

Self-Determination, Smoking, Diet, and Health

Geoffrey C. Williams, MD, PhD
Departments of Medicine and of Clinical and Social Sciences in Psychology
University of Rochester
P.O. Box 270266
Rochester, NY 14627 USA

Daryl S. Minicucci, MSN,RN,CS
School of Nursing
University of Rochester
Rochester, NY 14627 USA

Ruth W. Kouides, MD
Department of Medicine
Rochester General Hospital
1425 Portland Avenue
Rochester, NY 14621 USA

Chantal S. Levesque, PhD
Department of Clinical and Social Sciences in Psychology
University of Rochester
Rochester, NY 14627 USA

Valery I. Chirkov, PhD¹
Department of Clinical and Social Sciences in Psychology
University of Rochester
Rochester, NY 14627 USA

Richard M. Ryan, PhD
Department of Clinical and Social Sciences in Psychology
University of Rochester
Rochester, NY 14627 USA

Edward L. Deci, PhD
Department of Clinical and Social Sciences in Psychology
University of Rochester
Rochester, NY 14627 USA

Abstract

A clinical trial will test (1) a self-determination theory (SDT) model of maintained smoking cessation and diet improvement, and (2) an SDT intervention, relative to usual care, for facilitating maintained behavior change and decreasing depressive symptoms for those who quit smoking. SDT is the only empirically derived theory which emphasizes patient autonomy and has a validated measure for each of its constructs, and this is the first trial to evaluate an SDT intervention. Adult smokers will be stratified for whether they are at NCEP (1996) recommended goal for LDL cholesterol (LDL-C). Those with elevated LDL-C will be studied for diet improvement as well as smoking cessation. Six-month interventions involve a behavior-change counselor using principles of SDT to facilitate autonomous motivation and perceived competence for healthier behaving. Cotinine-validated smoking cessation and LDL-C validated dietary recall of reduced fat intake, as well as depressive symptoms, will be assessed at 6 and 18 months. Structural Equation Modeling will test the model for both behaviors within the intervention and usual-care conditions.

Many people contribute to their own morbidity and premature mortality by behaving in unhealthy ways. Indeed, together, tobacco use and poor diet account for about one third of all American deaths (McGinnis & Foege, 1993; Woolf, 1999), nearly eight hundred thousand per year. In spite of these statistics, however, people show remarkable resistance to changing these health-compromising behaviors. Thus, an intervention that could significantly improve the percentage of people able to successfully change those behaviors would represent an important contribution in terms of both its humanity and its savings in health care costs.

This project will explore the utility of self-determination theory (SDT: Deci & Ryan, 1985b, 2000) for facilitating and explaining health behavior change by examining smoking cessation and, for smokers with elevated LDL cholesterol (LDL-C), diet improvement. The project will employ a dual approach of testing the effectiveness of the SDT-based counseling intervention relative to usual care and by testing the SDT process model of change within both the intervention and usual-care groups.

Adult smokers will be recruited to a smokers' health study and stratified according to whether their LDL-C is or is not at goal as specified by the National Cholesterol Education Program (NCEP). Those at goal will be assigned to a stratum concerned only with smoking cessation and those not at goal will be assigned to one concerned with smoking cessation and diet improvement. The intervention will target either smoking only or smoking and diet, and the intervention participants will be compared to control-group participants assigned to usual care provided by their primary-care physicians.

Theoretical Approach

From the time when the focus of behavior-change research began to shift from stimulus-response associations (B. Skinner, 1953) to cognitive processes (Rotter, 1954), the concept of expectancies has been central to behavior-change theories. Initially, the concept was concerned with whether people expected outcomes to follow reliably from their behaviors--studied both in

terms of individual differences (Rotter, 1966) and situations (Seligman, 1975)--with people who expected behavior-outcome dependence being considered high in perceived control (E. Skinner, 1995). Subsequently, investigators differentiated the concept of perceived control into two components, (a) contingency expectations or means-ends beliefs, and (b) efficacy expectations or agency beliefs (see, e.g., Abramson, Seligman, et al., 1977; Bandura, 1977; E. Skinner, Chapman, et al., 1988; Weisz, 1983).

With this distinction, attention became increasingly focused on perceived competence (Deci, 1975; Deci & Ryan, 1980; Harter, 1978; White, 1959) or self-efficacy (Bandura, 1977) as a basis for predicting motivation and behavior change. The literature on perceived control and perceived competence is vast, and our own work, like that of other research teams, has shown the importance of perceived competence for predicting maintained change of health-relevant behaviors. For example, a study of patients with diabetes showed that change in patients' glycosylated hemoglobin (HbA1c) over 12 months was explained by change in their perceived competence (Williams, Freedman, et al., 1998). In this and other studies, perceived competence was assessed with the Perceived Competence Scale (PCS), and we expect that, in the research herein described, perceived competence will predict maintenance of both smoking cessation and diet improvement. Perceived competence for each behavior is measured with the 5-item PCS.

In spite of the findings from many studies that perceived competence or efficacy was useful for predicting healthy behavior change, early studies (e.g., Fisher, 1978; Ryan, 1982) revealed that perceiving oneself to be competent at a behavior is not adequate for facilitating motivation for that behavior; people must also feel a sense of autonomy with respect to it. The documented importance of perceived competence and perceived autonomy led to the formulation of self-determination theory (Deci & Ryan, 1985b, 2000).²

Self-Determination Theory (SDT)

The theory, which details the motivational bases of regulatory processes, focuses on the concept of autonomy which is not included in any other empirically derived theory of motivation

(see Ryan & Deci, 2000, for a fuller account of the theory). Specifically, SDT distinguishes between autonomous and controlled motivations, which anchor the ends of a continuum describing the extent to which regulatory processes are self-determined (Ryan & Connell, 1989).

Autonomous regulation involves experiencing a sense of choice, a sense of full volition. When autonomous, a behavior is felt to be personally important and congruent with one's deeply held values. The behavior emanates from one's true sense of self and is thus considered self-determined. Controlled regulation, in contrast, involves people feeling pressured or coerced by an interpersonal or intrapsychic force. When controlled, people behave because of a demand, threat, or reward from an external agent (e.g., a health-care provider) or because of a rigid belief that they should do it--that they have to do the behavior to feel worthy.

If a man lowered his caloric intake because his doctor insisted that he do so, his behavior would be controlled. Evident are his feeling pressured and his lack of personal investment. In contrast, if he did it because he believed that the improved diet was important for his health and he was personally committed to becoming healthier, he would be autonomous. Evident in this latter case are both personal investment and self-initiation.

The distinction between autonomous and controlled regulation represents a continuum, so actions can be characterized in terms of the degree to which they are autonomous versus controlled. In health-care, this is measured for each behavior by the 15-item Treatment Self-Regulation Questionnaire (TSRQ: Williams, Grow, et al., 1996), and we predict that both smoking cessation and diet improvement will be predicted by greater perceived competence and more autonomous self-regulation. As such, we have selected SDT as the theoretical basis for this study because it alone suggests that the degree to which people are autonomously motivated to stop smoking (and to improve their diet) will predict maintained cessation (and maintained lowered fat intake) over and above the contributions made by perceived competence or efficacy.

Internalization is the process through which controlled motivation is transformed into autonomous motivation, thus becoming the basis for self-determined behavior. The concept of internalization has been used differently by different theorists, most typically describing the simple change from a behavior's being regulated by a source outside the person to being regulated by a source inside the person. SDT proposes, however, that the process of internalization can function more or less effectively resulting in a regulation being more or less fully accepted by the person. When people take in a regulation without making it their own, the process is considered relatively ineffective and unstable. It is only when they identify with the value of the behavior and integrate its regulation with their sense of self that the process can be considered relatively effective and stable. Internalization that is less complete is referred to as introjection; it creates an internal demand that pressures and coerces people to act. As such, the ensuing regulation is still considered controlled. Integration, which is the most complete type of internalization, involves accepting the value of the behavior and transforming its regulation into one's own. Through integration, initially external regulations become self-determined.

Internalizing the regulation of behavior is highly relevant for both smoking cessation and diet improvement. When patients show little willingness or ability for behavior change, health-care providers may need to prompt these behaviors. But it is only when the regulation is fully internalized (i.e., integrated) that the patients accept responsibility for the health-relevant behaviors and become self-determined in carrying them out. Merely introjecting the value of these behaviors does not provide an adequate basis for being self-determined in making the change.

Several studies have used the Treatment Self-Regulation Questionnaire to assess the degree to which a health-relevant behavioral regulation has been internalized and predicts long-term change. The TSRQ asks patients why they engage in particular behaviors (e.g., attempt to follow a diet or to quit smoking), and their responses reveal their level of autonomy versus

control with respect to the behaviors. The studies have consistently found positive behavior and health outcomes associated with patients' reporting more autonomous reasons for engaging in the behaviors. For example, Ryan, Plant, et al. (1995) found that patients in an alcohol treatment program who reported more autonomous reasons for participating attended more regularly and were rated by their clinicians as more involved in their own treatment.

Williams, Grow, et al. (1996) found that severely obese patients who reported more autonomous reasons for participating in a very-low-calorie, medically-supervised weight-loss program attended the 6-month program more regularly, lost more weight, and displayed greater maintained weight loss and a better exercise regimen at 23-month follow up. Williams, Rodin, et al. (1998) found that patients who reported more autonomous reasons for taking their medication displayed significantly better adherence as assessed by a two-week pill count.

Adult smokers who had been counseled by a physician to quit evidenced better 6-month and 18-month cessation rates (biochemically validated) if they had reported more autonomous reasons for trying to quit (Williams, Gagné, et al., in press). Finally, in a study of high school students, autonomous reasons for trying not to smoke predicted reduction in the students' smoking over four months (Williams, Cox, et al., 1999).

Together, these studies suggest that patients whose motivation for health-related behaviors was more autonomous, showed greater adherence and better maintenance of healthy behavior change. Thus, there is reason to expect that more autonomous motivation for smoking cessation or diet improvement will facilitate greater maintained change. Whereas these past studies were primarily correlational, intended to examine the relation between autonomous motivation and health behavior change, the present study was designed not only to test this relation but also to evaluate an intervention based on SDT to facilitate autonomous motivation for change.

Facilitating Autonomous Self-Regulation

The Treatment Self-Regulation Questionnaire assesses autonomous motivation for particular behaviors such as smoking cessation and reduced fat intake. According to SDT, patients will be more autonomously motivated for healthy behaviors--that is, they will more fully internalize the regulation of such behaviors--if the health-care climate is autonomy supportive.

The health-care climate. The interpersonal style used by providers is a key element in the health-care climate within which patients are advised. Several studies have used the 15-item Health Care Climate Questionnaire (HCCQ) to assess the degree to which patients' experience their providers as autonomy supportive, defined as taking the patient's perspective, encouraging and answering their questions, supporting their initiatives, offering choice about treatment options, and minimizing control. Results have indicated that patients who perceived the climate to be more autonomy supportive were more autonomous and felt more competent to change than those who perceived the climate to be less so (e.g., Williams, Freedman, et al., 1998; Williams, Grow, et al., 1996; Williams, Rodin, et al., 1998).

The studies thus suggest that provider autonomy support is important for patients' long-term change of risk behaviors, and in the present study we will examine whether an intervention designed to be autonomy supportive will enhance patients' perceived autonomy and felt competence for changing the target behaviors and, in turn, will significantly affect maintained change of the behaviors. The proposed research will test the effects of autonomy-supportive care on smoking cessation and diet improvement in two ways, both as experimentally manipulated and as perceived by the patients.

SDT further proposes that, although social contexts affect people's autonomous regulation of particular behaviors, enduring aspects of their personality also affect the degree to which they are autonomous with respect to the behaviors. Specifically, SDT uses the concept of general causality orientations to refer to the relevant individual difference.

Causality orientations. The autonomous causality orientation, assessed with the General Causality Orientations Scale (GCOS; Deci & Ryan, 1985a) concerns people's general tendency to orient toward autonomy support and to be more self-determined. This involves people being aware of their needs and feelings and, in general, experiencing a sense of choice in the regulation of their behavior.

Various studies have shown that people high on the autonomy orientation reported more internalized (i.e., autonomous) reasons and greater perceived competence for health-behavior change and were also more successful in maintained change (e.g., Williams & Deci, 1996; Williams, Grow, et al., 1996). Of these variables, autonomous reasons has been most strongly related to autonomy orientation and autonomous reasons has typically mediated the relations between the autonomy orientation and both perceived competence and maintained change. Thus, we hypothesized that participants high on the autonomy orientation would report more autonomous reasons for trying to stop smoking and/or reduce fat intake, and in turn would feel more competent to change and would be more successful in long-term change.

The Self-Determination Model

Figure 1 presents the self-determination model of health behavior change which shows the primary hypotheses to be tested, and Table 1 lists the scales that will be used to test the model. Central to the model is autonomous regulation of behavior change (assessed with the TSRQ). Autonomy support, both as experimentally manipulated and as perceived by patients (HCCQ), and also patients' general autonomy orientation (GCOS) are predicted to enhance patients' autonomous regulation (TSRQ) and perceived competence (PCS) for smoking cessation, diet improvement, or both. Autonomous self-regulation and perceived competence are in turn expected to increase maintained change of the health-risk behaviors. Specific hypotheses will be tested with regression and analyses of variance, and the overall model will be tested with Structural Equation Modelling.

Insert Figure 1 and Table 1 about here

The Research Project

Strategy

This research involves examining SDT with respect to specifiable behaviors that are unequivocally linked to health outcomes. We selected SDT as the theoretical basis for this study because it is the only empirically derived theory of motivation which posits that perceived autonomy is essential for maintained behavior change and because there are validated psychometric instruments for each construct in the theory. Thus, we can test a theory-based process model as well as testing an intervention. Accordingly, although the SDT intervention shares certain features with other interventions such as Motivational Interviewing (Miller & Rollnick, 1991), the specific test of SDT comes from the joint examination of the process model and a main effect for the intervention. The SDT health-care model was formulated to account for the promotion of all health-relevant behaviors, but we are focusing on smoking cessation and diet improvement because smoking and poor diet are perhaps the most serious behavioral issues facing our health-care system today and because data indicate that they are highly interactive in creating risk for cardiovascular disease (Stampfer et al., 2000)

Overview

All participants are cigarette smokers at least 18 years of age who smoke at least five cigarettes per day. They are told that the study is designed to examine how people change health-related behaviors and how health-care professional can work with people to improve their health. Thus, participants are accepted into the study whether or not they express a desire to quit smoking. If they ask about smoking cessation during the recruitment call, they are told that if

they want to quit they can work with a health-care professional toward that end. The sample of smokers is stratified depending on whether they have normal versus elevated LDL-C (as defined by the NCEP, 1996, guidelines). Those with LDL-C at or below the NCEP goal are randomly assigned either to usual care or to a self-determination intervention for tobacco dependence. Those with LDL-C above the NCEP-recommended goal are randomly assigned to one of three conditions: usual care for tobacco dependence and elevated LDL-C; a self-determination intervention for tobacco dependence and usual care for elevated LDL-C; or a self-determination intervention for both tobacco dependence and elevated cholesterol.

Within this design, usual care means that patients are asked to consult their own doctors (for one or both medical problems, depending on the group to which they were assigned), which may involve doing whatever other activities their doctors recommend (e.g., attending group meetings). Thus, the intervention is tested for whether it represents a significant improvement over the typical care that is available for these medical conditions in the geographical area covered by the study.

This design allows for (1) a direct test of the intervention for tobacco dependence by comparing cessation rates for intervention versus nonintervention participants, and (2) a direct test of the intervention for elevated lipids by comparing reductions of fat intake for participants with initially elevated LDL-C in the smoking plus diet intervention group versus the smoking only intervention group. Furthermore, the fit of the process model to the data will be tested regarding change of each health behavior in the relevant intervention groups and in the usual-care control groups.

Finally, the study tests the hypothesis that the experience of autonomy helps patients who quit smoking to counteract the depressive symptoms that frequently accompany smoking cessation. This hypothesis will be examined in terms both of the experimental conditions and of participants' perceptions of the autonomy supportiveness of their providers.

The Intervention

The intervention spans a 6-month period, during which a counselor has contact with the participants four times (six times in the condition designed to facilitate both smoking cessation and diet improvement). Counselors' interactions with participants are intended to promote autonomous motivation for change and to support change for those who make an attempt. The first contact between counselor and participant, which typically lasts about an hour, is always face-to-face, although subsequent contacts, which are typically about 20 minutes, may either be face-to-face or by phone, as the participant chooses. Intervention patients are also encouraged to consult either their own doctor or a doctor provided by the study to discuss pharmacologic agents or other relevant medical issues.

The initial contact is intended to build rapport, explore participants' values and experiences, and focus the intervention by presenting health benefits of smoking cessation and cholesterol reduction. The initial session begins by eliciting the participants' history and perspective regarding smoking and, if appropriate, diet. At times, the discussions focus on specific information related to behavior and health, and/or on the processes of change. Counselors provide options for change that are efficacious, and they support patients' initiatives for change. In all sessions, the counselors convey interest and empathy by encouraging participants to discuss their feelings and by acknowledging their perspective regarding smoking or diet. If a patient is willing to make a change, time is devoted to enhancing perceived competence by skills building and problem solving with respect to barriers and difficulties, and by arranging extra-treatment social support. If participants are in the condition involving change of both smoking and diet behaviors, separate information exchanges and problem solving discussions focus on smoking cessation and on diet improvement. For participants who say they do not want to make a change attempt, discussions are used to check on how they are doing and whether they have thought more about the issues. If participants have made a change attempt,

counselors check on progress, acknowledge the attempt, reframe failures as short successes, discuss difficulties, reaffirm the importance of personal choice regarding smoking or diet, and go into any matters the participants want to discuss.

During all contacts with the participants, counselors work to create and maintain an autonomy supportive health care climate. In line with the definition of autonomy support, counselors elicit the patients' perspective, provide choices and information, promote competence, and minimize the use of pressure to change. Designed to reflect the principles of self-determination theory, the intervention is also consistent with the PHS guidelines for tobacco dependence (Fiore, Bailey, et al., 2000) and the NCEP (1996) guidelines for diet improvement, which tend to emphasize what PHS refers to as intra-treatment social support, skills building, and extra-treatment social support.

Critical Intervention Components

Several features of the intervention are considered essential for promoting autonomy and competence. First, it is recognized that all smokers experience ambivalence about health behavior change (i.e., about breaking their nicotine dependence and improving their diet) because the unhealthy behaviors are clearly serving some important psychological function even though they are injurious to the participants' health and may have other unpleasant effects. Thus, to encourage participants' experience of autonomy with respect to their decisions about smoking and diet, counselors do not align themselves with either side of the ambivalence, instead encouraging participants to express both sides and, ultimately, after reflecting the patients' feelings, encouraging them to make their own decision about change. As such, counselors elicit, acknowledge, and accept participants' choices about whether or not to change, avoiding pressuring them to change, because past research has indicated that pressure is counterproductive for maintained behavior change (see, e.g., Deci & Ryan, 2000).

If a participant states that he or she has decided not to make a change, the counselor accepts the decision as being appropriate for the participant at that time. The provision of autonomy support in this way serves two functions: first, it acknowledges the reality that an individual's behavior is in fact his or her own responsibility; and second, it is expected to facilitate internalization of the ambient value of health-relevant change (viz., smoking cessation and/or diet improvement) and thus to enhance autonomous motivation for healthy behaving and to increase the likelihood that the participant will make the health-promoting change.

A second feature of the intervention concerns the fact that the intervention is, in fact, intended to promote change, even though counselors do not pressure participants to change and do accept their decisions not to change. Thus, the issue of change is addressed in the first and all subsequent contacts. In the first meeting, this is done in three steps. First, the counselor asks the participants to indicate their day-to-day life goals (i.e., what they are striving for in their lives), and then asks them to reflect on how smoking helps or hinders their reaching these goals. As the second step, the counselor presents the patients with the health benefits of smoking cessation and cholesterol reduction in terms of their 10-year risk of coronary artery disease (Grundy, Pasternak, et al., 1999). As the third step, at a time in the discussion that seems opportune, the counselor asks about the participants' willingness to make a change. If the participants say they are ready to change, the counselor asks what the participants need in order to make the change attempt easier and recommends that the participants choose a change date within the subsequent two weeks. The counselor then asks about the participants' willingness to use pharmacotherapy, engages them in skills building, encourages them to seek support from significant others in their lives, and plans follow-up during the first days after the participants' quit date.

If the participants say they are not ready to make a change attempt, the counselor asks what would be necessary in order for them to be ready. If they respond with obstacles that can be addressed, the counselor initiates an appropriate discussion. If not--for example, if a participant

were to say, "I will not quit smoking until I am diagnosed with cancer,"--the counselor would simply reflect the participant's feelings and ask for permission to raise the issue again during the next contact. At all times during the discussions, the counselor relates to participants from the participants' perspective.

A third feature of the intervention reflects the investigators' belief that a central aspect of both nicotine dependence and poor diet is that these behaviors represent a means through which participants cope with their anxieties and depression. One after another, participants have made comments such as, "I know cigarettes are bad for me, but without them I don't know how I could cope with the stresses in my life," or "I feel driven to eat junk food when I am anxious and fearful." Thus, the focus of skills building and problem solving concerns how to cope with stresses, anxieties, and feelings of depression without relying on cigarettes or unhealthy eating. This might involve, for example, identifying cues that bring on the urge to smoke or eat, examining alternative coping activities that are healthier, and discussing either large or small life changes that could lessen the stresses and anxieties. In addition, the counselor discusses FDA approved pharmacotherapies for nicotine dependence which also help control depressive symptoms. Participants are taught about withdrawal symptoms and about how the medications can help relieve these. Then, if the participants choose to use such medications, appropriate prescriptions are provided with medical supervision.

A fourth critical feature of the intervention reflects the fact that relapse is perhaps the most important time for the autonomy support because most people who fail are self critical and expect others to be critical of them, and this contributes to a loss of motivation for continuing to try. Virtually all people who successfully quit smoking have required multiple quit attempts, and most people who attempt to improve their diets have periodic lapses into unhealthy overeating. In all such cases, counselors maintain a neutral, nonjudgmental stance, eliciting how the failure makes the participants feel, acknowledging that one or more relapses is the norm, taking interest

in how the relapse occurred, facilitating problem solving with respect to the conditions that prompted the relapse, and inquiring about when the participants might be ready to make another change attempt.

The issue of acknowledging that change requires persistence and takes multiple attempts for virtually all individuals who attempt these changes is a complex one. Although it is important for participants to attempt a change with the expectation that they will succeed, over zealous expectations of success can exacerbate participants' feeling like a failure if they do relapse. Such feelings can have the unintended effect of increasing their unhealthy behaving and making another attempt more difficult. Counselors are sensitive to this issue and, although there is not a rigid way of handling it, counselors typically comment that many participants require multiple change attempts but some have been successful on their first attempt through their determination and persistence. The overall goal of the intervention is to bring the participants closer to making an autonomous choice about whether they want to change and then helping them cope with the withdrawal and with their emotions, whether they succeed or fail.

Participants and Assessments

Participants are contacted through doctors' offices or their insurers and through announcements and advertisements in the media.

Various questionnaire assessments will be done at the beginning of the intervention, one month later, at the end of the 6-month intervention, and at 18-month follow up. Questionnaire assessments will include the demographics and risk behaviors as well as the GCOS (done before the intervention begins), the HCCQ (done with respect to their primary care physician and with respect to the study staff, done at one month and six months), the TSRQ (done at the beginning and end of the intervention, and at follow-up), and the PCS (done at the beginning and end of the intervention, and at follow-up).

At 6 and 18 months, participants will report smoking status, with reports of quitting being confirmed by serum cotinine levels. Participants in the elevated LDL-C stratum will have three-day dietary recalls done by phone at the beginning and end of the intervention and at 18-month follow up. Lipid profiles will also be drawn at the beginning and end of the intervention and at follow up. Depressive symptoms will be assessed with the CES-D self-report scale (Radloff, 1977) before the intervention, at one month, at the end of the intervention, and at follow up.

Analyses

Data will be analyzed using ANOVAs to test between group differences, LISREL to test the fit of the SDT model to the data, and multiple regressions to test the predicted mediated relations.

Concluding Comments

Past correlational studies have supported the self-determination model of health behavior change, but this is the first study that will not only test the process model but will also test an intervention developed in accord with the principles of SDT by designing an autonomy-supportive approach to counseling. Because it is being used to facilitate change of two health-risk behaviors and to examine participants' depressive symptoms, the study will help refine the general approach to promoting health-behavior change based on self-determination theory.

Footnotes

1. Valery I. Chirkov is now in the Department of Psychology, University of Saskatchewan, Saskatoon.
2. In SDT, perceived relatedness is the third psychological state that is theorized to facilitate self-determination and thus maintained behavior change. We have found that in the health-care domain many participants do not spend enough time with their providers to have a sense of relatedness that is independent of their experience of autonomy support, whereas in other domains, such as education and home life, the constructs are separable. Thus, we do not include relatedness as a separate construct in the health-care model.

References

- Abramson, L. Y., Seligman, M. E. P., & Teasdale, J. D. (1978). Learned helplessness in humans: Critique and reformulation. Journal of Abnormal Psychology, *87*, 49-74.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, *84*, 191-215.
- Deci, E. L. (1975). Intrinsic motivation. New York: Plenum.
- Deci, E. L., & Ryan, R. M. (1980). The empirical exploration of intrinsic motivational processes. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 13, pp. 39-80). New York: Academic Press.
- Deci, E. L., & Ryan, R. M. (1985a). The general causality orientations scale: Self-determination in personality. Journal of Research in Personality, *19*, 109-134.
- Deci, E. L., & Ryan, R. M. (1985b). Intrinsic motivation and self-determination in human behavior. New York: Plenum.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, *11*, 227-268.
- Fiore, M. C., Bailey, W. C., Cohen, S.C., et al. (2000, June). Treating tobacco use and dependence. Clinical Practice Guideline. Rockville, MD: U.S. DHHS, Public Health Service.
- Fisher, C. D. (1978). The effects of personal control, competence, and extrinsic reward systems on intrinsic motivation. Organizational Behavior and Human Performance, *21*, 273-288.
- Grundy, S. M., Pasternak, R., Greenland, P., Sidney, S., & Valentin, F. (1999). Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations. Circulation, *100*, 1481-1492.
- Harter, S. (1978). Effectance motivation reconsidered: Toward a developmental model. Human Development, *1*, 661-669.

McGinnis, M. J., & Foege, W. H. (1993). Actual causes of death in the United States. Journal of the American Medical Association, *270*, 2207-2212.

Miller, W. R., & Rollnick, S. (1991). Motivational interviewing: Preparing people to change addictive behavior. New York: Guilford.

National Cholesterol Education Program (NCEP) Guidelines. (1996) Journal of the American Medical Association, *269*, 3015-3023.

Radloff L. (1977). The CES-D scale: A self report depression scale for research in the general population. Applied Psychological Measurement, *1*, 385-401.

Rotter, J. (1954). Social learning and clinical psychology. Englewood Cliffs, NJ: Prentice-Hall.

Rotter, J. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, *80* (1, Whole No. 609). Pp. 1-28.

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. Journal of Personality and Social Psychology, *43*, 450-461.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. Journal of Personality and Social Psychology, *57*, 749-761.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, *55*, 68-78.

Ryan, R. M., Plant, R. W., & O'Malley, S. (1995). Initial motivations for alcohol treatment: Relations with patient characteristics, treatment involvement and dropout. Addictive Behaviors, *20*, 279-297.

Seligman, M. E. P. (1975). Helplessness. San Francisco: Freeman.

Skinner, B. F. (1953). Science and human behavior. New York: Macmillan.

Skinner, E. A. (1995). Perceived control, motivation, and coping. Thousand Oaks, CA: Sage.

Skinner, E., Chapman, M., & Baltes, P. (1988). Control, means-ends, and agency beliefs: A new conceptualization and its measurement during childhood. Journal of Personality and Social Psychology, *54*, 117-133.

Stampfer, M. J., Hu, F. B., Manson, J. E., Rimm, E. B., & Willett, W. C. (2000). Primary prevention of coronary heart disease in women through diet and lifestyle. New England Journal of Medicine, *343*, 16-22.

Weisz, J. R. (1983). Can I control it? The pursuit of veridical answers across the life span. In P. B. Baltes & O. G. Brimm (Eds.), Life-span development and behavior (pp. 233-300). New York: Academic Press.

White, R. W. (1959). Motivation reconsidered: The concept of competence. Psychological Review, *66*, 297-333.

Williams, G. C., Cox, E. M., Kouides, R., & Deci, E. L. (1999). Presenting the facts about smoking to adolescents: The effects of an autonomy supportive style. Archives of Pediatrics and Adolescent Medicine, *153*, 959-964.

Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: A test of self-determination theory. Journal of Personality and Social Psychology, *70*, 767-779.

Williams, G. C., Freedman, Z., & Deci, E. L. (1998). Supporting autonomy to motivate patients with diabetes for glucose control. Diabetes Care, *21*, 1644-1651.

Williams, G. C., Gagné, M., Ryan, R. M., & Deci, E. L. (in press). Facilitating autonomous motivation for smoking cessation. Health Psychology.

Williams, G. C., Grow, V. M., Freedman, Z., Ryan, R. M., & Deci, E. L. (1996). Motivational predictors of weight loss and weight-loss maintenance. Journal of Personality and Social Psychology, *70*, 115-126.

Williams, G. C., Rodin, G. C., Ryan, R. M., Grolnick, W. S., & Deci, E. L. (1998). Autonomous regulation and long-term medication adherence in adult outpatients. Health Psychology, 17, 269-276.

Woolf, S. H. (1999). The need for perspective in evidence-based medicine. Journal of the American Medical Association, 282, 2358-2365.

Table 1

Psychometric Instruments Used in the Study, with Acronyms and the Constructs They Assess.

Treatment Self-Regulations Questionnaire (TSRQ)	Autonomous Regulation for health behavior
Perceived Competence Scale (PCS)	Perceived Competence for health behavior
Health Care Climate Questionnaire (HCCQ)	Perceived Autonomy Support from providers
General Causality Orientations Scale (GCOS)	Autonomy Orientation as individual difference

Note. All four scales used in this research can be found on the web at: <http://psych.rochester.edu/SDT/> in the Questionnaires section.

Figure Caption

Figure 1. The Self-Determination Theory model of maintained behavior change.

