

Stage of Change Movement Across Three Health Behaviors: The Role of Self-Efficacy

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Abstract

Purpose. In this study, we examined the influence of self-efficacy in predicting stage of change (SOC) movement, without intervention, over a 1-month period for smoking cessation, exercise adoption, and dietary fat reduction.

Design. The design of this study was longitudinal. Patients' stage of change and self-efficacy were assessed at baseline, and stage of change was reassessed at a 1-month follow-up. Patients were categorized as (1) Regressors (moved backward at least one stage), (2) Stables (no change), or (3) Progressors (moved forward at least one stage). Chi-square analyses were used to determine the ability of self-efficacy to predict stage movement at 1-month follow-up.

Setting. The data were collected at a large, inner city, academic hospital in the southeastern United States. Patients were attending primary care clinics.

Subjects. Five hundred fifty-four low income, predominantly African-American, individuals attending primary care clinics were participants in the study.

Measures. Previously validated scales of stage of change and self-efficacy from Prochaska's laboratory were used in this study.

Results. Results showed statistically significant differences between predicted and actual SOC movement for smoking cessation, exercise adoption, and dietary fat intake reduction. Baseline self-efficacy ratings were significantly related to stage progression, regression, and stability of stage of change for all three health behaviors. Thirty-seven percent of smokers who were predicted to progress on the basis of their self-efficacy scores progressed. For exercise adoption and dietary fat reduction, 50% and 44%, respectively, of individuals expected to progress at least one stage on the basis of self-efficacy scores progressed.

Conclusion. Self-efficacy influences SOC movement for smoking cessation, dietary fat reduction, and exercise adoption. (*Am J Health Promot* 2004;19[2]:94-102.)

Key Words: Stage of Change, Self-efficacy, Prospective, Smoking Cessation, Exercise Adoption, Dietary Fat Reduction, Prevention Research

INTRODUCTION

The Transtheoretical Model hypothesizes that a person adopting a new behavior progresses through specific stages of readiness to change marked by distinct cognitive processes and behavioral indicators.^{1,2} The five stages of change are Precontemplation (no intention to change in the next 6 months), Contemplation (intention to change in the next 6 months), Preparation (intention to change and small or inconsistent behavioral attempts, without regular behavior change), Action (regular change for less than 6 months), and Maintenance (sustained change for more than 6 months). Some individuals move through these stages in a linear fashion, whereas others progress and regress in a spiral fashion.³ Stage of change (SOC) movement is purported to be influenced by specific mediating variables, including a person's confidence in his or her ability to change a specific behavior (i.e., self-efficacy). The SOC model has demonstrated empirical support across a wide range of health behaviors, including smoking cessation,^{1,4} exercise adoption,⁵⁻⁸ and dietary fat reduction.⁹⁻¹¹

Stages of Change and Self-Efficacy

Self-efficacy, as one of the key constructs of Bandura's social cognitive theory,¹² has also been examined across a wide range of health behaviors. Bandura's investigation of self-efficacy, as part of his larger social learning theory, suggests that an individual's confidence to make a behavioral change is closely related to actual behavioral outcomes.¹³ A signifi-

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cant amount of research has demonstrated a strong positive relation between self-efficacy and health behavior change (i.e., exercise adoption, smoking cessation, dietary fat reduction).¹⁴⁻¹⁷ The integration of stage of change and self-efficacy has been investigated in a number of studies and has generally demonstrated that confidence in one's ability to make health behavior changes increases consistently in a linear fashion across the stages of change.^{4,7,18-23}

However, the literature examining stage of change and self-efficacy demonstrate several notable trends, including limited (1) prospective research examining predictors of stage movement, (2) prospective research with relatively shorter follow-up time periods, and (3) research conducted with low income minority individuals. In this study, we attempt to account for each of these limitations found in the literature.

Limited Prospective Research on Predictors of Stage Movement

Weinstein and colleagues²⁴ stated "it is easier to point out the differences between caterpillars and butterflies than to understand how the transformation occurs. Similarly, it is easier to describe stages of health behavior than to identify the factors that produce transitions between these stages" (p. 292).²⁴ The majority of SOC research has been cross-sectional. Although descriptive information regarding stages of change has been an initial and necessary step toward understanding health behavior change, identifying the variables that influence movement through the stages is critical for validating the model^{8,24-27} and for providing mediating variables that can be targets of behavioral interventions.²⁸ Prospective, longitudinal research designs must be employed and act as the true test of the model's validity.²⁹

In contrast to cross-sectional research, longitudinal studies examining the association between self-efficacy and stage movement have been few and far between.^{22,25-27} Mudde et al.³⁰ examined the ability of self-efficacy to predict SOC movement for individuals who were in the process of quitting smoking. Mudde et al.³⁰

found that long-term abstinence from smoking was predicted by post-treatment self-efficacy. Furthermore, Plontikoff et al.²⁷ examined predictors of SOC movement, without intervention, for exercise in a large sample of Canadian men and women. They categorized individuals as either regressed, remained, or progressed in their stage of change, depending on their movement at a 6-month follow-up interview. This study demonstrated that self-efficacy was a significant predictor of exercise SOC movement. Although notable studies are few, further longitudinal research is needed before firm conclusions can be drawn.^{22,25,31}

Brief Follow-up Periods

Many prospective studies examining SOC movement that have not found positive results have used relatively long time periods between baseline and follow-up evaluations;^{26,29,32} most have used 6-month to 1-year delays.^{26,32} Follow-up measurements of behavioral stage change might need to be performed closer to the time that baseline mediating variables such as self-efficacy are assessed.^{14,26,32} Most theories of health behavior change acknowledge that the shorter the delay between the assessment of a predictor and an outcome, the stronger the observed relation.^{12,33} Changes in self-efficacy also are likely to occur during these delays.

Understudied Populations

Much of what is known about stage of change and health behaviors has been ascertained from research on individuals who are middle or upper-middle income, employed, insured, and white.^{23,26,27} This is surprising given that unemployed, low income, uninsured, minority individuals consistently have the greatest rates of unhealthy behaviors in the United States.³⁴⁻³⁷ Further research with these understudied populations is necessary to demonstrate generalizability of the theory.²⁰

Summary and Purpose

In this study, we examined the influence of self-efficacy in predicting SOC movement, without intervention, over a 1-month period for

smoking cessation, exercise adoption, and dietary fat reduction.

METHOD

Design

The design of this study was longitudinal. Patients' stage of change and self-efficacy for smoking cessation, exercise adoption, and dietary fat intake reduction were assessed at baseline, and stage of change was reassessed at a 1-month follow-up. Patients were categorized as (1) Regressors (moved backward at least one stage), (2) Stables (no change), or (3) Progressors (moved forward at least one stage) for each health behavior. Chi-square analyses were used to determine the ability of self-efficacy to predict stage movement at 1-month follow-up.

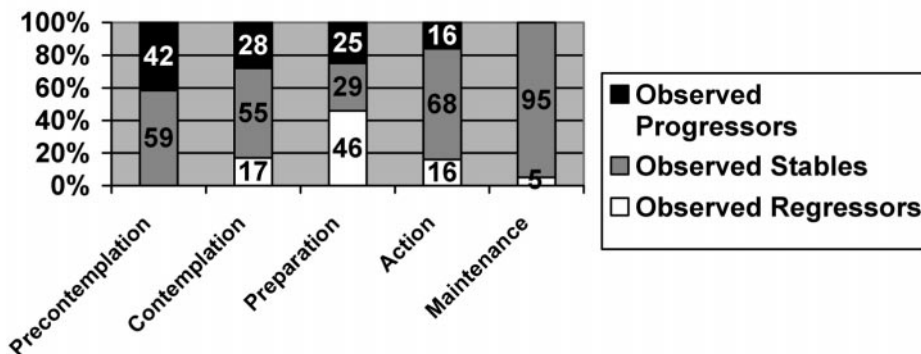
Sample

Participants were selected and interviewed while attending or waiting for scheduled medical appointments. Inclusion criteria were that the participants be over 18 years old and be attending a primary care outpatient appointment. Patients who were cognitively incapacitated (i.e., delirious, demented, or intellectually disorganized) were not able to participate in the study. A blend of randomly selecting participants as well as convenience sampling was used in this study. Specifically, a random number table was used to determine which participants were eligible for the study. When only a few patients were in the clinic at a time, all were approached. Participants signed an informed consent and were interviewed with the use of a variety of health risk behavior measures related to models of behavior change, including measures of stage of change and self-efficacy. Although records were not kept on patients refusing, it was estimated that less than 10% did so. Participation rates were high because the patients could participate in the study with minimal time commitment while they were waiting for their physician appointments. The same interviewers who conducted the baseline assessment telephoned the patient 30 days after his or her visit and reassessed stage of change for all

Figure 1

Observed Percentage of Individuals who Progressed, Remained Stable, or Regressed Through the Stages of Change at the 1-Month Follow-up for Smoking Cessation by Baseline Stage of Change

Smoking Stage Movement by Baseline Stage of Change



Total n = 235

Baseline Stage of Change:
 Precontemplation (n = 41)
 Contemplation (n = 47)
 Preparation (n = 28)
 Action (n = 19)
 Maintenance (n = 100)

three health behaviors. Interviewers were Masters-level research assistants in mental health-related areas who underwent extensive training by doctoral-level investigators regarding appropriate and ethical data collection, the adherence to protocols, and how to interview the patients. Instructions and procedures were kept standardized across sites and interviewers. Participants were compensated \$25 for participation. Institutional Review Board approval was granted by Louisiana State University Medical School. More details on the procedures used in this study can be found elsewhere.^{20,21}

Five hundred fifty-four (males = 107; females = 447) medical patients were enrolled in this study. The sample was taken from four primary care clinics from similar demographic backgrounds affiliated with public teaching hospitals in the Southeast. From this sample, 274 participants had a history of smoking or were

current smokers, and 235 (86%) completed 1-month follow-up data. For exercise, 537 were able to complete baseline data and 466 (86%) completed a 1-month follow-up assessment. Finally, for dietary fat intake, 523 participants completed dietary fat intake measures, whereas only 453 (87%) completed the 1-month follow-up assessment. Participants who did not complete certain sections of the study did not do so because the behavior in question was not applicable to them (e.g., patients who, for health reasons, were advised not to exercise were not eligible to complete the exercise adoption portion of the study and patients who were on a specialized diet prescribed by their physician were not eligible to complete the dietary fat reduction portion of the study). Comparisons suggested that demographic and baseline measures (e.g., stage of change, self-efficacy) did not differ significantly between those patients

with and without 1-month follow-up data ($p > .10$). Comparisons also suggested that demographic variables, stage of change, self-efficacy, and decisional balance measures did not differ significantly between patients collected at the different primary care clinics ($p > .10$).

Fifty-nine percent of the sample was African-American, 41% was white, and less than 1% was Hispanic/Asian. The mean age of our sample was 45.34 years old (SD = 14.08). The majority of the participants were unemployed (60%), the average yearly income was less than \$5000 per year, and less than half of the sample graduated from high school. Twenty-five percent of the sample was single, 43% was married, 5% was separated, 17% was divorced, and 11% characterized themselves as Other. The majority of the sample did not have medical insurance (71%); most of the remainder (21%) received federally funded health care benefits (i.e., Medicare, Medicaid). The majority of the participants had at least one chronic illness (95%), with the most common diagnoses being hypertension, type 2 diabetes, and high cholesterol. The average number of chronic illnesses in this population was three. Analyses demonstrated that race, education level, employment, number of chronic illnesses, yearly income, marital status, or age were not significantly related ($p < .05$) to stage of change; self-efficacy; or pro and con ratings for smoking cessation, exercise adoption, or dietary fat intake reduction. However, gender differences were found for stage of change, self-efficacy, and pro and con ratings for smoking cessation and exercise adoption. More details on the gender findings can be found elsewhere.³⁸

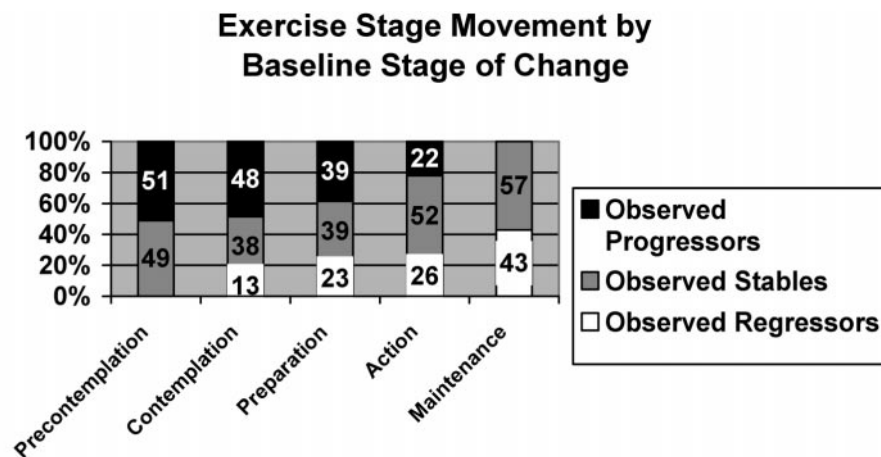
MEASURES

Stages of Change Questionnaires

On the Smoking Stage of Change questionnaire,³⁹ respondents indicated which description best characterized themselves from a list of items assessing intentions and attempts to quit smoking. A smoker can fall into one of three categories: Precontemplation (not thinking about quit-

Figure 2

Observed Percentage of Individuals Who Progressed, Remained Stable, or Regressed Through the Stages of Change at the 1-Month Follow-up for Exercise Adoption by Baseline Stage of Change



Total n = 466

Baseline Stage of Change:

Precontemplation (n = 80)

Contemplation (n = 164)

Preparation (n = 78)

Action (n = 58)

Maintenance (n = 86)

ting), Contemplation (thinking about quitting in the next 6 months), and Preparation (planning to quit in the next 30 days and already made a recent quit attempt). Former smokers fell into one of two stages: Action (continuous cessation for greater than one 1 day but less than 6 months) and Maintenance (continuous cessation for greater than 6 months). Good psychometric properties (i.e., internal consistency and concurrent validity) have been reported.⁴⁰

Prior to completing the Exercise Stage of Change measure, participants were given the following definition of regular low to moderate-intensity exercise three or more episodes of low to moderate-intensity exercise per week, for 20 minutes or longer each time. On the Exercise Stage of Change questionnaire, respondents indicated which description best characterized themselves from a list of items assessing intentions and attempts to maintain a reg-

ular exercise regimen. Participants were grouped into one of five categories: Precontemplation (not intending to exercise in the next 6 months), Contemplation (intending to exercise in the next 6 months), Preparation (intending to begin exercising regularly in the next month and having displayed some behavior indicative of change), Action (exercising regularly, but for less than 6 months), and Maintenance (keeping a regular exercise regimen for greater than 6 months). Good internal consistency (.78) and concurrent validity with a 7-day recall physical activity questionnaire have been demonstrated for this measure.⁴¹⁻⁴²

The Dietary Fat Stage of Change questionnaire placed participants in one of five categories on the basis of their response to the following question: "Do you consistently avoid eating high fat foods?" The five categories were: Precontemplation (not intending to avoid dietary fat in the next 6 months), Contemplation (in-

tending to avoid dietary fat in the next 6 months), Preparation (intending to avoid dietary fat in the next 30 days and displaying some behavior indicative of change), Action (already avoiding dietary fat, but for less than 6 months), and Maintenance (avoiding dietary fat for more than 6 months). Following this question was a series of five yes/no questions regarding actual use of low- or no-fat eating habits (e.g., use light salad dressing or eat bread without butter). Participants with responses to the validating questions that were incompatible with their reported stage of change were recoded to the most appropriate stage. For example, if someone initially indicated that they were consistently avoiding high fat foods and then responded to the eating habits questions in a manner suggesting they did not avoid high fat foods, they were reclassified into an earlier stage.⁴³

Self-Efficacy Questionnaires

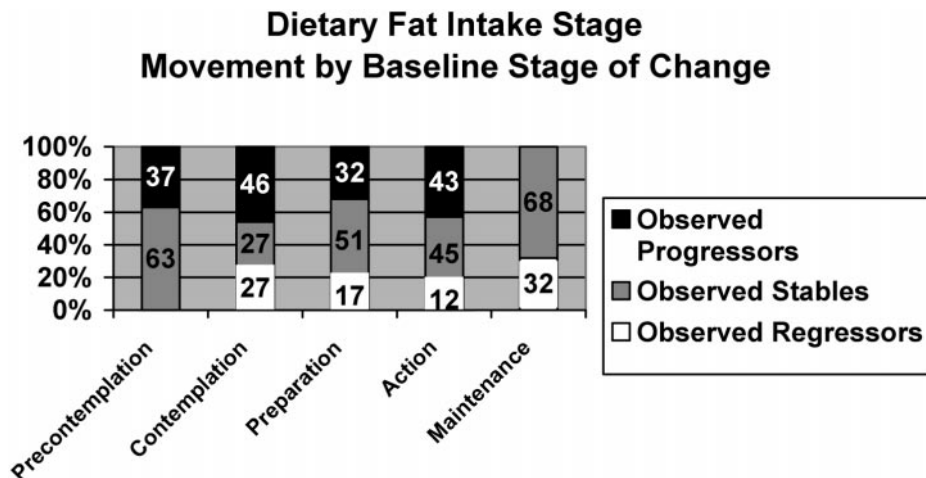
Smoking cessation self-efficacy was measured with a 20-item scale pertaining to how confident participants felt about their ability to resist smoking across a variety of situations.⁴⁴ Level of confidence was rated on a five-point scale ranging from 1 (not at all confident) to 5 (extremely confident). Higher scores indicated more self-efficacy for quitting smoking. Previous research has demonstrated good internal consistency (e.g., alpha coefficients ranging from .83 to .95).

The five-item exercise self-efficacy measure was used to assess the participants' confidence in their ability to engage in exercise across a variety of situations.⁷ Participants rated their confidence on a five-point Likert scale ranging from 1 (not at all confident) to 5 (extremely confident). Past research has indicated that this scale has adequate internal consistency (alpha = .76 to .82) and good construct validity.^{6,41}

Self-efficacy for reducing dietary fat intake was assessed with a 12-item measurement tool.⁴³ It contained items that represented three situations: positive social situations, negative or affective situations, and situations when it would be difficult to

Figure 3

Observed Percentage of Individuals Who Progressed, Remained the Same, or Regressed Through the Stages of Change at the 1-Month Follow-up for Dietary Fat Intake Reduction by Baseline Stage of Change



Total n = 453

Baseline Stage of Change:
Precontemplation (n = 103)
Contemplation (n = 55)
Preparation (n = 141)
Action (n = 42)
Maintenance (n = 112)

eat low-fat foods. Participants responded to each item on a five-point scale ranging from 1 (not all likely) to 5 (extremely likely). Higher scores indicate increased self-efficacy for avoiding dietary fat. Internal consistency for this measure is .88.⁴³

Analysis

Participants were split into groups on the basis of their baseline self-efficacy scores. This was done for each of the five stages of change, within which, participants were divided into one of three groups on the basis of their self-efficacy scores (i.e., lowest, middle, or upper tertile). This resulted in the total sample being divided into 15 groups. This scheme of classifying participants was repeated for each of the three behaviors studied.

Participants were then classified into three Predicted Groups on the basis of whether we expected them to regress, stay the same, or progress. Specifically, those groups correspond-

ing to the lowest intrastage tertiles were Predicted to regress (Predicted Regressors); those in the middle tertiles were expected to stay the same (Predicted Stables); and those in the upper tertiles were predicted to progress (Predicted Progressors). Similarly, we classified participants into three Observed Groups on the basis of whether they progressed, regressed, or stayed the same from baseline stage of change to the 1-month follow-up stage of change. If they regressed one or more stages, they were classified into the Observed Regressor group; if they remained the same, they were classified into the Observed Stable group; and if they advanced one or more stages, they were classified into the Observed Progressor group. Chi-square analyses were used to examine statistically significant differences between predicted and actual SOC movement for smoking cessation, exercise adop-

tion, and dietary fat intake reduction.

RESULTS

Collapsing across the stages of change, this sample had relatively moderate levels of self-efficacy for smoking cessation, with an average (SD) of 68.23 (28.70) out of 100. Patients also reported relatively moderate self-efficacy for exercise adoption and dietary fat reduction with 12.99 (4.85) out of 25 and 32.99 (12.34) out of 60, respectively. Self-efficacy scores increased incrementally across the five stages of change for smoking cessation, exercise adoption, and dietary fat.

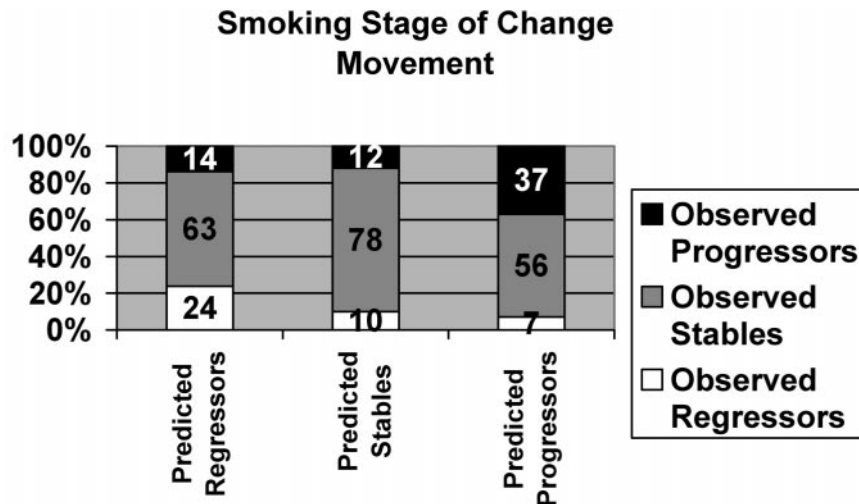
Figures 1 through 3 summarize stage movement by baseline stage of change for each of the behaviors. Among smokers, long-term quitters at baseline (i.e., Maintainers) were least likely to move. Ninety-five percent of Maintainers remained in Maintenance at 1-month follow-up, while 5% regressed to an earlier stage. On the other end of the continuum, 42% of Precontemplators advanced to a later stage. Preparers, individuals falling in the middle stage of change, exhibited the most variability, with 46% regressing to an earlier stage and 25% progressing to a later stage (Figure 1). That is, 25% of participants in the Preparation stage quit smoking.

For exercise, the majority (57%) of participants in Maintenance at baseline remained in Maintenance at 1-month follow-up, and 43% regressed to an earlier stage (Figure 2). More than half (51%) of Precontemplators advanced to a later stage. Among Preparers, 39% progressed and 23% regressed. Similar patterns were noted for dietary fat intake reduction (Figure 3).

Chi-square analyses were performed for smoking cessation, exercise adoption, and dietary fat intake reduction to examine the relation between the Predicted and Observed groups. It should be noted that the independent variable was percentage of individuals in the Predicted and Observed groups. The *a priori* acceptance *p*-value was set at <.05. Figures 4 through 6 summarize the relation

Figure 4

Percentage of Individuals Predicted to Regress, Remained Stable, or Progress Through the Stages of Change for Smoking Cessation on the Basis of Baseline Self-efficacy Scores and the Observed Stage of Change Movement at 1-Month Follow-up



Predicted groups are based on intra-stage tertiles:

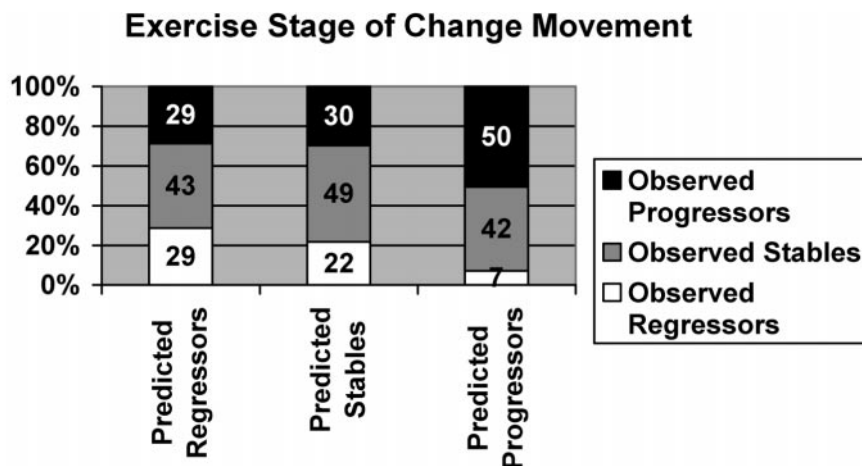
Predicted Regressors (n = 51) = lower tertiles (Groups 4, 7, 10, 13)

Predicted Stable (n = 138) = middle tertiles and (Groups 1, 2, 5, 8, 11, 14, 15)

Predicted Progressors (n = 43) = upper tertiles (Groups 3, 6, 9, 12)

Figure 5

Percentage of Individuals Predicted to Regress, Remain Stable, or Progress Through the Stages of Change for Exercise Adoption on the Basis of Baseline Self-efficacy Scores and the Observed Stage of Change Movement at 1-Month Follow-up



Predicted groups are based on intra-stage tertiles:

Predicted Regressors (n = 129) = lower tertiles (Groups 4, 7, 10, 13)

Predicted Stable (n = 212) = middle tertiles (Groups 1, 2, 5, 8, 11, 14, 15)

Predicted Progressors (n = 125) = upper tertiles (Groups 3, 6, 9, 12)

between Predicted and Observed groups.

For all three behaviors, χ^2 analyses demonstrated that participants in the Predicted Progressor groups were more likely to have moved forward at least one stage at the 1-month follow-up when compared with patients in the Predicted Regressor group. However, this should be interpreted with the knowledge that only a small portion of the participants reported SOC movement.

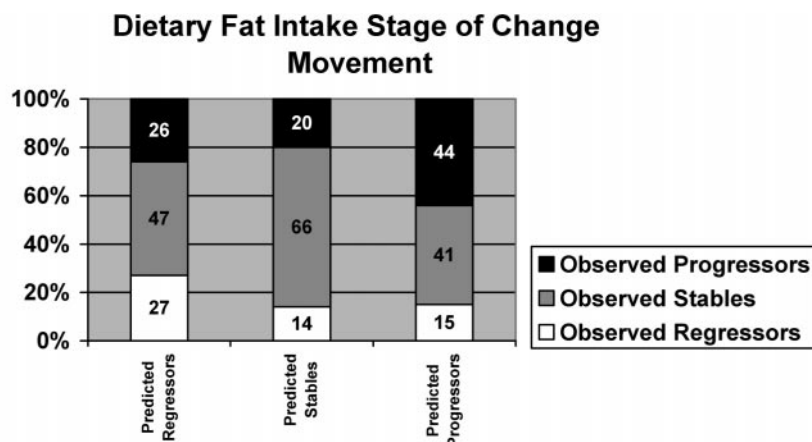
The χ^2 analyses were significant for smoking cessation ($\chi^2_4 = 20.83$, $N = 229$, $p < .001$), suggesting a significant discrepancy between what was predicted to occur and the observed movement at the 1-month follow-up. Among smokers, 37% of those classified in the Predicted Progressor group actually progressed (Figure 4); in contrast, only 14% of the Predicted Regressors advanced at least one stage. Furthermore, 24% of those in the Predicted Regressor group regressed, whereas 7% in the Predicted Progressor group regressed. Finally, although 78% of the expected Stables did not move in stage of change, a large percentage of Predicted Progressors (63%) and Predicted Regressors (56%) also remained stable and did not move in the expected directions.

Although the proportions differed, similar patterns were observed for exercise and dietary fat intake (Figures 5 and 6). The χ^2 analysis was also significant for exercise adoption ($\chi^2_4 = 28.17$, $N = 466$, $p < .001$), suggesting a significant discrepancy between what was predicted to occur and the observed movement at the 1-month follow-up. Results suggest that 50% of Predicted Progressors actually progressed. This is a significantly larger percentage than the 29% of the Predicted Regressors who progressed at least one stage of change. Furthermore, whereas 29% of Predicted Regressors moved backward, only 7% of Predicted Progressors moved backward. Finally, similar to smoking, although 49% of Predicted Stables remained stable after 1 month, a large percentage of patients who were predicted to regress or progress also remained stable (Figure 5).

For dietary fat intake reduction, the χ^2 analysis was also significant (χ^2_4

Figure 6

Percentage of Individuals Predicted to Regress, Remain Stable, or Progress Through the Stages of Change for Dietary Fat Reduction on the Basis of Baseline Self-efficacy Scores and the Observed Stage of Change Movement at 1-Month Follow-up



Predicted groups are based on intra-stage tertiles:

Predicted Regressors (n = 120) = lower tertiles (Groups 4, 7, 10, 13)

Predicted Stable (n = 216) = middle tertiles (Groups 1, 2, 5, 8, 11, 14, 15)

Predicted Progressors (n = 116) = upper tertiles (Groups 3, 6, 9, 12)

= 32.84, $N = 457$, $p < .001$), suggesting a significant discrepancy between what was predicted to occur and the observed movement at the 1-month follow-up. Although 44% of Predicted Progressors for dietary fat moved forward, only 26% of Predicted Regressors moved forward. Also, 27% of Predicted Regressors compared with 15% of Predicted Progressors moved back at least one stage of change over the 1-month period. Once again, although a large percentage of the Predicted Stables (66%) remained stable after 1 month, a large percentage of patients who were predicted to regress (47%) or progress (41%) also remained stable (Figure 6).

DISCUSSION

Baseline confidence in one's ability to adopt a behavior was related to SOC movement for three health behaviors over 1 month in a sample of low income patients attending primary care clinics. Across smoking cessation, exercise adoption, and dietary fat intake reduction, individuals with the greatest relative confidence in their ability to change were the most

likely to have advanced at least one stage at the 1-month follow-up. Likewise, patients with the lowest confidence in their ability to change their health behaviors had the greatest number of patients who regressed in the stages of change, and the individuals categorized as having relatively moderate confidence to change their health behaviors were the most likely to remain stable in their stage of change. However, despite these interesting results, the authors acknowledge the limitations of self-efficacy in its ability to predict future SOC movement, as evidenced by the number of participants whose movements were not predicted from their self-efficacy scores.

As demonstrated in Figure 5 (exercise adoption), 29% of patients with the lowest ratings of exercise self-efficacy at baseline (Predicted Regressors) regressed at least one stage at the 1-month follow-up, whereas only 7% with the highest self-efficacy scores (Predicted Progressors) regressed. Furthermore, 50% of the individuals with the greatest exercise self-efficacy ratings at baseline progressed at least one stage over the 1-

month period of time, whereas only 29% of patients with the lowest confidence progressed. These findings were consistent for smoking cessation, exercise adoption, and dietary fat intake reduction and were also consistent with previous research findings. Plotnikoff et al.²⁷ performed a 2-year study to determine whether baseline assessments of several mediating variables, including self-efficacy, predicted exercise SOC movement. Similar to this study, participants were categorized as having progressed, regressed, or remained the same. Their results suggested that baseline self-efficacy scores were significantly related to stage movement for all five baseline stages of change for exercise. For example, participants who advanced from Contemplation to Preparation exhibited significantly greater self-efficacy scores at baseline when compared with Contemplators who regressed to Precontemplation.

Other researchers' findings have demonstrated that the relationship between self-efficacy and SOC movement might be more complex. Unlike Plotnikoff et al.,²⁷ some studies have demonstrated self-efficacy to be only predictive for specific stages of change.^{22,25} DiClemente et al.²² examined the ability of self-efficacy to predict stage movement over a 3–5-month period for smoking cessation and found that baseline self-efficacy only predicted stage movement for individuals who were contemplating smoking cessation (Contemplation) or who had recently quit (Action). Baseline self-efficacy failed to predict stage movement for individuals in other stages of change. Similarly, DeVries and Mudde²⁵ demonstrated different stage-specific findings for their sample of smokers. High self-efficacy predicted stage progression at 10-month follow-up in individuals who were in Preparation at baseline, but it did not for individuals in Precontemplation, Contemplation, or Action at baseline.

Although the present findings are promising, it should be noted that for all three health behaviors, a significant number of individuals either did not change their stage or moved in the opposite direction that their

self-efficacy scores would have predicted. For example, for exercise adoption, 29% of our sample who was predicted to regress based on their self-efficacy scores at baseline actually progressed in the stages of change at the 1-month follow-up. The same trend is exemplified in the dietary fat data; 15% of those participants with the highest intrastage self-efficacy for dietary fat intake reduction actually regressed, and nearly 28% of those with the lowest intrastage dietary fat intake self-efficacy advanced at least one stage instead. Furthermore, across all three health behaviors, many participants remained stable, not progressing or regressing, in their stage of readiness for change (Figures 4 through 6).

Although the causes of these trends are unclear, we can speculate why these trends occurred. First, the artificial trichotomy used to create self-efficacy tertiles might have contributed to the large number of patients who remained stable in their stage of change, even when they were predicted to move. Furthermore, other variables not accounted for in this study could have confounded the ability of self-efficacy to predict behavior change for some participants.^{10,44} Mediating variables, such as decisional balance or processes of change, might be stronger predictors of stage movement^{26,45}; however, these variables were not used as predictors in this study. Finally, it could simply be that the participants did not progress or regress in their stage of change over the 1-month period of time. Further research is needed to elucidate the trends found in this prospective evaluation of SOC movement for smoking cessation, exercise adoption, and dietary fat intake reduction.

In addition to the unpredicted movement and stability of some of our sample, this study has some further limitations that deserve mention. First, the majority of the participants had at least one chronic illness (approximately 95%); therefore, the sample might not fully represent the low income minority population who are not medically ill. Second, it has been demonstrated that measurement itself can lead to behavior

change. Therefore, the use of the same assessment 1 month after baseline might have influenced participants' responses. This, as well as participants' desire to placate the interviewees at follow-up, might have partially influenced the participants who reported significant stage movement over a 1-month period of time.

Third, we were unable to report stage-specific trends because of limitations in sample size. Our cell sizes were not sufficient, for example, to determine whether smokers in baseline Action who progressed to Maintenance ($n = 3$) had higher self-efficacy than those in baseline Action who regressed ($n = 3$). Considering the inconsistency among patterns observed between stages in other studies, future research should aim to collect large enough samples to fill such cells appropriately and be able to meet the requirements to perform stage-specific analyses.

Despite its limitations, we believe this study has made three important contributions to the understanding of behavior change that could further the development of behavior change programs addressing smoking cessation, exercise adoption, and dietary fat reduction. First, results indicated that self-efficacy can influence SOC movement for smoking cessation, exercise adoption, and dietary fat intake reduction. This commonality is of great importance because it suggests that self-efficacy is central for behavior changes that involve an adoption of new behavior (i.e., exercise) or the cessation of old behaviors (i.e., smoking). Often, providers are challenged to find ways to assist patients in changing their overall unhealthy lifestyles in a restricted amount of time. Therefore, evidence of generalizability might help to devise interventions that are translatable. For example, an intervention that improves exercise self-efficacy could be modified to also improve self-efficacy related to dietary fat intake reduction. Although it is not necessarily suggested that multiple risk factors be addressed at the same time, the general principals for enhancing health behavior change might be common with the specifics

modified to fit the particular behavior.

Second, this study was, to our knowledge, the first of its kind to perform prospective research involving stages of change and multiple health behaviors in a low income sample. Once again, because low income individuals are less likely to engage in health behaviors than middle or high income individuals,⁴⁶ it is beneficial that we have a basic understanding of what influences change in the health behaviors of this population. From our findings, self-efficacy appears to have an influence on the ability of low income patients attending primary care clinics to progress through the stages of behavior change for smoking cessation, exercise adoption, and dietary fat intake reduction. A first step in decreasing the proliferation of poor health behaviors within disadvantaged communities might be the clarification of relationships between mediating variables, such as self-efficacy, and the ability to change health behaviors. We view this study as an important step in investigating the causes of the disproportionately high rates of smoking, sedentary lifestyle, and high dietary fat intake in low income individuals.

Third, this study provided some insight on how interventions can be tailored to individuals in different stages of change and for each particular behavior. For instance, with regard to smoking cessation, a large percentage of participants (46%) regressed from the Preparation stage, suggesting that efforts could be placed to prevent individuals who are ready to quit to regress to Precontemplation or Contemplation stages of quitting. On the other hand, with regard to exercise adoption, 57% of participants regressed from Maintenance stage. That is, over 50% of individuals who were engaging in the recommended level of exercise regressed to earlier stages. These two examples suggest that intervention efforts for these two behaviors could be very different. Future research is necessary to replicate these findings in larger samples, which, in turn, will provide useful information to practitioners on how to best assist their patients in attaining healthier lifestyles.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

This study seems to indicate that self-efficacy is related to whether or not individuals move in their stage of change for smoking cessation, exercise adoption, and dietary fat reduction. If this assertion holds true, health care providers might be able to employ interventions that enhance self-efficacy when assisting their patients with any of these three health behavior changes. Also, researchers are encouraged to study self-efficacy-enhancing interventions to determine whether such interventions hasten stage of change movement. Finally, it is recommended that more longitudinal designs are used to determine the influence of self-efficacy on health behavior intentions to change.

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