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Health and Wellness Coaching Can Improve Usage of Positive Airway Pressure Therapy in Participants With Obstructive Sleep Apnea and Obesity

Abstract: *Obstructive sleep apnea (OSA) has been tied to chronic conditions, such as obesity. Although continuous positive airway pressure (CPAP) device is an effective treatment, device discomfort impacts treatment adherence. Health and wellness coaching (HWC) can increase weight loss (WL) and adherence across other treatment types. This study aims to determine whether participants undergoing an HWC program improve CPAP device usage and WL compared to control group (CG). Participants were randomly selected to participate in the HWC group in conjunction with standard care. The HWC participants were gender, age, weight, CPAP usage (e.g., hours, days), and race matched to CG participants receiving standard care only. Variables collected include demographics (i.e., age, gender), CPAP device usage, and weight across four time points (baseline, 3-, 6-, and 9-months). Paired samples t-*

test and Pearson's coefficient correlation were conducted to determine how outcomes differ

Keywords: sleep; sleep apnea; adherence; weight loss; health and wellness coaching

 “The findings of this study reflect that lifestyle medicine, such as HWC, can improve device adherence and weight loss outcomes over time.” 

between groups. Of 232 participants studied, those in the HWC group significantly increased CPAP usage over time ($P < .001$) vs CG (6.5 ± 1.8 , and 5.0 ± 2.3 hours, respectively). The HWC group had significantly more weight loss (11.0 ± 14.5 lbs.) than CG (5.7 ± 16.1 lbs.) across the 9-month timeline ($P < .001$). This study provides evidence that HWC can improve CPAP adherence and weight loss.

Introduction

Obstructive sleep apnea (OSA) is a chronic condition that affects 1 billion individuals worldwide, becoming more severe as people age or through chronic conditions, such as obesity.^{1,2} Approximately 70% of individuals with OSA have a body mass index (BMI) greater than 27 kg/m^2 and are classified as overweight or obese.³ Since OSA can lead to other long-term health

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problems, such as hypertension, cardiovascular disease, diabetes, and cognitive decline, there is a need to better understand and treat those with OSA.^{4,5}

The current standard of care for individuals with OSA includes prescription of continuous positive airway pressure device (CPAP) used for participants diagnosed with moderate to severe OSA.^{6,7} This method is considered an acute solution that aims to improve sleep daily.⁸ Previous studies have found that OSA devices can have several adverse side effects or symptoms that decrease adherence or usage, such as feeling uncomfortable using the device and decreasing usage over time.^{7,9-11} The risk of ongoing severe OSA without treatment can increase the risk of obesity or weight gain, and vice-versa.^{12,13} There is a need to develop a long-term treatment method to improve usage adherence and weight loss outcomes through lifestyle medicine.

Health and wellness coaching (HWC) has become a popular form of lifestyle medicine designed to support health behavioral changes over time.¹⁴ Recent studies have found that HWC can have long-term behavioral improvements for participants with chronic conditions (e.g., obesity or OSA).¹⁵⁻¹⁸ HWC became a popular lifestyle medicine and behavioral method for obesity treatment with promising significant long-term weight loss outcomes through both in-person and virtual sessions.^{17,19-22} Coaching sessions have consisted of setting goals, discussing behaviors, barriers, and methods to overcome obstacles, all of which are methods that can be applied to patients using CPAP.^{23,24} Although HWC is distinctive of therapy, many individuals have reported HWC being effective to support healthy lifestyle behavioral changes (i.e., regular exercise) that

can support patients with conditions like OSA.¹⁵

Additionally, there has been previous research assessing how HWC can improve sleep hygiene.¹⁷ For instance, existing literature has found that supported exercise and diet maintenance through HWC has improved sleep outcomes and quality over time.^{13,25} However, there is a gap in the literature demonstrating how HWC combined with weight management can improve CPAP device adherence (hours per night and days per month). As a result, this study aims to assess the relationship between HWC and CPAP adherence (e.g., device usage) and weight loss compared with standard care.

Methods

This retrospective longitudinal study assessed participant data from a single clinic (Sleep Health MD, Santa Cruz, CA) across four time points (e.g., initial, 3-, 6-, and 9 months). Participants were randomly selected to participate in the HWC group in conjunction with standard care. The HWC participants were gender, age, weight, CPAP usage (e.g., hours and days used), and race matched to CG participants receiving standard care only. All data was collected through an electronic health record system and stored in the researchers' secure location.

Participants

Participants in this study were recruited from the clinic within the same timeframe (November 2021-March 2022). Participants were randomly selected through individual-pair matching to either participate health and wellness coaching (HWC) or receive standard care through the clinic as the control group (CG). The two groups were gender, age, weight, CPAP usage (e.g., hours, and days

used). HWC patients that did not meet the 9-month time point were excluded (n = 6) from analysis and all CG patients were only included if they met with a physician 9 months from their initial appointment. Of the six patients that did not complete 9 months of coaching, reasons reported were inability to meet (e.g., vacation), stop using CPAP machine, or changing physician practice. Consent was not needed for this study due to its retrospective nature, and all information was de-identified. Approval to collect data from participants at this clinic was confirmed by Coastal Carolina University's Institutional Review Board.

Health and Wellness Coaching Group (HWC). Participants in the health and wellness coaching group (HWC) underwent health and wellness coaching via video conferencing while undergoing clinic standard of care for OSA treatment (e.g., CPAP prescription, regular meetings with physician, remote CPAP data monitoring). Participants in the HWC were prescribed a CPAP device and attended in-clinic appointments, as required standard OSA treatment. Coaching sessions involved reviewing materials related to goals, coping skills, and usage of CPAP device, as seen in [Table 1](#). Patients were assigned a health coach at random, and all coaches were trained and certified as a health coach.

Variables

All patient data was collected through the clinic's electronic medical record system (Athena v.22.11) and de-identified prior to analysis. Demographic data collected includes age, race, date of diagnosis, type of OSA device (e.g., ResMed), sleep apnea severity, and gender. Variables of interest were body weight, hours of CPAP use,

Table 1.

Standard of Care Program for Control Group (CG). Health and Wellness Coaching (HWC) Group Included Standard Care + HWC Sessions.

Standard of care	Health and wellness coaching (HWC) sessions
- Medical doctor consultations	- Weekly sessions (months 1-3), biweekly (months 4-6), monthly (6-9) with coach
- Physical assessments	- Build and maintain rapport
- OSA diagnosis	- Create and monitor progress toward 9-month wellness goals
- CPAP device prescription	
- Monthly CPAP device data review, upload and check-ins	- Motivational interviewing to support generative moments and explore strengths and values to health behavior change relating to OSA and obesity
	- Discuss nutritional, physical activity, and sleep RX and progress

and days of CPAP device use. These variables of interest were collected at all time points (initial, 3-, 6-, and 9-months) and data was wirelessly transmitted to the participants medical charts. Additional variables collected for HWC group are HWC start date, most recent appointment date, and number of coaching visits.

Weight loss (WL) has been calculated by subtracting final and initial body weights, documented at the clinic visits. Percent weight loss (%WL) was calculated by subtracting final by initial weight, dividing by initial weight and multiplying by 100. Difference in body mass index (Δ BMI) was calculated by subtracting final and initial BMI reported by clinic. Values of WL, %WL and Δ BMI were included to provide a clear indication of weight change across groups.

Statistical Analysis

Demographics and variables of interest (e.g., weight, OSA device, usage hours, and usage days of use) were analyzed through descriptive statistics. HWC and CG outcomes (e.g., weight, usage hours, usage days) were compared through

paired samples *t*-test. Eta-squared effect size was used to describe the strength of association between variables and was chosen over other analyses to address whether the group sizes are equal in comparison per the match-pair sampling. The strength of association calculated was determined based the corresponding values of small = .01, medium = .06, and large = .13.²⁶ A Pearson product-moment correlation coefficient was also conducted to determine the relationship between the number of visits with the HWC group and OSA device usage hours with weight change. All data was analyzed through IBM SPSS v.27 statistical software.

Results

Among the 232 participants included in this study, 116 met with a health and wellness coach (HWC). Most of the study population were female ($n = 124$, 53%), white ($n = 203$, 88%), diagnosed with severe sleep apnea ($n = 148$, 64%), and using CPAP ($n = 230$, 99%) ResMed OSA device ($n = 104$, 45%). Mean age and weight (\pm SD) were 57 ± 14 years and 258 ± 53 lbs. All other

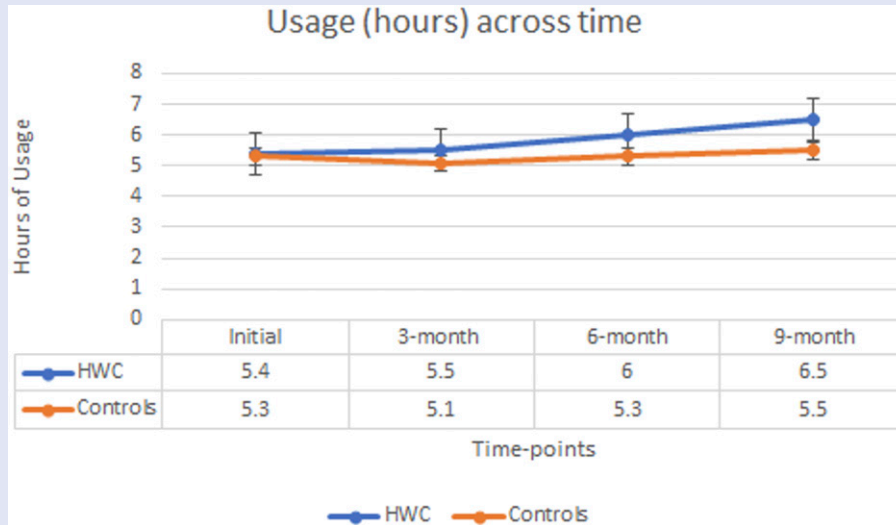
demographics can be seen in [Table 1](#).

Average (\pm SD) CPAP usage within the study population at the first time point was 5.2 ± 2.3 hours and 23 ± 7 days. Within the HWC group, there was a significant increase in CPAP usage for hours of usage and days at 6- and 9-month time points than the control group ($P = .008$ and $P < .001$, respectively), as seen in [Figure 1](#) and [Table 2](#). A similar trend was seen in days used with HWC having a significantly increase in CPAP usage than the control group at the 9-month time point ($P < .001$), as seen in [Figure 2](#).

There was a significant difference in hours used for those in the HWC group at 6-month (6.0 ± 2.9 hours) and 9-month time points (6.5 ± 1.8 hours) than the control group (5.3 ± 2.1 hours and 5.5 ± 2.3 hours, respectively; $t(115) = 2.7$, $P = .008$, and $t(115) = 5.6$, $P < .001$, respectively). The magnitude of the difference in means for 6-month (MD = .75, 95% CI: .2, 1.3) and 9-month (MD = 1.0, 95% CI: .69, 2.1) time points was large (eta-squared = .35 and .73, respectively). Additionally, there was a statistically significant difference in days of usage, where participants in HWC

Figure 1.

OSA device usage by hours between HWC (n = 116) and CG (n = 116) across four time points (baseline, 3-, 6-, and 9-months) with 95% confidence intervals.



group had more days of usage at the 9-month time point than CG ($t(115) = 4.7, P < .001$). The magnitude of difference for days of usage at 9-month (MD = 4.2, 95% CI: 2.4, 5.9) was large (eta-squared = .62), as seen in Figure 3.

A paired-samples *t*-test was conducted to compare weight loss (WL), percent weight loss (%WL), and BMI change between HWC and CG. There was a significant difference in WL among the HWC group (11.1 ± 14.5 lbs.) but not within the CG (5.7 ± 16.1 lbs., $t(115) = 2.5, P = .009$) across 9-months. The magnitude of the difference (MD = 5.0, 95% CI: 1.3, 5.2) between the means was large (eta-squared = .34). The same trend was seen for %WL and BMI where the HWC group has significantly greater reduction in %WL ($4.1 \pm 5.2\%$, $t(115) = 2.3, P = .018$) and BMI (1.7 ± 2.5 kg/m², $t(115) = 2.5, P = .012$) than the CG group ($2.2 \pm 6.6\%$ and $.9 \pm 2.6$ kg/m²) at 9-month time point. The magnitude of difference between groups was large for both %WL (MD = 1.8, 95% CI: .3, 3.3, eta-

squared = .31) and BMI (MD = .8, 95% CI: .2, 1.5, eta-squared = .32). (Table 3)

Pearson's correlation found a positive correlation between number of HWC visits and CPAP usage hours at 6 months ($r = .177, n = 232, P < .001$) and at 9-months ($r = .275, n = 232, P < .001$) with those having more visits also having more CPAP device adherence. In addition, there was a strong negative correlation between visits and weight loss ($r = -.272, n = 232, P < .001$), with those having more visits also having more weight loss. The same trends were seen for days of %WL, Δ BMI, and OSA devices used, as seen in Tables 4 and 5, respectively.

Discussion

This study found that HWC in combination with standard of care treatment for OSA (e.g., OSA device prescription and monitoring), significantly improved OSA device usage adherence and weight loss across 9-months. The findings of this study reflect that lifestyle medicine,

such as HWC, can improve device adherence and weight loss outcomes over time.

There has been a recent shift in research from pharmaceutical based treatment with the risk of side effects to lifestyle behavioral interventions.^{14,27} Recent research has found that participants preferred investing their time into making lifestyle changes rather than taking medication with the risk of adverse side effects.^{28,29} The results from this study indicate that participants have more promising health outcomes (i.e., weight loss) when undergoing HWC with CPAP device standard care.

HWC has become an increasingly studied method for establishing lifestyle behavioral changes related to chronic conditions (e.g., obesity, cancer, diabetes, and OSA).^{15,21,30} Additionally, recent research indicates that HWC can improve additional lifestyle behaviors, such as diet maintenance, physical activity levels, and treatment adherence (i.e., CPAP device usage).^{15,18,31} The results from this

Table 2.

Study Population Demographics.

Variable	Mean ± SD [range]	
	Health and wellness coaching group (HWC)	CG (CG)
Age (years)	57.5 ± 13.9 [23.0-87.0]	57.6 ± 12.6 [23.0-87.0]
Gender: N (%) female	64 (55.2)	64 (55.2)
Race: N (%) White	94 (81.0)	94 (81.0)
Level of severity	N (%)	N (%)
Mild	9 (8.1)	7 (6.0)
Moderate	33 (28.3)	34 (29.3)
Severe	74 (63.6)	73 (62.9)
CPAP brand		
Respironics/Philips	67 (57.8)	57 (49.1)
Resmed	46 (39.6)	58 (50.9)
OSA treatment type		
CPAP	115 (99)	115 (99)
BIPAP	1 (1)	1 (1)

Note. N = 232 for the entire sample. N = 116 for IG, and n = 116 for CG. Percentages may not equal 100% due to adjusted values.

Figure 2.

OSA device usage by days between HWC (n = 116) and CG (n = 116) across four time points (baseline, 3-, 6-, and 9-months) with 95% confidence intervals.

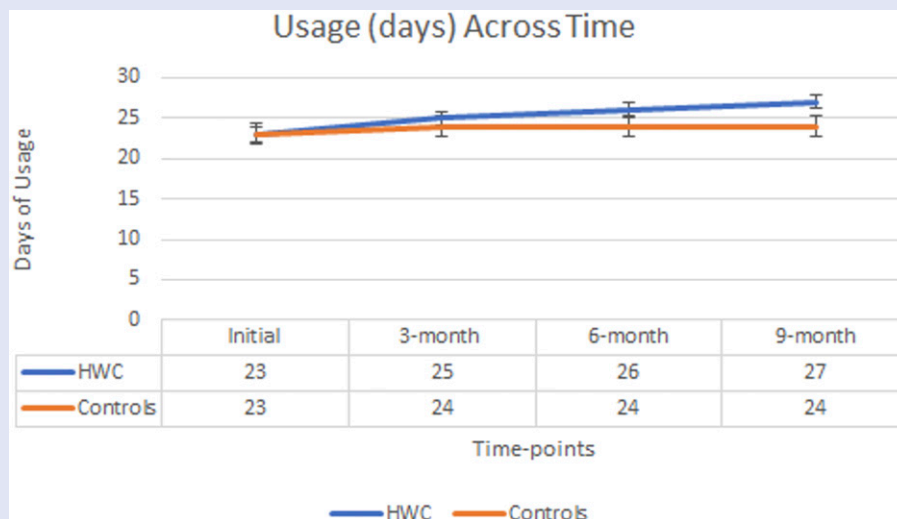


Figure 3.

Scatter plot comparing final hours (9-month) of CPAP device usage across visits ($P < 001$).

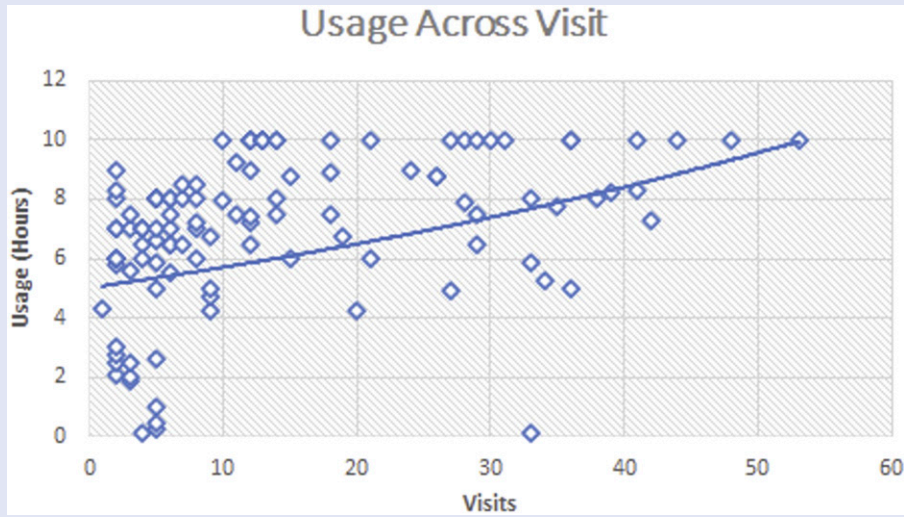


Table 3.

Descriptive Statistics of Primary Outcome Variables.

Variables	MEAN ± SD			
	Health and wellness coaching group (HWC)	Control group (CG)	Mean difference (MD)	P-value
Weight (lbs.)				
Initial weight	258.9 ± 51.1	258.3 ± 56.9	0.6	.009*
Final weight	243.2 ± 69.1	254.3 ± 64.4	11.1	
BMI (kg/m ²)				
Initial BMI	41.1 ± 7.8	41.3 ± 7.6	0.2	.012*
Final BMI	38.8 ± 7.8	39.8 ± 7.4	1.1	
Usage (days)				
Initial	23.3 ± 6.6	23.6 ± 8.3	0.3	<.001*
Final	27.9 ± 4.5	24.7 ± 8.3	3.2	
Usage (hours)				
Initial	5.4 ± 2.3	5.3 ± 2.3	0.1	<.001*
Final	6.5 ± 1.8	5.5 ± 2.3	1.2	

Note. N = 232 for the entire sample. N = 116 for IG, and n = 116 for CG. P-value statistics include significant differences between initial and final values between groups. *Significance set at ($P < .05$).

Table 4.

Descriptive Statistics and Correlations for Weight Change by Visits With a Health and Wellness Coach.

Variable	n	M	SD	1	2	3	4
1. Visits	116	7.5	12.2	—			
2. WL ^a	116	-8.4	15.5	-.27**	—		
3. %WL ^b	116	-3.1	5.9	-.26**	.97**	—	
4. ΔBMI ^c	116	-1.3	2.6	-.25**	.99**	.97**	—

^aWL, weight loss.

^b%WL, percent weight loss calculated by initial weight- final weight/initial weight.

^cΔBMI, change in body mass index from initial and final values.

**P < .001.

Table 5.

Descriptive Statistics and Correlations for Obstructive Sleep Apnea Device Usage Participants by Visits With a Health and Wellness Coach.

Variable	n	M	SD	1	2	3
1. Visits	116	7.5	12.2	—		
2. 6-month days used	116	25.3	7.5	.17**	—	
3. 9-month % compliance	116	25.8	7.1	.24**	.53**	—

**P < .001.

study support these findings and provide evidence that HWC can improve the likelihood of participants maintaining CPAP device adherence over-time. However, future prospective research is needed to further understand how HWC can improve lifestyle behaviors.

Previous research had found that HWC improves weight loss outcomes when compared to controls.^{32,33} Previous studies support the finding of the present study, where a population in the experimental group meeting with a HWC lost significantly more weight than the CG. However, there is a gap in understanding whether long-term behavioral changes can be maintained after HWC ended. Additionally, due to the relationship

between excess body weight and OSA, the findings of this study support behavioral interventions, such as HWC. Researchers have shown improvements in CPAP compliance over time with behavioral interventions.³⁴⁻³⁷ However, there is still a need to better understand long-term CPAP adherence with HWC. Future prospective research should be aimed at understanding whether HWC can impact long-term behavioral changes.

Limitations from this study include its retrospective nature with the risk of recall and sampling bias that may not represent the public. This study only included individuals with no missing data from their medical charts. Additionally, the experimental group was restricted to

only participants that met with a health and wellness coach and continued going into the sleep-health clinic for 9-months. This study only included participants within a specific clinic. Future research is needed with larger sample sizes and more diverse samples to improve generalizability of study findings. Furthermore, this study mainly includes white participants while OSA is more prevalent among African Americans and Hispanics.³⁸ Future research should aim to include more minority groups within the study population.

Conclusion

This study provides evidence that HWC can significantly increase weight loss and OSA device usage

(hours per night and days per week) across time compared to a CG. Additionally, this study establishes the relationship that HWC can improve OSA treatment and outcomes longitudinally. Future research should include prospective research studying HWC and OSA treatment to better understand lifestyle behavior change for those with diagnosed sleep disorders and obesity.

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Declaration of Conflicting Interests

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