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Evaluation of a Person-Centered, Theory-based Intervention to Promote Health Behaviors

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Abstract

Background—Effective promotion of health behaviors requires strong interventions. Applying person-centered approaches and concepts synthesized from two motivational theories could strengthen the effects of such interventions.

Objectives—The aims were to report the effect sizes, fidelity, and acceptability of a person-centered, health behavior intervention, based on self-regulation and self-determination theories.

Methods—Using a pre- and postintervention design, with a four-week follow-up, advanced practice registered nurses (APRNs) made six weekly contacts with 52 volunteer participants. Most participants were educated White women. APRNs elicited participant motives and particular goals for either healthy diet or physical activity behaviors. Minutes and type of activity and servings of fat and fruit/vegetables were assessed.

Results—Effect sizes for engaging in moderate aerobic activity and in fruit/vegetable and fat intake were 0.53, 0.82, and −0.57, respectively. The fidelity of delivery was 80–97% across contacts and fidelity of participants' receipt of intervention components was supported. Participant acceptance of the intervention was supported by positive ratings on aspects of relevance and usefulness.

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Discussion—To advance the science of health behavior change and improve client health status, person-centered approaches and concepts synthesized from motivational theories can be applied and tested with a randomized, controlled design and diverse samples to replicate and extend this promising behavioral intervention.

Keywords

health behavior; nursing; patient engagement; self-regulation theory; self-determination theory

Although many researchers have tested intervention effects on health behaviors, scholars continue to be challenged to develop stronger behavioral interventions to improve individuals' health (Desroches et al., 2013). International scholars seek improved explanations of health behavior to guide future interventions (Michie, Abraham, Whittington, McAteer, & Gupta, 2009; Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Healthcare leaders seek more efficacious interventions to promote health behaviors, improve health status, and minimize costs of chronic disease (Centers for Disease Control [CDC], 2014).

Scholars have tried to promote health behaviors, such as diet and activity, by focusing individuals on the need to prevent or minimize chronic illnesses (e.g., diabetes, Estabrooks et al., 2005; Guo, Chen, Whittemore, & Whitaker, 2016; or cardiovascular disease, Edelman et al., 2006; Parra-Medina et al. 2011; Sniehotta, Scholz, & Schwarzer, 2006). These approaches rest on the assumptions that individuals (a) value prevention highly; (b) perceive susceptibility to disease or its consequences; (c) perceive health behaviors as feasible; and (d) appreciate the connection between behaviors and clinical outcomes. However, these assumptions are not often valid as explained below.

People's motives for health behaviors can differ from those of researchers and clinicians. People can perceive the distant risk of disease as less salient than their other life goals and may not initiate or sustain health behaviors (Carpenter, 2010; Segar, Eccles, & Richardson, 2008; Teixeira et al., 2012). Based on a systematic review, people engage in health behaviors to meet various proximal, short-term goals more so than to prevent a distal outcome such as disease (Rhodes, Quinlan, & Mistry, 2016). People may engage in physical activity or healthy eating to alter their moods in the short term or to look better in the long term (Bowen, Balbuena, Baetz, & Schwartz, 2013; Lauver, Worawong, & Olsen, 2008).

Thus, health behavior interventions could be strengthened by making them more patient-centered. This would involve customizing interventions on people's choices of health behaviors, and on their motives, preferences, values, goals, beliefs, characteristics, or needs (Morgan & Yoder, 2012; Rhodes et al., 2016). Patient-centered interventions can be motivational and efficacious for improving diet, activity, and clinical status in the longer term (Greaves et al., 2011; Teixeira et al., 2012).

To strengthen behavioral interventions, researchers have tried to identify key components of successful dietary and activity interventions (Desroches et al., 2013; Pomerleau, Lock, Knai, & McKee, 2005). For example, interventions delivered face-to-face have been more efficacious than those without face-to-face contact on physical activity (effect size = 0.19,

95% CI [0.06, 0.31]) and subsequent cardiovascular fitness (effect size = 0.50, 95% CI [0.28, 0.71]; Richards, Hillsdon, Thorogood, & Foster, 2013), as well as on maintenance of diet and activity behaviors (Fjeldsoe, Neuhaus, Winkler & Eakin, 2011). Researchers need to identify what other components can contribute to interventions that are efficacious, feasible, acceptable, and cost-effective (Dombrowski, O'Carroll, & Williams, 2016; Teixeira et al., 2012).

Health behavior interventions could be strengthened by basing them on relevant theories that have empirical support (Michie & Prestwich, 2010). Theories can serve as roadmaps to guide designs and analyses to determine key components of behavioral interventions. Yet, researchers often have not (a) identified whether they used theory to guide methods; (b) explained how they applied theory; or (c) applied theory and concepts accurately (Conn, Hafdahl, Brown, & Brown, 2008; Michie et al., 2009; Michie & Prestwich, 2010).

The overall purpose of this study is to report findings from an initial test of a behavioral intervention that was (a) person-centered by customizing on individual preferences for health behavior adoption; and (b) guided by innovative concepts synthesized from two motivational theories. An intervention based on concepts from two such theories—which each have empirical support—could be stronger than an intervention based on either one alone.

Background

Experts have called for more patient-centered care as well as more patient-centered research (Grady & Gough, 2015). Here the term "person-centered" is used rather than "patient-centered." The focus was on a population of adults who are cognitively intact, have moral authority, live independently in the community, and typically have busy lives with multiple priorities.

A person-centered, behavioral intervention partly based on the last author's APRN experiences in primary care was designed. When people have periodic exams, clinicians are expected to address multiple guidelines for health promotion and disease prevention (e.g., screenings, substance use, diet), but they have limited time to do so. They may either just "tell people what to do" or skip some topics for efficiency. Yet, telling people what to do is unlikely to improve their behaviors (Estabrooks et al., 2005; Silva, Vieira, et al., 2010; Teixeira et al., 2012).

Some researchers have studied person-centered, health behavior interventions. For example, an individualized intervention for women with metabolic syndrome resulted in decreased fat intake (estimated effect size = −0.24, 95% CI [−0.59, 0.13] and increased fruit/vegetable intake (estimated effect size = 0.22, 95% CI [−0.16, 0.57] a year later (Gilstrap et al., 2013). Among people who had had cardiovascular disease (CVD) risk assessments, those who had discussions of individualized goal setting and action planning had greater physical activity and weight loss and subsequently lower CVD risk than those who did have such discussions (Edelman et al., 2006). Health behavior assessment, along with discussion of dietary and activity goals and participants' particular plans for corresponding goals, resulted in some

decrease in fat intake (estimated effect size = −0.15, 95% CI [−0.55, 0.26] and some increase in activity (estimated effect size = 0.35, 95% CI [-.06, 0.75]) among people with diabetes (Clark, Hampson, Avery, & Simpson, 2004).

Although these studies have strengths, the researchers seemed to have assumed that having a chronic disease would prompt peoples' behavior change, yet that is not necessarily true (Carpenter, 2010). Some interveners discussed goals and plans with participants, but researchers had predetermined these goals (Clark et al., 2004; Edelman et al., 2006); one intervention had nonsignificant effect sizes (Clark et al., 2004). Many researchers did not report use of behavioral theories. Two complementary motivational theories were synthesized to guide the design of the behavioral intervention: self-regulation theory and self-determination theory.

Self-Regulation theory (SRT)

Self-regulation theory (Carver & Scheier, 2001) explains what people do to manage (i.e., regulate) aspects of themselves to reach desired future states (see Table 1). Components of this theory include input about a current state, a reference point, a monitoring and comparison process (i.e., current state to a reference point), and a conclusion about whether the current state is congruent with the reference point. When one monitors behavior or health status against a reference point, one receives feedback on progress. Perceived discrepancy between present and future health states can motivate people's actions towards these states (Carver & Scheier, 2001; Silva et al., 2010).

In addition, SRT includes a hierarchy of reference points. When reference points are applied to health behaviors, they can be thought of as goals (Beruchashvili, Moisio, & Heisley, 2014; Segar, Eccles, & Richardson, 2008). Abstract goals may be "experiencing good health" and corresponding concrete goals may be "walking daily for 15 minutes." Another SRT concept includes behavioral change strategies such as self-monitoring, setting goals, and dealing with obstacles (Sniehotta et al., 2006).

Behavioral interventions that have included self-regulation strategies have resulted in improved diet, activity, and weight loss (Greaves et al., 2011; Michie et al., 2009; Prestwich, Conner, Hurling, Ayres, & Morris, 2016). Conn et al. (2008) reported that self-regulation strategies—goal setting, self-monitoring, and problem-solving—were components of efficacious interventions for activity; the effect size was 0.45 (95% CI [0.38, 0.52]). In an experimental study, patients with CVD who received counseling—about action plans for activity and coping plans to deal with barriers—later engaged in more activity than another group who received only counseling about action plans (effect size = 6.18; 95% CI [5.36, 6.93]; Sniehotta et al., 2006).

Self-Determination Theory (SDT)

Self-determination theory (SDT) is an integrated set of ideas about human motivation that has guided effective behavioral interventions. According to SDT, individuals have three inherent, psychological needs (Teixeira et al., 2012). One need is relatedness; this reflects connecting in a mutually respectful, nonjudgmental, humanistic manner. A second need is autonomy; this refers to having volition, rather than independence. The third need is

perceived competence which refers to perceived ability to engage in a certain behavior and which is analogous to self-efficacy (Silva, Markland, et al., 2008, 2010). When peoples' psychological needs about a given behavior are met, they are more likely to engage autonomously in that behavior (Teixeira et al., 2012; See Table 1).

Propositions from SDT have been supported empirically in the context of health behaviors. For example, researchers (Silva, Vieira, et al., 2010; Williams et al., 2006) conducted experimental designs where interveners attempted to meet experimental participants' psychological needs about health behaviors but not the comparison participants. The experimental participants increased their autonomous motivation and perceived competence for health behaviors and later improved their behaviors (e.g., diet). Importantly, health behaviors explained improved subsequent, physiologic outcomes (e.g., cholesterol, weight loss; Silva, Vieira, et al., 2010; Williams et al., 2006).

Synthesis of SRT and SDT

Thus, behavioral interventions could be strengthened by applying an innovative synthesis of concepts, from self-regulation and self-determination theories, to a behavioral intervention. Guided by self-regulation theory, interveners would offer the types of content needed to support a participant's behaviors (Greaves et al., 2011; Michie et al., 2009). Guided by self-determination theory, interveners would interact with participants to meet their psychological needs and, thus, promote health behaviors and physiologic outcomes (Teixeira et al., 2012). Yet, few researchers have based their diet or activity interventions on such concepts (Johnson et al., 2016). Silva, Markland, et al. (2008) and Silva, Vieira, et al. (2010) report on an exception in which they conducted a randomized, controlled trial about weight control. Interveners met participants' basic psychological needs and addressed self-regulation concepts. In contrast to a comparison group, an experimental group had improvements in perceived autonomy support, daily steps (estimated effect size = 0.65, 95% CI [0.32, 0.88]), moderate-vigorous activity (estimated effect size = 0.75, 95% CI [0.48, 1.05], and weight loss one year later.

Person-Centered Interventions and Fidelity

Some scholars have questioned whether person-centered interventions would vary so much that they would not have fidelity (Lauver, 2004). However, researchers who study person-centered interventions can assess the fidelity of their interventions for methodological rigor. The degree to which interveners follow protocol is *fidelity of delivery*; the degree to which participants report receiving what researchers intended is *fidelity of receipt* (Bellg et al., 2004).

The purpose of this study was to evaluate outcomes of an initial, person-centered intervention, based on self-regulation and self-determination theories. The aims were to (a) estimate effect sizes for diet and activity to use in planning future studies; (b) assess the fidelity of delivery and receipt of the intervention; and (c) describe participant perceptions of the acceptability of the intervention.

Methods

Design

A one-group, pre- and postintervention design with a four-week follow-up period was used. It involved six sessions about one week apart: the first session was face-to-face, the others by telephone. Variables were measured at three time points: pre-intervention (just after intervention sessions ended) and at follow-up (four weeks after the sessions ended), as in similar prior interventions (Edelman et al., 2006; King et al., 2006; Marcus et al., 2006). Participants were involved in the study for 10 weeks.

Setting and Sample

Recruitment sites included primary care clinics and community sites. The original plans were to recruit at least 40 participants, allow for loss of 25% participants, retain 30 participants and have stable estimates of outcome variables (Hertzog, 2008). Eligibility criteria were: (a) adults 18–65 years of age, (b) living independently, and (c) able to communicate in English, both verbally and in writing. Exclusion criteria involved having (a) a new or untreated medical condition that warranted assessment and treatment, or that could interfere with new health behaviors (e.g., recent myocardial infarction without rehabilitation, new diagnosis of diabetes in prior three months); and (b) a diagnosed chronic illness that was not stable.

The “Healthy You” Intervention

The intervention consisted of six, weekly, participant-directed, nurse-facilitated individual contacts. Advanced practice registered nurses (APRNs) were interveners. Their education prepares them to address biophysiologic phenomena, psychological issues, and the sociocultural contexts in which people live (American Association of Colleges of Nursing [AACN], 2017).

The last author oriented two interveners over five weeks. The orientation involved independent readings and at least 20 hours of discussions, clarifications, experiential learning, and feedback. Initially, interveners met with participants face to face for 50 to 60 minutes at a mutually convenient, quiet place. Subsequent weekly contacts occurred by telephone and typically lasted 15 to 30 minutes. Modes of delivery were recommended by participants in a previous study (Lauver et al., 2008).

The type of information to discuss with participants was based on self-regulation concepts. Interveners assessed a participant’s long-term goals (e.g., “to wear the little blue dress”; Carver & Scheier, 2001; Lauver et al., 2008), current activity and eating behaviors, and specific behavioral goals for either diet or activity. To provide participants with reference points, interveners shared professional recommendations for diet or activity, aligned with participants’ chosen behaviors, such as (a) engaging in moderately intense PA at least 30 minutes a day on five or more days a week (e.g., Marcus et al., 2006; American Heart Association [AHA], 2014); (b) having a minimum of five fruits or vegetables a day; or (c) limiting fat to less than 30% of total calories per day and saturated fat to less than 10% total per day (U.S. Department of Health and Human Services [HSS], 2010).

Self-determination concepts guided the interpersonal processes between interveners and participants. To support participant autonomy, interveners asked participants to choose (a) adoption of either diet or activity behavior; (b) particular behaviors within diet and activity categories (e.g., to decrease calorie intake or increase walking); and (c) specific action plans for the next week (Michie et al., 2009; Teixeira et al., 2012). Interveners fostered perceived competence by encouraging participants to choose goals that were challenging, yet not overwhelming (Carver & Scheier, 2001; Teixeira, et al., 2012). When participants suggested potentially unsafe goals, interveners negotiated safer goals. In follow-up contacts, interveners assessed participants' experiences with new behaviors, goals, and action steps; provided informative feedback neutrally, and elicited participants' preferences for keeping or revising goals. Both interveners and participants used the same worksheet about behaviors and goals during their contacts. The worksheet prompted interveners to discuss intervention components for fidelity. The sheet prompted participants to reflect on such components (e.g., congruence of behaviors with goals). A sufficient intervention dose was defined as having both an initial contact and at least four subsequent sessions. This included five or six contacts with an orientation to the study, forms, and time frame, plus additional, subsequent contacts to set, meet, and monitor weekly goals (Estabrooks et al., 2005).

Measures

Physical activity and dietary intake—Aerobic activity was measured with the 7-day Physical Activity Recall Interview (PAR) (Blair et al., 1985) (Table 2). This interview has eight questions about sleep, as well as moderate, hard, and very hard activities over the prior week. Authors of the PAR assume the remaining hours are spent in light activity. For accuracy in reporting, a 7-day period is used and examples of activity intensity are provided for: (a) moderate activities, e.g., raking or brisk walking (3 mph or 20 min/mile); (b) hard activities, e.g., scrubbing floors or traditional dancing; and (c) very hard, e.g., jogging or soccer. Scores on the PAR reflect minutes of moderate and vigorous (i.e., hard, and very hard) aerobic activity in the prior week. Assuming that 1 MET = 1 kcal × kg^{-1} × $hour^{-1}$, METS are calculated by (a) multiplying the number of hours spent in each category by an evidence-based estimate of METS for the respective category: 1 = *sleep*, 1.5 = *light activity*, 4 = *moderate*, 6 = hard, 10 = *very hard*, and (b) summing the products to yield total METS (Blair et al., 1985). The PAR has had predictive validity with physiologic measures (Blair et al., 1985) and established equivalence between in-person and telephone use (Hayden-Wade, Coleman, Sallis, & Armstrong, 2003).

Fruit and vegetable intake was measured using self-report of frequency of eating seven fruit/vegetable items using response options ranging from 0 = *less than once per week* to 5 = *two or more times per day*, with possible total scores from 0–35 (Block, Gillespie, Rosenbaum, & Jenson, 2000). Fat intake was self-reported using list of 17 items about foods high in fat. For fat intake, response options were from 0 = *once a month or less* to 4 = *five or more times/week*, with possible total scores from 0–68 (Estabrooks et al., 2005). The screeners have had construct and predictive validity and have been efficient in measuring food intake in intervention studies (Block, Gillespie, Rosenbaum, & Jenson, 2000; Estabrooks et al., 2005).

Fidelity of delivery and receipt—Fidelity of delivery was measured in two ways. One, interveners reported the degree to which they could follow the intervention protocol using a 15-item checklist of components reflecting eight, broad categories (e.g., supporting autonomy). Most categories included two to four examples, such as, "provide a reference point with professional recommendations for diet or activity." Second, fidelity of delivery by reviewing audiotapes of intervention contacts was evaluated. Two or more researchers independently reviewed audiotapes and rated them using the 15-item checklist. The audiotapes represented different interveners and contacts ($n = 13$). Researchers resolved discrepancies by consensus.

Fidelity of receipt was assessed in two ways. Participant perceived congruence of values, goals, and behaviors were measured with three questions written for this study, based on self-regulation theory. One question assessed participant perceptions of how well their longer-term goals matched their shorter-term goals. Two questions assessed participant perceptions of how well their health goals matched their current behaviors (diet, activity). Fidelity of receipt was also assessed with five items about the intervener-participant relationship. Some items were similar to items used in self-determination research (e.g., interveners "listened to me"). Participants responded using 5-point scales from *strongly disagree* to *strongly agree*.

Acceptability of the intervention—Participants answered 13 questions about intervention components written for this study. Questions addressed relevance and usefulness of information provided, helpfulness of the goal-focused approach, and whether they would recommend the intervention. Participants rated items with a 5-point scale from *strongly disagree* to *strongly agree*.

Procedures

After approval by the institutional review board, posters were placed at recruitment sites, which included primary care clinics, a coordinating center for federally-funded screening, and community settings (e.g., libraries, shops). Because of low recruitment at one site, more active recruitment methods were used at that location. Staff at the coordinating center discussed the study with clients. A project nurse coordinated recruitment, consent, and data collection. At pre-intervention and follow-up, the nurse obtained measures of perceived congruence, diet, and activity. Immediately postintervention, the nurse obtained data on fidelity of receipt and acceptability. After each contact, interveners rated their fidelity of delivery. Later, researchers rated audiotapes of selected contacts. The last author discussed inconsistencies between tapes and protocols with interveners on an ongoing basis.

Analysis Plan

For Aim 1, effect sizes were estimated by calculating differences between pre- and posttests for standardized mean scores with NCSS Statistical Software (version 10). Effect sizes can be useful for summarizing the degree of change with modest sample sizes and multiple outcome measures (Crombie & Davis, 2009). For Aim 2, descriptive statistics and *t*-tests were generated to compare pre- and posttest means for fidelity of receipt with SPSS. For Aim 3, means and standard deviations on acceptability with SPSS were also generated.

Results

Participant Characteristics

Among 73 volunteers, 9.6% ($n = 7$) were ineligible and 9.6% ($n = 7$) declined to participate. Of 59 eligible participants, the retention rate was 88.14 (52/59). Among the 73 volunteers, 83.6% ($n = 61$) learned of the study from clinics, 8% ($n = 6$) from others, 6% ($n = 4$) from the screening site, one from a public site, and one did not recall. Table 3 summarizes participant characteristics ($N = 52$). Average age was 47.6 years ($SD = 11.15$); 79% were female. Most were non-Hispanic White, with baccalaureate degrees. Half had a chronic health condition; many were overweight or obese. All participants received minimal doses of the intervention; most ($n = 43$; 82.7%) received all contacts or five of six planned contacts ($n = 9$; 17.3%).

Aim 1: Activity and Diet Effect Sizes

About half of the participants chose activity goals ($n = 25$; 48.1%) and another half chose diet goals ($n = 27$; 51.9%). As shown in Table 4, differences between pretest and posttest scores on two measures of activity were statistically significant ($p < .05$) as were two measures of diet activity ($p < .05$) and diet ($p < .01$). Estimated effect sizes were 0.53 for moderate aerobic activity, 0.82 for fruit/vegetable intake, and −0.57 for fat intake (Table 4).

Aim 2: Fidelity of Delivery and Receipt

Interveners reported delivering study protocols adequately in 77–97% of contacts. They reported that participants could identify behavioral goals in 84–87% of first or second contacts. In 68–81% of later contacts, participants could make action plans to meet their goals. When researchers reviewed audiotapes, they documented that interveners addressed at least 80% of criteria in initial contacts and 97–92% of components in the second to sixth contacts, respectively.

To assess fidelity of receipt, pre- and posttest means were compared on three self-regulation variables. In the total sample, postscores were higher than pretest scores for the congruence of values and goals ($p = .02$). Among participants with activity goals, the congruence of their activity behaviors and goals improved ($p = .01$). Among those with dietary goals, the congruence of their eating behaviors and goals improved also ($p = .01$). Participant postintervention ratings of their relationships with interveners were described, based on self-determination theory; on the 1-to-5 scale, interveners had welcoming attitudes ($M = 4.9$, $SD = 0.24$); listened to participant desires ($M = 4.9$, $SD = 0.35$); and provided encouraging feedback ($M = 4.8$, $SD = 0.47$), yet did not push them ($M = 4.4$, $SD = 0.99$).

Aim 3: Acceptability

Reports about the acceptability of the intervention are summarized in Table 5. Participants said the information was useful, fit their situations, and was “just about right” in depth and breadth. They agreed that setting weekly goals, identifying obstacles and ways around obstacles were helpful components.

Discussion

In attempts to strengthen behavioral interventions, we evaluated whether a person-centered and theory-guided intervention could improve engagement in health behaviors. In an innovative approach, our intervention was based on a synthesis of concepts from two motivational theories. Whereas concepts from self-regulation theory guided informational content, concepts from self-determination theory guided most of our interpersonal processes. Consistent with research guided by self-regulation theory (Carver & Scheier, 2001; Sniehotta et al., 2006) and self-determination theory (Silva, Vieira, et al., 2010; Teixeira et al., 2012), health behaviors improved pre- and postintervention.

The moderate to large effect sizes for health behaviors—activity and diet—were comparable to those reported in a meta-analysis of activity (Conn et al., 2008) and a systematic review of dietary intake (Pomerleau et al., 2005). The effect sizes were greater than those associated with a-theoretical interventions (Clark et al., 2004; Gilstrap et al., 2013) yet lower than those for theoretically guided interventions which had more contacts (Silva, Vieira, et al., 2010) or a rigorous design (Sniehotta et al, 2006). The degree of our effect sizes may be explained by the person-centeredness, the complementary nature of theories guiding the intervention, and high fidelity. Findings suggest that future interventions designed similarly to this study could be valuable in promoting health behaviors.

A methodological challenge in patient-centered research was addressed by assessing the fidelity of our person-centered interventions (Lauver, 2004). Findings documented that our intervention had fidelity of delivery and receipt (Bellg et al., 2004). Knowing that this intervention could be delivered with fidelity is important to planning future replications or extensions.

High ratings on the type and degree of information shared—as well as the self-regulation strategies discussed—support the acceptability of the intervention. These findings are congruent with the high retention rate (88%).

There were more participants than anticipated from one recruitment site. Expectations were to accrue at least 40 volunteers over a few months and retain 30–35 participants in the study. Yet, there were 72 volunteers over a few months accrued mostly from primary care clinics rather than a coordinating center for federally-funded screening. This response suggests that this *Healthy You* intervention was acceptable and these participants wanted help with behavior change—despite being well-educated and financially comfortable—on average. Taken together, these findings are consistent with the ideas that interventions delivered on a one-to-one basis are desirable (Richards et al., 2013) and that behavior change is complex (Michie et al., 2009).

Limitations

The one group, pretest posttest design, is a limitation. Because participants were not assigned to treatment at random, findings could be explained by: selection bias among motivated, volunteer participants; Hawthorne or measurement effects because participants knew their behaviors were measured over time; or nonspecific effects from contacts with

interested nurses. Also, outcomes were measured only using behavioral self-report (Shadish, Cook, & Campbell, 2002).

The sample was disproportionally White, educated, and female, and thus relatively homogenous, despite attempts to recruit a diverse sample. The characteristics of the sample could limit the external validity of the findings. The moderate to large effect sizes observed for activity and diet behaviors may have reflected the time and means available to participants to change their behaviors, given their socio-economic status. On the one hand, the intervention remains to be tested in diverse samples. On the other hand, it may be useful for people from diverse cultural backgrounds because it is highly individualized, designed to meet universal psychological needs, and research based on self-determination theory has been supported internationally (Teixeria et al., 2012).

Implications for Future Research

In replications, researchers can use an experimental design with randomization to minimize limitations. Designing an active comparison group would be desirable, such as one in which participants receive typical health promotion messages. Future researchers can strategize ways to recruit more diverse samples (Carroll et al., 2011; Gilstrap et al., 2013) and build upon behavioral interventions that have been efficacious with people of color and of low socioeconomic status (Marcus et al., 2015; Parra-Medina et al., 2011).

Interventions of longer duration can be used to (a) identify what intervention components are most important to either health behavior adoption or maintenance; and (b) examine what processes support either adoption or maintenance of such behaviors (Fjeldsoe et al., 2011). The type and components of behavioral interventions that can promote not only health behaviors, but also changes in health status can be identified (Greaves et al., 2011). Cost-effectiveness of person-centered, theory-based health behavior interventions compared to usual care to improve health behaviors and health status should be addressed.

To strengthen knowledge about health behavior interventions, intervention components and conceptual foundations should be clearly explicated (Conn et al., 2008; Michie et al., 2009). The type of content, interpersonal interactions, and individualization, as well as the delivery mode, frequency, and intensity of contacts, should be described. These descriptions are needed to identify key components of successful, feasible, and acceptable interventions and comparative effectiveness trials for health promotion (Dombrowski et al., 2016; Fjeldsoe et al., 2011).

Conclusion

A person-centered, behavioral intervention based on APRN practice, empirical evidence, and an innovative synthesis of two motivational theories showed moderate to large effects on self-reported physical activity and dietary intake when pretest and posttest scores were compared. Interveners delivered the *Healthy You* with fidelity and participants rated it positively. Researchers can replicate and extend this promising intervention, guided by self-regulation and self-determination theories for content and interpersonal process, respectively. Continued research on person-centered, theory-based interventions could contribute to knowledge about how to improve health behaviors and, in turn, health status. If

future research supports the effectiveness of similar interventions, clinicians could have a set of concepts to guide the content of their discussions and their interpersonal interactions with patients in order to promote health behaviors effectively.

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TABLE 1

Concepts from Self-Regulation Theory and Self-Determination Theory Used to Design a Person-Centered Health Behavior Intervention

Theory/concept	Application	Example
Self-regulation theory		
Input	• Assessment of current behavior (e.g., level and frequency)	• Assess, discuss current behavior (e.g., level, frequency)
Reference point	• Evidence-based guidelines • Short- and long-term goals	• Provide recommended dose of recommended behavior for health benefits (e.g., 30–45 minutes moderate activity, six days/week) • Elicit, discuss short-term goal (e.g., walk for 15 minutes, six days/week) and long-term goal (e.g., able to walk a mile without breathlessness)
Monitor/compare current state to reference point [a]	• Typical individual behavior vs. population-focused evidence-based guidelines	• Invite comparison of current activity or dietary behavior to: (a) to expert guidelines initially; and (b) later to short- and long-term goals
Congruent or discrepant	• Conclusion from comparing current behavior to expert guidelines	• Invite participants to conclude whether current behavior matches their goals; assesses how participants think and feel about conclusion
Output	• Discuss behavioral steps to reach short- and long-term goals	• Encourage weekly action plans towards short- and long-term goals
Self-determination theory		
Relatedness	• Interact responsively, in a humanistic manner	• Demonstrate respect, acceptance, and egalitarian approach. Avoids judgment.
Autonomy	• Volition (having meaningful options not independence)	• Offers choices: (a) behavior to adopt activity or dietary; (b) short- and long-term goals; and (c) action plans
Perceived competence	• Perceptions of abilities to execute certain behavior in life context	• Assess, discuss current level of competence re: meeting short-term goal; negotiate short-term goal that is somewhat challenging but not overwhelming
Monitor/compare current state to reference point [a]	• Typical individual behavior vs. population-focused evidence-based guidelines	• Avoid collaboratively setting goals that are: (a) too easy, lacking challenge; and (b) not so hard, overwhelming
Degree of autonomous motivation	• Motives are freely chosen, not from own or others' "should"	• Invite identification of reasons for choosing goals

Note.

[a] Similar concept and application in both theories.

TABLE 2

Concepts, Measures, and Occasions of Measurement

		Measurement occasion			
Concept	**Measure**	**Pre**	**During**	**Post[a]**	**Follow-up[b]**
Physical activity behavior	PAR (interview)	X			X
	Aerobic activity (type and duration)	X			X
	Aerobic activity (METS)	X			X
Dietary intake behavior	Food Frequency Questionnaire	X			X
	Fruit/vegetable intake	X			X
	Fat intake	X			X
Fidelity (delivery)	Intervener self-ratings		X		
	Audiotape ratings (by researchers)		X		
Fidelity (receipt)	Values, goals, behaviors (congruence)			X	
	Relationship (quality)			X	
Acceptability	Feedback questionnaire[c]			X	

Note. METS = metabolic equivalents; PAR = Physical Activity Recall.

[a]Post-intervention measurement was within one week of last contact.

[b]Follow-up measurements were taken four weeks after last contact during the intervention.

[c]Relevance, usefulness.

TABLE 3

Participant Characteristics

Characteristic	*M*	*(SD)*
Age (years)	46.6	(11.15)
BMI (kg/m^s)	28.6	(6.37)
	n	***(%)***
Sex (female)	41	(78.8)
Ethnicity (White/non-Hispanic)[a]	50	(96.2)
Race (White)[b]	48	(92.3)
Marital status (married, living together)[c]	31	(59.6)
Education (highest level)		
Grade 12	2	(3.8)
College 1–3 years	13	(25.0)
College 4 years	25	(48.1)
Master's degree	7	(13.5)
Doctoral degree or lawyer	5	(9.6)
Employed (yes)	44	(84.6)
Can meet financial needs		
No	10	(19.2)
Yes	40	(77.2)
No response	2	(4.0)
BMI		
<20.0	5	(9.6)
20.0–24.9	9	(17.6)
25.0–29.9	21	(40.4)
30.0–34.9	12	(23.0)
≥35.0	5	(9.6)

Note. $N = 52$. BMI = body mass index; *SD* = standard deviation.

[a]Remainder were Hispanic.

[b]Others were African American ($n = 3$; 5.8%) or Unknown ($n = 1$; 1.9%).

[c]Alternative was single, divorced, or widowed.

TABLE 4

Self-Reported Behavioral Outcomes by Goal

		Pretest		Posttest		Difference			
Goal/outcome	***n***	***M***	**(*SD*)**	***M***	**(*SD*)**	***M***	**(*SD*)**	***p*** [a]	**ES**
Activity	25								
≥ Moderate (minutes)		627.6	(714.70)	888.2	(1104.4)	245.6	(505.10)	.05	.27
Moderate (hours)		6.4	(5.02)	10.9	(10.65)	4.5	(9.37)	.05	.53
METS[b]		37.8	(8.40)	40.4	(15.2)	2.6	(7.29)	.10	.21
Eating	27								
Fruit/vegetable (score)		12.1	(3.85)	15.7	(4.74)	3.6	(3.79)	.01	.82
Fat intake (score)		22.8	(6.48)	18.6	(7.35)	−4.0	(6.56)	.01	-.57

Note. ES = effect size; METS = metabolic equivalents; *SD* = standard deviation.

[a]Dependent-samples *t*-test.

[b]For moderate activity.

TABLE 5

Acceptability of the Intervention

Question/response	*M*	*(SD)*
Please think about the information and resources you received during our contacts with you. The information…[a]		
fit my situation	4.6	(0.66)
was easy to understand	4.6	(0.77)
was useful to me	4.6	(0.56)
kept me on track	4.3	(0.75)
Please rate the information you received[b]		
Depth of information	2.8	(0.65)
Amount of information	2.75	(0.62)
Regarding goals[a]		
Using goals tool sheet was helpful	3.8	(1.16)
Goals I chose were my own, not someone else's	4.9	(0.34)
How helpful were the following in making progress towards your health goal?[a]		
Setting my weekly sub-goals	4.2	(1.01)
Checking in with staff each week	4.8	(0.41)
Identifying my obstacles to my goal	4.5	(0.73)
Identifying ways around my obstacles	4.5	(0.70)
I would recommend this program to my friends[a]	4.5	(0.90)

Note. SD = standard deviation.

[a]Response options were 1 = *strongly disagree* to 5 = *strongly agree;* 3 = *neither.*

[b]Response options were 1 = *not enough* to 5 = *too much;* 3 = *just the right amount.*