Comparison of In-Person and Online Motivational Interviewing–Based Health Coaching

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Health coaching is a common approach for promoting lifestyle changes, but little is known about the effectiveness of different delivery methods. The purpose of this study was to evaluate the effectiveness of in-person versus online health coaching when used as part of a facilitated behavior change program. To increase translatability, the study used a naturalistic design that enabled participants to self-select the coaching delivery method (Group) as well as the target behavior (diet, physical activity, or weight management). Regardless of group, participants were provided with a behavior-based monitoring device and guided to use it by the health coach. A sample of 92 adults participated and 86 completed pre–post evaluations to assess behavior change strategies and posttest outcome measurements for their specific goal. Two-way (Group × Time) analyses of variance were used to evaluate changes in behavioral strategies. Intent-to-treat regression analyses were used to compare postintervention outcomes for groups. The in-person group had significantly higher Healthy Eating Index scores than the online group (p < .05), but nonsignificant group differences were observed for those targeting physical activity or weight change (p > .05). The results support the use of health coaching for promoting behavior change and suggest that online coaching may be equally effective as in-person methods.

Keywords: *physical activity; behavior change; health promotion; health coaching*

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INTRODUCTION

Changes in health care policies have led to greater emphasis on behavior change programming for prevention of obesity and chronic disease (LeFevre, 2014). Counseling and referrals to community-based treatment programs are increasingly common since provisions in the current health care policies enable and incentivize reimbursements for behavior change (Koh & Sebelius, 2010). The tremendous growth in popularity of wearable technologies and cell phone applications for tracking health behaviors have also led to considerable interest in mobile health (mHealth) applications to facilitate behavior change (Burke et al., 2015; Knight, Stuckey, Prapavessis, & Petrella, 2015). These technology-based tools and applications have been widely used in research for promoting changes in diet, physical activity, and weight control (Curioni & Lourenço, 2005; Guide to Community Preventive Services, 2009; Johns,

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Hartmann-Boyce, Jebb, & Aveyard, 2014; Looney & Raynor, 2013), but coordinated behavior change programming is still needed to enable incorporation of these devices and technologies into practice (Lobelo et al., 2016).

BACKGROUND

Despite the popularity of consumer activity monitors there is limited evidence that regular use is helpful in promoting or sustaining behavior change. For example, a prominent and highly publicized study, published in the *Journal of the American Medical Association* by Jakicic et al. (2016), reported limited value from the inclusion of wearable monitors in standard weight loss programming. Facilitated health coaching approaches used in conjunction with consumer monitoring devices may offer a cost-effective way to enhance the utility of technology-based tools for promoting behavior change and weight control.

Wolever et al. (2013) defined health coaching as "a patient-centered approach wherein patients at least partially determine their goals, use self-discovery or active learning processes together with content education to work toward their goals . . . ." (p. 52). While a variety of methods can be used, health coaching based on motivational interviewing (MI) techniques offers advantages for promoting behavior change since the individual is guided to make their own decisions about how they make changes in their lifestyle (Miller & Rollnick, 2013; Rosengren, 2009). Based in self-determination theory (SDT), MI embodies the principles of autonomy, competence, and relatedness and has been shown to promote behavior change through increasing intrinsic motivation to change. MI-based health coaching can be delivered in-person (Leahey & Wing, 2013), via telephone (Bennett et al., 2009; Thomas et al., 2012), online (Green et al., 2014), or through various combinations of e-mail, telephone, and in-person visits (Linden, Butterworth, & Prochaska, 2010; McDoniel, Wolskee, & Shen, 2010; Olsen & Nesbitt, 2010). Understanding the influence of delivery mode on outcomes is a critical step for determining how to implement behavior change protocols beyond the research environment. For example, Appel et al. (2011) found nonsignificant differences in weight loss in obese individuals between groups receiving in-person MI in combination with phone and e-mail support compared to a group receiving remote support alone. This suggests that in-person contact may not be necessary to realize benefits. However, additional research is needed to better understand the potential advantages and disadvantages of both approaches. A review of potential mobile health (mHealth) approaches for counseling specifically emphasized the need to directly evaluate the relative impact of different health coaching methods to inform both research and practice (Burke et al., 2015). The present study compares the effectiveness of in-person versus online health coaching based on the principles of MI when provided as part of a facilitated self-monitoring intervention.

Key design features enable this study to advance the science of health promotion programming. Standard research designs call for participants to be randomized into groups to compare different treatment approaches. However, in the "real world," people typically make active decisions about their lifestyles and their involvement in programs when seeking assistance with behavior change. These features of autonomy and self-directed choice are key principles in SDT, which is similar to MI (Patrick & Williams, 2012; Vansteenkiste et al., 2012). To promote self-determination (and to be consistent with MI principles), participants in the present study were given autonomy to select both the target behavior that they wanted to improve (diet, physical activity, or weight management) and the way in which they received the intervention (in-person or online). This novel naturalistic design strategy provides an evaluation of approach effectiveness, which enhances the generalizability of the findings to health promotion programs. To further increase the potential for translatability, we chose a relatively brief intervention period (8 weeks) that may be more reflective of the resources that are available for this type of programming outside the research environment. We hypothesized that participants in the in-person health coaching group would have better outcomes than those in the online health coaching group due to a more direct personal connection and easier application of MI approaches through in-person discussion than via online communication.

METHOD

This study involved the evaluation of a brief 8-week facilitated health coaching intervention designed to promote self-directed lifestyle behavior change in adults. The institutional review board approved all procedures and all participants read and signed an informed consent document prior to participation.

Recruitment and Enrollment Into Health Coaching

A total of 101 adults from the community were recruited in two cohorts: the Fall cohort began in September and the Spring cohort began in February. Recruitment occurred via e-mails sent to university faculty and staff and flyers around the community and at local worksites. A doctor's note to participate was required for participants who indicated a need based on their responses to the Physical Activity Readiness Questionnaire. A sample of 92 adults (26 males, 66 females) met inclusion criteria and agreed to participate. Exclusion criteria were having physical limitations that would preclude increasing physical activity, a metal allergy, or a pacemaker, using a portable oxygen system, and participation in another weight loss program.

During the first scheduled visit, participants completed a battery of surveys and basic anthropometric measurements were obtained, including height, weight, body mass index (BMI), and body fat percentage as assessed with a handheld bioelectric impedance analyzer. Participants were provided with a Sensewear Armband (SWA) to begin self-monitoring physical activity and were also asked to record their diet for 3 days, using the associated BodyMedia Weight Management online software to obtain baseline information about dietary habits.

Participants returned a week later to meet with a trained student health coach. Coaches employed standard MI practices to help obtain relevant background information about the participants' lifestyle behaviors and to elicit preferences about what behavior they wanted to target and how they wanted to receive health coaching in the study (in-person or online). The process yielded a reasonably balanced distribution between the in-person (n = 54) and online coaching (n = 38) options. Weight management was the most popular goal (n = 50), followed by physical activity (n = 24) and dietary change (n = 18).

After this initial counseling session, participants met with their assigned health coach (either in person or via e-mail exchange) on a weekly basis to discuss progress and to set additional behavioral goals. Consistent with MI principles, coaches used open-ended questions and affirmations to initiate self-directed behavior change strategies from the participants. At the beginning of the intervention, questions may have been similar between the two health coaching groups, but we did not require health coaches to ask the same questions of each participant. A key feature of MI counseling is that it is largely participant driven and not predetermined or overtly structured. Thus, content for each in-person session or e-mail were individualized based on participants' needs and their experiences. During conversations, both in person and via e-mail, participants were also encouraged to continue using the SWA and associated BodyMedia FIT software system to monitor lifestyle behaviors during the 8-week intervention.

Measures and Evaluation

The focus of the evaluation was on self-directed behavior change, and this was assessed at the beginning and end of the intervention using a battery of behavioral measures developed by Nothwehr (Nothwehr, Dennis, & Wu, 2007). This assessment includes nine subscales to measure behavior change strategies related to dietary behaviors (three scales), physical activity (three scales), and meal planning (three scales). All survey items are scored on a 4-point Likert-type scale, and the subscales have been shown to be internally consistent with Cronbach's alpha coefficients ranging from .73 to .90 (Nothwehr et al., 2007).

Diet quality, physical activity, and weight change were also directly assessed at the end of the study. Participants were asked to wear the SWA monitor for a full week and to complete at least 3 days of diet logging through the BodyMedia system. Standard anthropometric measurements (weight, BMI, and body fat percentage) were also collected to capture changes over the 8-week period.

Dietary Quality. Diet quality was assessed using self-reported 3-day diet records completed at Week 8 through the BodyMedia software. Data were entered into NutritionistPro™ Diet Analysis (Axxya Systems, Stafford, TX), and the overall quality of the diet was computed using the established Healthy Eating Index (HEI), which is widely used to evaluate compliance with recommendations outlined by the *Dietary Guidelines for Americans* (Guenther et al., 2013, 2014; U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Standard screening methods were used to detect underreporting of dietary intake (McCrory, Hajduk, & Roberts, 2002) prior to calculation of the HEI. The HEI score was used as the outcome measure for participants who chose either the weight management or diet goal.

Physical Activity. Physical activity measurements were obtained by examining the minutes of moderate and vigorous physical activity (MVPA) as estimated from the established SenseWear® Armband (SWA) monitor (Bai et al., 2016; Johannsen et al., 2010). An advantage of the SWA technology is that it automatically detects nonwear time to enable easy evaluation of participant compliance. Data were screened for compliance using the criteria of 600 minutes for a compliant day and 5 compliant days for an overall compliant assessment. A total of 62 participants met the criteria with average wear times of 1,209 ± 209 minutes of wear time for the SWA. The observed average amount of MVPA per day was used as an outcome measure for participants whose goals were physical activity or weight management.

Weight Management. Anthropometric measurements including height, weight, BMI, and body fat percentage were obtained at pre- and postintervention to evaluate changes in anthropometrics. Change in weight (kg) was used as the outcome measure for participants whose goal was weight management.

Statistical Analyses

Descriptive statistics were conducted to summarize the participants' demographics for all participants and separately for each health coach treatment. *T* tests and chi-square tests were conducted to test for demographic differences in participants enrolled in the online and in-person groups. A series of two-way analyses of variance was applied to test the main effect of group and pre–post (time effect) change in behavior strategies of diet, physical activity, and weight management. The interaction Group × Time was also included in the model. Least square means of pre- and postbehavior change scores from the three goals were calculated.

Intent-to-treat regression analyses were performed separately for diet (post-HEI), physical activity (post-MVPA), and weight change (pre-to-post) to determine differences in effectiveness of promoting behavior change between in-person and online health coaching after controlling for predictors including gender, cohort, goal, and behavior change strategies. For the analyses of behaviors, only the postintervention values for HEI and MVPA were used. This was done because participants were encouraged to access their data via the online software during their first week of wearing the SWA as a way to facilitate subsequent health coaching. Thus, their behavior during this first week may have been influenced by use of the monitor and was not a true baseline. Intent-to-treat analyses were conducted under the assumption that the outcome measures from participants who dropped out of the study remained unchanged from baseline. The models also included change values from various scales on the Nothwehr survey to determine if the behavior change strategies influenced the respective outcomes. The changes in behavior change strategies varied in the three models. One post-HEI model included the three scales that captured diet behavior change strategies (i.e., Diet Self-Monitoring, Social Interaction Diet, and the Cognitive Strategies Diet scales), and a second post-HEI model was done to examine the meal behavior change strategies (i.e., planning, preparing, and portioning). The post-MVPA regression model included the three scales that related to physical activity (Physical Activity Self-Monitoring, the Social Interaction Activity, and the Cognitive Strategies Physical Activity scales). The Weight Change model included all nine behavior change scales since they all relate to weight control. However, the scales were aggregated into three distinct subscales of Diet, Physical Activity, and Meal Planning by averaging the three component scales in each category. Because diet and physical activity are important for weight management, participants who had a weight management goal were included in both the diet and physical activity analyses, in addition to the weight loss analyses. Other predictors included in the analyses were participant age, income, cohort (Fall or Spring), sex, treatment group (in-person or online health coaching), and participant goal (diet, physical activity, and weight management). All data were processed with SAS Version 9.4 and alpha was set at .05 for statistical significance.

RESULTS

A total of 101 people enrolled in this study. Three people were excluded and six never returned for Visit 2 (four failed to obtain a doctor's note and two failed to follow up for unknown reasons). Of the remaining 92 participants, 54 chose in-person and 38 selected online coaching. Figure 1 depicts participant flow and selection of Group and Goal. A detailed demographics summary is reported in Table 1. No differences were observed in demographic characteristics between the participants from the two groups, and there were also no significant demographic differences between completers and noncompleters.

The analysis of variance results revealed nonsignificant interaction effects on the reported use of various behavior change strategies. The group main effects evaluating differences between in-person and online coaching were also nonsignificant with the exception of the reported use of cognitive strategies for physical activity being higher in the group receiving in-person coaching than those receiving online coaching (p = .0225). However, significant main effects for time were observed for all behavior change strategies scales, indicating increases in the use of the recommended behavior change strategies over the intervention. Details of the changes for each of the goals are summarized below.

A total of 68 participants chose either a diet goal or a weight goal. Significant increases (improvements) in the least square means were seen for the Diet Self-Monitoring (0.50, $p < .0001$), Cognitive Strategies Diet (0.20, p = .0169), Social Interaction Strategies Diet (0.20, p = .0186), Planning (0.11, p = .0332), Preparation/buying (0.18, p = .0054), and Portion Control scales (0.22, p = .0030). A total of 74 participants chose either a physical activity or a weight goal and were included in the behavior change strategies for physical activity analyses. The

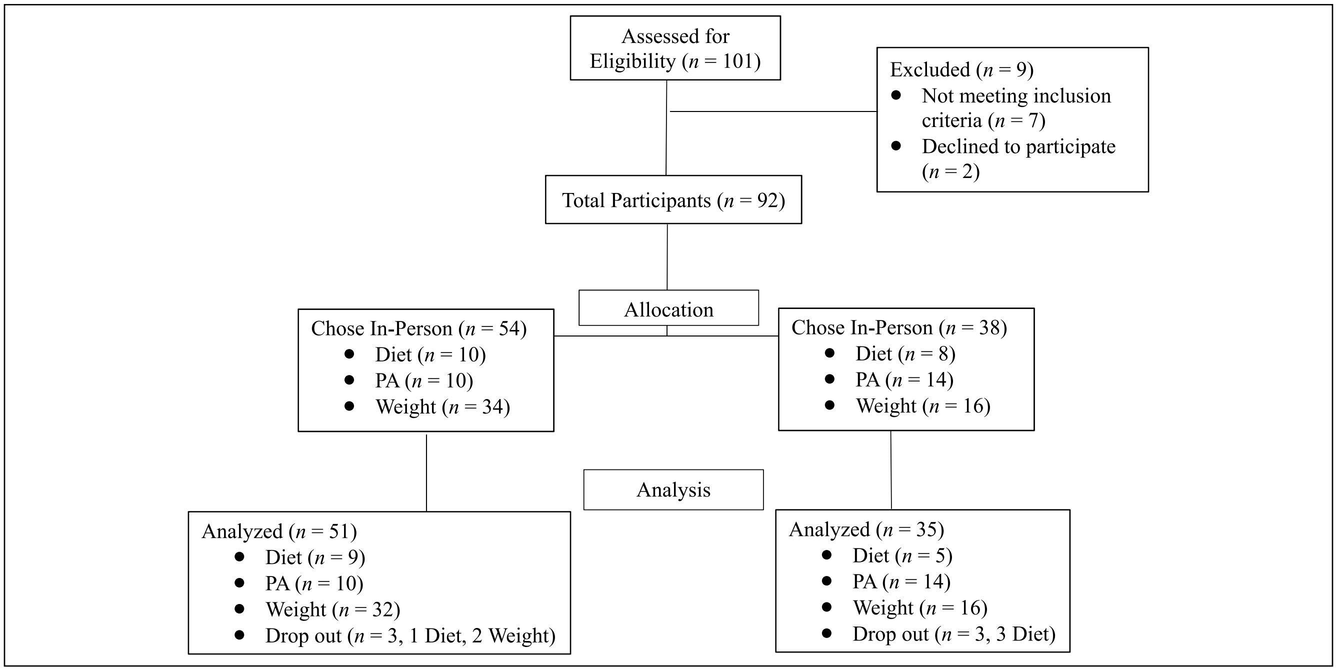

FIGURE 1 CONSORT Chart of Self-Selected Health Coaching Groups and Goals

NOTE: Diet = participants chose diet as goal; PA = participants chose physical activity as goal; Weight = participants chose weight as goal.

Physical Activity Self-Monitoring, Cognitive Strategies Physical Activity, and Social Interaction Strategies Physical Activity scales significantly increased by 0.53 ($p < .0001$), 0.26 ($p = .0005$), and 0.29 ($p = .0001$), respectively. Fifty participants selected the weight management goal and were included in behavior change strategies for weight change analyses; two of these were lost to dropout. The Diet subscale (average of Diet Self-Monitoring, Social Interaction Strategies Diet, and Cognitive Strategies Diet scales) significantly increased by 0.30 ($p = .0002$). The Meal subscale (average of the Meal Planning, Preparing, and Portioning scales) also significantly increased by 0.17 ($p = .0076$). The Physical Activity subscale (average of Physical Activity Self-Monitoring, Social Interaction Strategies Physical Activity, Cognitive Strategies Physical Activity) increased by 0.36 ($p < .0001$).

The intent-to-treat regression analysis results are summarized separately for diet, physical activity, and weight loss. Table 2 shows the results for the diet model based on the HEI index. Of the 62 completers, 43 participants provided a 3-day diet log and 33 (53%) provided sufficient data to be included in the diet analysis. The overall variance explained by the regression model was 38%. Results of this subsample showed that there was a significant difference in HEI scores between the two treatment groups (B = 12.64, $p = .0379$), with the in-person group achieving a higher HEI score postintervention than the online group. For the regression model with the Meal Strategies and HEI scores (data not shown), the variance explained was 40.6%, and there was no significant difference between the two groups (B = 8.89, $p = .1454$).

For the physical activity model, the predictors explained 35% variance in MVPA (Table 2). There was no significant interaction between group (online or in-person) and goal, but the main effect of group approached statistical significance ($p = .0585$). The 37 participants in the in-person treatment had an average of 24.88 more minutes of MVPA per day (±12.87) than the 25 individuals in the online treatment. A significant cohort effect was seen with Cohort 1 accumulating significantly more MVPA minutes (36.87) than participants from Cohort 2 ($p = .0006$). There was also a significant influence of gender with males accumulating 28.85 more minutes of MVPA than females ($p = .0159$). The change in the Physical Activity Self-Monitoring behavior strategy was significantly negatively correlated with MVPA (B = −18.41). The other two PA related behavior change strategy scales were positively correlated with MVPA (B = 14.43 and 6.95, respectively), but not statistically significant.

Last, for the regression results of weight change, the predictors collectively explained 26.4% of the variance in weight change (Table 2) and males lost 1.15 kg

TABLE 1
Baseline Participant Characteristics

Characteristic	*All*	*In-Person*	*Online*
N (male:female)	92 (26:66)	54 (17:37)	38 (9:29)
Age in years			
M (*SD*)	43.2 (10.99)	42.59 (11.59)	44.05 (10.17)
Range	23-73	23-73	26-67
Marital status, *n* (%)			
Married	67 (72.83)	40 (74.07)	27 (71.05)
Married, but divorced	11 (11.96)	6 (11.11)	5 (13.16)
Single	14 (15.22)	8 (14.81)	6 (15.79)
Race, *n* (%)			
Caucasian	83 (91.30)	48 (88.89)	36 (94.74)
Black	3 (3.26)	3 (5.56)	0 (0.00)
Asian	3 (3.26)	1 (1.85)	2 (5.26)
Unknown	1 (1.09)	1 (1.85)	0 (0.00)
Mixed	1 (1.09)	1 (1.85)	0 (0.00)
Income in $, *n* (%)			
<25,000	2 (2.17)	1 (1.85)	1 (2.63)
25,000-49,999	16 (17.39)	13 (24.07)	3 (7.89)
50,000-74,999	17 (18.48)	9 (16.67)	8 (21.05)
75,000-99,999	19 (20.65)	8 (14.81)	11 (28.95)
>100,000	38 (41.30)	23 (42.59)	15 (39.47)
Anthropometrics, *M* (*SD*)			
N	50	34	16
Weight	83.97 (18.63)	86.27 (19.49)	79.07 (16.16)
BMI	29.57 (5.06)	30.23 (5.10)	28.17 (4.83)
Body fat percentage	34.35 (6.77)	34.56 (7.17)	33.89 (6.02)

NOTE: BMI = body mass index. Only those participants with a weight management goal were included in Weight data.

more weight than females ($p = .0428$). An increase of 1 in the score for the Meal behavior change strategy subscale was associated with 2.25 kg more weight loss ($p = .0042$). There was no statistically significant difference between the weight loss achieved between the two health coaching groups ($p = .9386$).

DISCUSSION

This study evaluated results from an 8-week facilitated health coaching intervention based on MI techniques. The primary goal was to determine whether the nature of the delivery method (in-person vs. online) influenced outcomes related to behavior change. With regard to behavior change strategies, results demonstrated that participants improved from baseline, regardless of the method of delivery and regardless of the goal that was pursued. This may suggest that people know what works best for them in terms of what behavior changes can be made and what type of health coaching will fit into their lives. Furthermore, results from the three regression models revealed modest differences between groups for postintervention outcomes. No differences were seen between the in-person and online health coaching methods for MVPA or weight change, but significant group differences were found for diet. The lack of major differences in outcomes between in-person and online health coaching supports the potential utility of online programming. This may have advantages for clinical and community applications since it is a more cost-effective option.

To date, few studies have compared methods of health coaching delivery. Similar to our findings, Appel et al. (2011) found improvement in weight with both remote support and face-to-face support in the context of an intervention. Both treatment groups lost significantly

TABLE 2
Intent-to-Treat Regression Analysis of Postintervention HEI, MVPA, Weight With Different Diet, Physical Activity, and Weight Management Goals

	HEI for Participants With Diet and Weight Goal				*MVPA for Participants With PA and Weight Goal*				*Weight for Participants With Weight Goal*		
	B	SE	p		*B*	SE	p		*B*	SE	p
Intercept	51.13	5.11	<.0001		31.18	12.29	.0142		0.04	0.47	.9375
Sex											
Female	Reference				Reference				Reference		
Male	3.86	6.57	.5621		28.85	11.58	.0159		−1.15	0.55	.0428
Cohort											
Cohort 2	Reference				Reference				Reference		
Cohort 1	−1.12	4.96	.8231		36.87	10.03	.0006		−0.03	0.47	.9509
Group											
Online	Reference				Reference				Reference		
In-person	12.64	5.75	.0379		24.89	12.87	.0585		0.04	0.51	.9386
Goal				Goal							
Weight	Reference			Weight	Reference						
Diet	−10.48	8.41	.2246	PA	9.93	15.33	.5201				
In-person*Diet	5.25	12.08	.6677	In-person*PA	−30.97	22.36	.1717				
ChangeD	−1.51	4.44	.7361	ChangePA	−18.41	8.33	.0315	ChangeMeals	−2.25	0.74	.0042
ChangeCD	2.08	5.09	.6866	ChangeCPA	14.43	9.2	.1227	ChangePA	0.19	0.66	.7768
ChangeSD	2.9	4.33	.5098	ChangeSPA	6.95	8.55	.4198	ChangeDiet	0.12	0.82	.8886

NOTE: HEI = Healthy Eating Index; MVPA = moderate and vigorous physical activity; PA = physical activity; ChangeD = a change in Diet Monitoring; ChangeCD = a change in the Cognitive Strategies Diet scale; ChangeSD = a change in the Social Strategies Diet scale; ChangePA = a change in Physical Activity Monitoring; ChangeCPA = a change in the Cognitive Strategies Physical Activity scale; ChangeSPA = a change in the Social Strategies Physical Activity scale; ChangeMeals = a change in the average score of the Meal Preparation, Meal Portioning, and Meal Planning subscales; ChangePA = a change in the average score of the Physical Activity Monitoring, Cognitive Strategies Physical Activity, and Social Strategies Physical Activity subscales; ChangeDiet = a change in the average score of the Diet Monitoring, Cognitive Diet, and Social Diet subscales.

more weight compared to the control group; however, there was no difference between the two treatments. The results from the present study also showed no major differences between delivery options; however, the difference in dietary changes suggests that for dietary related behaviors, in-person health coaching may be more beneficial than online health coaching. The lack of differences between groups may be due to the fact that all participants received a SWA for the duration of the study. Several studies have shown that self-monitoring is an effective aid in weight loss (Burke, Wang, & Sevick, 2011; Shuger et al., 2011), which may have made it difficult to detect differences between the conditions.

The main strength of this study is the novel, ecologically valid design that enabled participants to select their preferred behavioral goal and the method in which they wanted to receive health coaching. While a randomized controlled trial would have more evenly distributed the participants, the self-selection design is more consistent with principles of SDT that underlie MI. Resnicow and McMaster (2012) specifically emphasized the need to incorporate elements of SDT into MI applications for optimal effectiveness. The evaluation of actual behavior change processes is also an advance over past studies since they provide insights into the strategies that participants use when trying to make behavior changes. Most studies evaluate behavior change based on the assessed changes in weight, BMI, or some other clinical outcome. However, these measures capture outcomes and not the underlying behaviors. The inclusion of both the self-reported behavior change strategies and the associated observed outcomes provides a more comprehensive way to evaluate this type of facilitated health coaching intervention, which is beneficial for development of health promotion programs.

While the naturalistic design replicates a more real-world scenario, it also has some limitations. The open-ended recruitment led to nonrepresentative samples (primarily female, White, and highly educated) and variability in number of participants in each goal and group. The modest changes in behaviors may also be attributed to the design feature that allowed for recruitment of "typical adults" instead of targeting overweight or inactive participants. Therefore, participants in the weight management goal may not have needed to lose weight, but had an interest in learning how to more effectively manage their weight to prevent weight gain. Standard weight loss studies observe larger weight loss outcomes by restricting their target population. We sought to evaluate the impact of health coaching on more typical adults using more real-world methods to enhance the utility of the findings. This feature makes our findings more applicable for many health promotion programs that generally serve people looking to improve their health rather than those with significant clinical health conditions.

Few studies to date have evaluated behavior change outcomes when participants are given choices about what they want to work on and how they receive information. This is surprising since autonomy and choice are central precepts in MI. The advantage of self-selection is that participants can actively determine what approach is best for their personality and their lifestyle. Participants who selected the online approach may have known that they would benefit from a technologically oriented approach while those who selected the in-person approach may have known that they needed the accountability of having to meet with and report to their health coach every week. Randomizing individuals into conditions is inherently artificial since individuals exert free will when making lifestyle decisions and managing their behaviors. Future work with this model may offer promise for advancing research on health coaching and MI.

CONCLUSION

The present results demonstrate that online health coaching may be as effective as in-person health coaching for physical activity and weight change. However, the use of in-person coaching yielded better outcomes for those wanting to improve dietary behaviors. Overall, the study demonstrates the value of facilitated health coaching approaches to help individuals use consumer activity monitors more effectively. Additional research is needed to test outcomes in different populations and settings.

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