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Long-Term Weight Change after a Technology-Based Weight Loss Intervention

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Introduction:

The proportion of older adults classified as having obesity now exceeds 35% and has led to a concomitant rise in the rates of obesity-related disability.[1] Previous weight loss studies have shown that caloric restriction alone can lead to detrimental effects on muscle function and declines in physical function in older adults.[2] Programs that also include structured resistance and aerobic exercise plans have demonstrated synergistic improvements in physical function.[3] However, access to such programs is limited, particularly for patients residing in rural areas. Thus, this demographic may benefit from the technology-based delivery of health promotion interventions. We previously published feasibility findings from a six-month technology-based intervention that offered dietary counseling and a structured exercise program for fifty-three older adults with obesity.[4] This multicomponent diet and exercise intervention was acceptable and feasible, resulted in 4.7±3.5% weight loss, and demonstrated improvements in physical function (30-second sit-to-stand: +3.1±4.2 reps; 6-minute walk: +42.0±77.3 m). Questions remain regarding the long-term sustainability of weight loss interventions, particularly for older adults. This report shares our findings on its long-term sustainability one year after completion of the active intervention for both participants who responded significantly to the initial intervention and those who did not.

Methods:

Details on the design, setting, and recruitment of this pilot study have been previously published.[4] This was a single center, pre/post, 26-week technology-based weight management intervention consisting of nutrition and exercise components. There were

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Author contribution:

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fifty-three community-dwelling participants aged ≥65 years with a body mass index (BMI) ≥30kg/m^2 residing in rural New England. The nutrition encounters included eighteen 30-minute virtual one-on-one personal nutrition sessions and seven in-person group sessions. The exercise component included forty 75-minute virtual group sessions, and seven in-person group sessions delivered by a physical therapist focusing on aerobic activities, resistance, flexibility and balance.

For this analysis, we evaluated participants' weight at 12 months from intervention completion relative to weight at baseline and at the time of intervention completion. These 12-month values were abstracted from the institution's electronic health record. For those with missing weight, we sent surveys to ask them their self-reported weight but had no response (n=2). We compared outcomes for responders, defined as those who lost ≥5% of their body weight during the intervention period, and non-responders, defined as those completing the program but did not.[5] Descriptive statistics were conducted, including an ANOVA testing over time. All analyses were conducted using R version 4.1.1.

Results:

Of the n=44 that completed the intervention, 50% of the cohort (n=22) responded to the initial intervention. There were no significant differences across several demographic variables and comorbidities between responders and non-responders (Table 1).[6] Among completers, baseline and 6-month (intervention completion) weights were 97.8±16.3 and 93.2±15.8 kg, respectively (Δ=−4.7 ±3.4 kg; p<0.001). Mean weight at 18-months (12-months post-intervention completion) was 92.6±16.8 kg (n=42). This was significantly less than the baseline weight (Δ=−5.3±7.1kg; p<0.001) but no different from the 6-month weight (Δ=−0.6±6.3; p=0.60; Figure 1).

Responders' mean baseline and 6-month weights were 99.6±14.8 vs. 92.4±13.9 kg (Δ= −7.2±2.5; p<0.001). Their mean weight at 18-months was 91.6±13.6 kg (n=21). This was significantly lower than at baseline (Δ=−8.9± 9.2; p<0.001) but no different from their 6-month weight (Δ=−1.5±8.6; p=0.44; Figure 1). In non-responders, the mean weights at baseline compared to 6-months weights were 96.0±17.8 vs. 94.0±17.7 kg (Δ=−2.0±2.0; p<0.001). Their mean weight at 18-months was 93.7±19.8 kg (n=21). This was not different than their weight at baseline (Δ=−1.8±4.5; p=0.09) or six-month weight (Δ =+0.4±4.3; p=0.69; Figure 1).

Discussion:

Our findings suggest that weight was maintained 12 months after completion of a technology-based, weight management program in older adults residing in rural areas. This was true for both those who significantly responded to the initial intervention and those who did not. Several studies have shown that while some weight is often regained in the period after intensive weight loss interventions for adults with obesity, participants typically remain below baseline weight, though these findings have been chiefly in younger adults.[7,8] Our overall weight maintenance findings align with those previously published for older adults.[9] Our findings offer encouraging evidence that technology-based interventions may address

access disparities and allow for maintained weight loss for older adults in rural areas. Due to the small size of this our pilot, we lacked statistical power to delineate what factors may have been associated with weight changes in the follow-up period. Further studies are needed to delineate these factors and the long-term net benefits on morbidity and muscle function.

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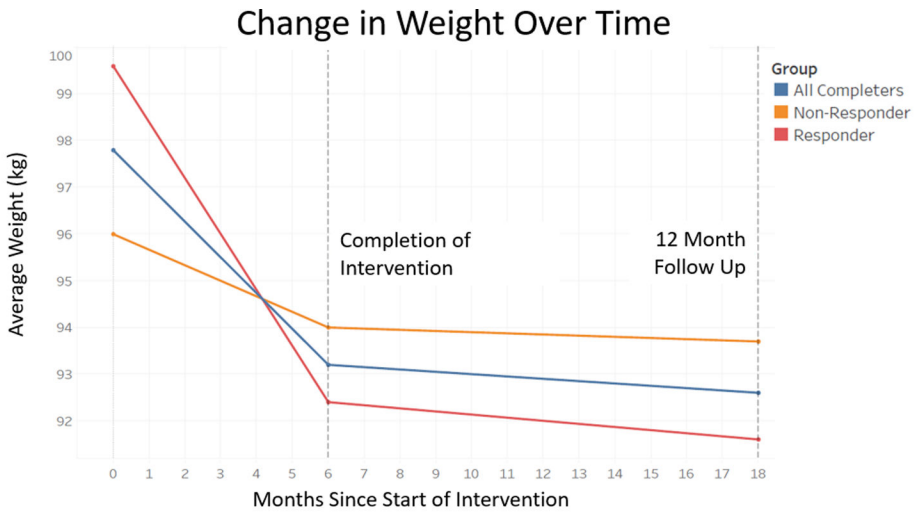

	Baseline Weight	Weight at 6 months	Weight at 18 months	p-value: Baseline vs. 6 months	p-value: Baseline vs. 18 months	p-value: 6 months vs. 18 months
All Completers	97.8±16.3	93.2±15.8	92.6±16.8 (n=42)	<0.001	<0.001	0.60
Responders	99.6±14.8	92.4±13.9	91.6±13.6 (n=21)	<0.001	<0.001	0.44
Non-Responders	96.0±17.8	94.0±17.7	93.7±19.8 (n=21)	<0.001	0.09	0.69

Figure 1.

Mean weight over time for three groups: all study participants who completed the intervention (All Completers), participants who lost ≥5% of weight in intervention period (Responders), and participants who lost <5% of weight in intervention period at beginning of intervention (Non-responders). Time points include baseline value at beginning of intervention, conclusion of 6-month intervention, and follow up 12 months after conclusion of intervention.

Table 1:

Baseline Characteristics by Weight Loss Status

	Participants who Completed Intervention	Responders (≥5% Weight Loss)	Non-responders (<5% Weight Loss)	P-value
	N=44	N=22	N=22	
Age, years	73.2 ± 3.9	72.5±4.0	73.9±3.7	0.23
Female Sex	32 (72.7)	8 (36.4)	18 (81.8)	0.18
Education				0.15
High school	7 (15.9)	3 (13.6)	4 (18.2)	
Some College	14 (31.8)	4 (18.2)	10 (45.5)	
College Degree	12 (27.3)	7 (31.8)	5 (22.7)	
Post-College Degree	11 (25.0)	8 (36.4)	3 (13.6)	
Income				0.64
Less than $25,000	9 (20.5)	3 (13.6)	6 (27.3)	
$25,000 to $49,999	7 (15.9)	5 (22.7)	2 (9.91)	
$50,000 to $74,999	11 (25.0)	5 (22.7)	6 (27.3)	
$75,000 to $99,999	10 (22.7)	5 (22.7)	5 (22.7)	
$100,000 or more	7 (15.9)	4	3 (13.6)	
Insurance				
Medicaid	0	--	--	---
Medicare	41 (93.2)	22 (100)	19 (86.4)	0.07
Private	25 (56.8)	12 (54.5)	13 (59.1)	0.76
Smoking Status				0.55
Current	1 (2.3)	---	1 (4.6)	
Former	17 (38.6)	8 (36.4)	9 (40.9)	
Never	26 (59.1)	14 (63.6)	12 (54.6)	
Marital Status				0.40
Married	28 (63.6)	14 (63.4)	14 (63.6)	
Widow	5 (11.4)	1 (4.6)	4 (18.2)	
Single	11 (25.0)	7	4	
Co-Morbidities				
Anxiety	4 (9.0)	1 (4.6)	3 (13.6)	0.29
Cardiovascular Disease	3 (6.8)	2 (9.1)	1 (4.6)	0.55
COPD	3 (6.8)	1 (4.6)	2 (9.1)	0.55
Depression	12 (27.3)	6 (27.3)	6 (27.3)	0.99
Diabetes	14 (31.8)	7 (31.8)	7 (31.8)	0.99
Fibromyalgia	2 (4.6)	2 (9.1)	---	0.15
Cancer	5 (11.4)	3 (13.6)	2 (9.1)	0.64
High Cholesterol	17 (38.6)	12 (54.6)	5 (22.7)	0.30
Hypertension	32 (72.7)	17 (77.3)	15 (68.2)	0.50

	Participants who Completed Intervention	Responders (≥5% Weight Loss)	Non-responders (<5% Weight Loss)	P-value
	N=44	**N=22**	**N=22**	
Osteoarthritis	18 (40.9)	11 (50.0)	7 (31.8)	0.22
Sleep Apnea	18 (40.9)	8 (36.4)	10 (45.5)	0.54
Stroke	1 (2.3)	1 (4.6)	--	0.31
Fat				
Total Mass, kg		45.5±12.0	49.8±22.7	0.43
Body Fat%		45.8±8.8	48.9±6.1	0.19
VAT, L		4.92±2.3	4.69±2.9	0.78
Muscle Mass & Function				
Fat Free Mass, kg		52.6±13.0	48.2±10.7	0.23
ALM, kg		13.7±2.9	12.3±3.8	0.19
ALM/height^2, kg/m^2		4.94±3.6	4.68±1.0	0.33

All values represented are means ± standard deviation or counts (%).

Abbreviations: VAT – visceral adipose tissue; ALM – appendicular lean mass