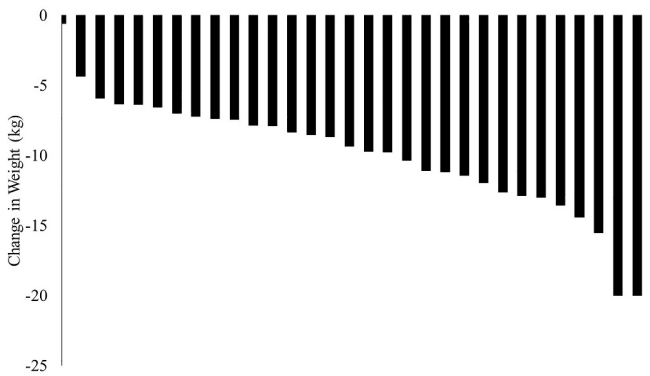

FIGURE 1 Individual weight change (kg). kg, kilograms.

4 | DISCUSSION

The *SOS Everybody* program produced clinically meaningful weight loss of 10.9% on average ($M = 9.9 \pm 0.7$ kg) and favorable results for feasibility and usability. More than half of the participants achieved a weight loss greater than 10%. Notably, this amount of weight loss was comparable with previous studies using the mainstream *SOS* program with people who did not have a disability.[30,31] Moreover, 96.8% of participants who completed the adapted program achieved a weight loss of at least 5%, and the retention and program attendance rates were also high at 91.4% and 92.0%, respectively. The high adherence and retention rates could be a result of the team-building emphasis engrained in the program, but more research is needed to qualify the core components that resulted in these findings. While food log completion was moderate with an average of 63.7% of logs completed, lower food log completion is not uncommon during weight loss trails.[31,33,34] In an SOS program previously delivered in a population without disability, food log completion ranged from an average of 6.5 out of 7 days completed in week 2 to 3.1 days completed in week 16.[31] Based on these findings, food log completion in the present study seems to fall in line with the existing literature.

These results are quite promising given that we are not aware of any published studies that demonstrated a 10% weight loss in adults with various physical disabilities, especially including people with severe impairments (i.e., unable to walk or having limited mobility to exercise).[35–37] One published study involving a weight loss program for people with a physical disability was a modification of the Diabetes Prevention Program lasting 20 weeks to include people with disabilities.[35] Researchers achieved a 7.4% weight loss but noted that regular self-weighing was an issue in the study sample, and were removed as a part of that program.[35] This barrier was overcome in the *SOS Everybody* program by mailing wheelchair accessible scales to participants as needed. Additionally, one pilot study using a 6-month

TABLE 3 Feasibility outcomes.

	M (SE)	Percent of total	Range
Sessions attended, # attended per participant	14.8 (0.3)	92.0	8–16
Weigh ins, # completed per participant (of 16)	15.8 (0.1)	98.6	12–16
Food logs, # completed per participant (of 8)	5.1 (0.5)	63.7	0–8

Note: Attendance and weigh-ins were tracked weekly for the duration of the program. Food logs were collected weekly for the duration of the program but were only required for the first 8 weeks of the program.

TABLE 4 Program satisfaction and helpfulness.

	M	SE	Range
Satisfaction (n = 29)			
Program's ability to help reduce calorie intake	4.7	0.1	4–5
Program's ability to help increase exercise participation	4.6	0.2	2–5
Program's ability to help lose weight	4.8	0.1	4–5
Program's appropriateness for your disability	4.2	0.3	2–5
Overall program	4.8	0.1	4–5
Helpfulness (n = 29)			
Welcome box and supplies	4.4	0.1	4–5
Printed curriculum	4.4	0.1	3–5
Online curriculum	4.4	0.2	1–5
Exercise equipment and handouts	4.4	0.2	3–5
Weekly coaching calls	4.4	0.1	3–5
Food logs	4.4	0.2	1–5
Weight scale	4.4	0.1	4–5
Homework assignments	4.3	0.2	1–5
Online community page	4.3	0.2	1–5
Online wish list with helpful materials	4.2	0.2	1–5
Overall program	4.6	0.1	4–5

Abbreviations: M, mean; SE, standard error.

Note: Scores were collected using a 5-point Likert scale, with 1 representing completely dissatisfied, and 5 representing completely satisfied. Helpfulness scores collected using a 5-point Likert scale, with 1 representing completely useless, and 5 representing completely helpful. Scores presented as the mean, standard error, and range.

weight loss program reported a median weight loss of 10.54% in a small sample of adults with multiple sclerosis (n = 8),[38] with weight loss of 8.6% using the same program in a larger randomized trial intervention (n = 71).[39] However, these studies only included those with multiple sclerosis and excluded those with more severe impairments, as indicated by a Patient Determined Disease Steps score of <4.[39] The present study was able to accommodate for those with more severe impairments, with over two-thirds of the sample using an assistive device for ambulation, while still producing significant weight loss.

This study was able to demonstrate that adapting a program using evidence-informed frameworks can result in outcomes similar to those seen in populations without disability in which the program was originally developed. This is important because instead of creating new programs, adapting existing programs that have already demonstrated success could be a better path forward in improving the health of PWD.

Limitations of this pilot evaluation include the small sample size and lack of a control group for comparison. Also, as is the nature of community programs, some constraints existed regarding data that could be collected from participants. Additionally, besides screening out participants using weight loss medications, no other information was collected regarding current medication use or any other potentially relevant health information. Also, collection of body composition changes or other metabolic outcomes was not possible in this program. One participant noted that they needed a few additional adaptations to accommodate a cognitive impairment that coincided with their physical disability. Future programs could provide additional materials such as pre-recorded supplemental content videos for participants who need additional support other than the live class presenting information. Future research should also consider adding follow-up program to assess the long-term maintenance of weight loss produced during this program. Research suggests that the majority of lost weight regained within the first year following weight loss,[40,41] which remains important to investigate in the context of this population. Finally, it would be important to investigate the potential for this program to be disseminated on a larger scale. While this program was delivered in a community setting, it is not known if it could be scaled up to a wider setting.

Despite the higher prevalence of obesity and obesity-related comorbidities in people with disabilities, many weight loss programs are not accessible to this population. The *SOS Everybody* program demonstrated effectiveness, feasibility, and usability when used in people with a physical disability. Our findings suggest that PWD can achieve clinically meaningful weight loss when provided a program that has been adapted to meet their specific needs, and that adaptation frameworks can be useful for creating inclusive programs.

AUTHOR CONTRIBUTIONS

Julianne G. Clina, Holly R. Wyatt, James O. Hill, Hui-Ju Young, and James H. Rimmer conceived the research project; Julianne G. Clina and CFC conducted the research; Julianne G. Clina performed the statistical analyses; Julianne G. Clina drafted the manuscript; and Holly R. Wyatt, James O. Hill, CFC, and Hui-Ju Young provided critical feedback and edits to the manuscript. All authors take responsibility for the final content of the manuscript.

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CONFLICT OF INTEREST STATEMENT

JOH and HRW have received royalties from the book *State of Slim*. They have ownership in Shakabuku LLC, which offers weight loss to the public. The remaining authors have no relevant conflicts of interest to disclose.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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