Can Activity Monitoring and Connected Health Increase Physical Activity in Patients with Obesity? A Pilot Study

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Background

- Increasing physical activity is associated with better weight control, reduced all-cause mortality, cardiovascular disease incidence, and incidence of type 2 diabetes.
- Although the government and health care organizations recommend at least 150 minutes of moderate-intensity physical activity per week, half of the population does not reach the goal, and about one-third of the population completes no moderate-vigorous physical activity.
- Physical inactivity is associated with a critical public health threat of obesity in the US.
- Wearable technology using activity monitoring with a connected health platform have the potential to improve adherence to the recommended amount of physical activity.

Objectives

The purpose of the study was to test the feasibility of connected health with wearable activity monitoring to improve the amount of physical activity as well as body composition in patients with obesity.

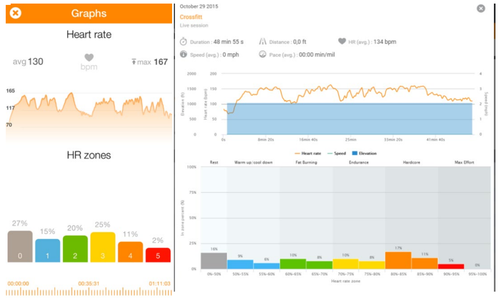
Methods

- 19 adults (18 to 59 years old, 4 males and 15 females) with 30 ≤ BMI < 40kg/m^2 were enrolled.
- All subjects received a Fitbit Flex2 and Polar H10 Heart Rate monitor. Bluetooth technology downloaded activity data to a smartphone with the 24alife software.(Figure1)
- Subjects were randomized to a Connected Health (CH) group or Self-Monitoring (SM) group.
- The CH intervention consisted of 2 in-person exercise consultations (week 1 and 4) plus 6 follow-up telephone calls, once between the in-person consultations and 5 calls thereafter, with individualized instruction.(Figure1) The exercise consultation was performed by FP, an exercise physiologist who completed Motivational Interviewing training.
- The SM group monitored activity and exercise using wearable devices without any individualized follow-up instruction or consultation.(Figure1)
- Food screeners were used to assess dietary habit. International Physical Activity Questionnaire was used to estimate total physical activity and sedentary time.
- Subjects were followed up for 24 weeks and scheduled to come back to get outcome measures (weight, waist circumference, body fat percentage) at 12 and 24 weeks.

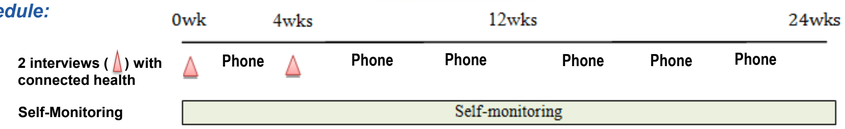
Figure 1

Activity monitor, Chest HR monitor, and app

App & Web Screen



Schedule:



Physical Activity goals:

Initial 4 weeks	4 – 24 weeks
8,000steps/day	10,000steps/day
Exercise 2 days/week	
60 – 90 min/week	150 min/week of moderate intensity with Polar HR monitor

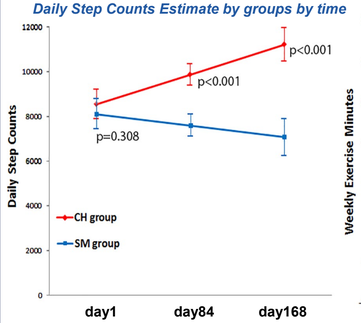
Table 1: Patient Characteristics

	CH group (n=9)	SM group (n=10)	P value
Age	46.4(±13.7), 53.0	50.9(±8.5), 55.5	0.51
Gender, Female/Male	7 / 2	8 / 2	1.00
Weight, kg	97.9(±11.4), 94.6	95.9(±11.6), 95.3	0.83
BMI, kg/m^2	36.9(±1.9), 37.3	34.7(±2.3), 34.8	0.04
Waist, cm	117.7(±10.3), 120.5	110.6(± 8.1), 111.8	0.07
Body fat %, %	44.2(±6.0), 46.0	43.4(±6.2), 45.9	1.00
Hypertension, n (%)	4 (44.4)	5 (50.0)	1.00
Pre-diabetes, n (%)	1 (11.1)	5 (50.0)	0.14
Hyperlipidemia, n (%)	3 (33.3)	6 (60.0)	0.37
Dietary Fruit-Vegetable-Fiber Screener and Dietary Fat Screener			
Dietary Fiber, gram	12.8(±2.7), 12.5	13.0(±5.6), 12.6	
Dietary Fat, gram	99.0(±17.1), 99.9	91.8(±23.8), 88.3	
International Physical Activity Questionnaire (IPAQ) Long Forms			
Physical activity MET-minutes, MET*min/week	3655(±2804), 4386	3838(±4352), 2175	
Sitting minutes, min/week	2774(±1020), 2700	3201(±1189), 3085	

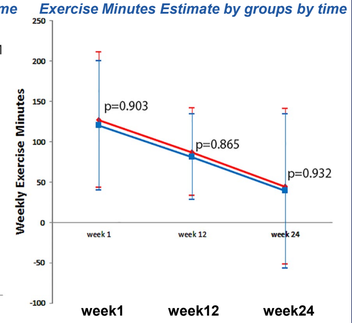
Data are expressed as mean (±SD), median. P values were calculated by Kruskal-Wallis tests for continuous variables and by Fisher's exact test for categorical variables.

Results

Daily Step Counts Estimate by groups by time

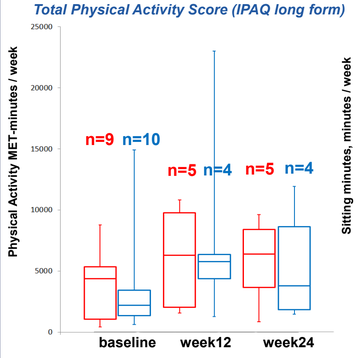


Exercise Minutes Estimate by groups by time

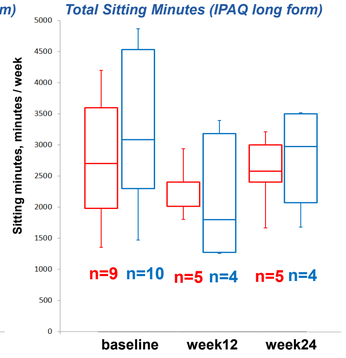


Estimated model effects resulting from a longitudinal mixed-effect model with an auto-regressive correlation structure.

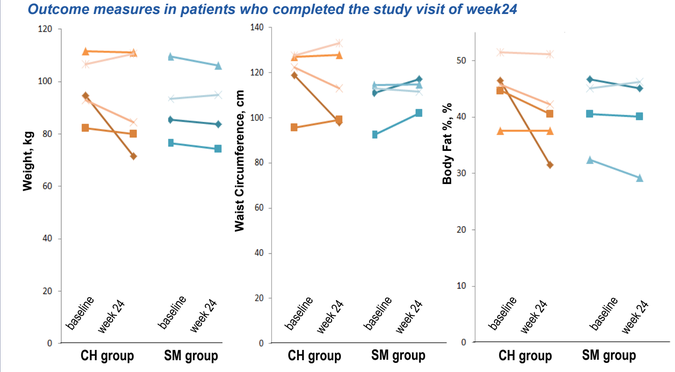
Total Physical Activity Score (IPAQ long form)



Total Sitting Minutes (IPAQ long form)



Outcome measures in patients who completed the study visit of week24



Discussion

- Withdrawn patients (4 of 9 in CH group and 6 of 10 in SM group) had lower adherence to using the HR monitor and lower exercise minutes during the initial 4 weeks compared to those who remained in the study. A screening period for early adherence before randomization can be considered in the future clinical study.
- Causes of the attrition were device preferences, technical difficulties to handle 2 devices, injury, and difficulties to return to study visits. Device related issues can be improved, and better patient engagement strategies are indispensable.
- Getting more daily steps is an affordable goal and the connected health intervention seemed effective to keep participants' motivation as time goes.
- IPAQ was used as a supplement to assess other physical activities and sedentary minutes. An objective monitoring method of total physical activity is required.
- Changes in weight, waist circumference, and body fat % had large variability, and the number of available data was too small to make statistical analyses.

Conclusions

- The patients who received Connected Health intervention achieved more daily steps compared to Self Monitoring alone, while there was no significant difference in the minutes of structured exercise between the groups.
- High attrition rate and the small sample size were the limitations of the study.

Disclosure

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