Theoretical Approaches to Motivating Change: A Farm Family Case Example

Carole H. Lund, Ann K. Carruth, Karen B. Moody, and Cynthia A. Logan

ABSTRACT

The purpose of this article is to assist health educators and students to integrate theory with practice by examining four major learning theories for their implications for motivating healthy behavior change. Using a prototypical case example based on the authors' experiences with farm families through community health screenings, the learning theories of behaviorism, constructivism, transtheoretical model of health behavior change, and social ecological theory are examined. The four theories are described and the family's attitudes and health behaviors are interpreted from each perspective. Case-specific examples of how the learning theories can be used to motivate change and promote health-seeking behavior are provided. Guidelines are offered that have heuristic and practical utility for educators and students in applying learning theory to health promotion interventions.

One of the goals of targeted health screening at the community level is to motivate individuals with identified risks to modify their behavior toward more healthy outcomes. The farm family presents a unique challenge to health educators in regards to altering health behavior because of overlapping risk factors associated with indigenous occupational and environmental conditions. For example, extreme ranges of ambient temperature, long work hours, job-related stress,[1] and loud noise[2] have been associated with elevated blood pressure. Environmental pollution with carbon monoxide from vehicular and heavy machinery exhaust is thought to damage heart muscle.[3] Heavy lifting and prolonged sleep deprivation have been associated with increased risk of heart disease.[1] Many of these conditions impact the entire farm family since members typically live within the work environment and they mutually contribute to farming operations.

The purpose of this article is to integrate theory with practice by examining four major learning theories for their implications for motivating healthy behavior change. The desired behavior change is reduction of risky heart health activity among farmers and their families selected by nurse faculty and students through School of Nursing health screenings. Within the context of the Healthy Farm Families Initiative (HFFI), a National Institute for Occupational Safety and Health (NIOSH) grant-funded project, at-risk farm families are identified through targeted screenings for health education, prescribed risk reduction behaviors, and evaluated for compliance with recommended change. A challenge for faculty is to teach students how to motivate and facilitate health behavior change based on theory.

Using a case illustration format, the authors examine four learning theories including behaviorism, constructivism, the transtheoretical model of health behavior change, and social ecological theory to illustrate their practical use in promoting healthy behavior change. Behaviorism draws heavily on learned behavior, constructivism emphasizes cognitions (thoughts), the transtheoretical model targets stages of change, and the social ecological theory emphasizes human interaction

Carole H. Lund, PhD, APRN, BC, is a professor of nursing at Southeastern Louisiana University, SLU 10448, Hammond, LA 70402; E-mail: clund@selu.edu. Ann K. Carruth, DNS, RN, is professor of nursing and Project Director of the Healthy Farm Families Initiative at Southeastern Louisiana University, SLU 10835, Hammond, LA 70402. Karen B. Moody, PhD, RNC, is assistant professor of nursing at Southeastern Louisiana University, 4849 Essen Lane, Baton Rouge, LA 70809. Cynthia Logan, PhD, RN, is associate professor of nursing at Southern Louisiana University, 4849 Essen Lane, Baton Rouge, LA 70809.

Partial support of this work was provided by the Southwest Center for Agricultural Health, Injury Prevention, and Education under CDC/NIOSH Cooperative Agreement 1 U50 OH07541-01.

within the social environment. Each perspective has heuristic and practical implications that can be used to enhance health.

This article begins with a prototypical case example based on a composite of the authors' experiences with farm families in rural Louisiana in association with the HFFI project. Issues are raised about the family's motivation to modify lifestyle behaviors that they know would help lower their risk for heart disease. Next, the four learning theories are described and the family's attitudes and behaviors are interpreted from each perspective. Finally, case-specific examples of how each perspective could be used to motivate change and facilitate health are provided. Guidelines are offered in table format that can help health educators and students conceptualize the practical applications of each learning theory and convert them into specific motivational interventions for promoting health-seeking behavior.

THE THOMAS FAMILY: A CASE EXAMPLE

The Thomas family attended an annual Dairy Day in which nursing students from a nearby school of nursing and a community health educator were conducting heart health screenings. The Thomas family includes Sam, a 50 year old dairy farmer, whose sole employment is the family farm; Janet, his 48 year old wife, who has worked on the dairy farm all of her adult life; and Ted, their 18 year old son, a high school senior who lives at home and helps out with farm chores. The family's dietary habits include a hearty consumption of dairy and animal products high in fat content. Screening identified the following risk factors for Sam: an elevated body mass index that indicated obesity, waist circumference greater than 40 inches, elevated total cholesterol of 248, and history of treatment for hypertension. Both Sam and Janet reported high stress levels, long working hours, and economic concerns abut the viability of the farm. Ted was also found to be overweight with elevated cholesterol levels and he frequently worked long hours after school to assist with farm duties. Both men acknowledged their need to reduce their risks for heart disease but neither expressed a desire to alter his behavior. Janet voiced concern to the health educator regarding the men's lack of motivation to change their respective lifestyles and eating habits.

THEORETICAL PERSPECTIVES OF LEARNING

Since learning is viewed as being "a persistent change in behavior as a result of experience,"[4] learning theories that have specific implications for motivating behavior change will be considered. The four major learning theories that will be addressed are behaviorism, constructivism, transtheoretical model of health behavior change, and social ecological theory. The purpose of this section is to describe each theoretical approach to learning and to interpret the Thomas family case from each perspective.

Behaviorism

The focus of behavioral theory is on the behavior of people and not on what they think or feel. Behaviorists view personality as consisting of a series of learned behaviors; they postulate that a change in behavior will ultimately lead to a change in personality.[5,6] This perspective is very appealing to practitioners who deal with people with problem behaviors and enjoy widespread use for treating addictive and anxiety disorders. Since it is easier to change behavior than personality,[7] the thinking is that as behavior changes, the thoughts and feelings will follow.

Behavioral theory addresses the relationship between measurable stimuli and behavioral responses that, when combined with reinforcement, lead to learned behaviors.[8] Learning is thought to occur when the learner makes an association between a specific stimulus and a response as a result of repeated exposure to both. This stimulus-response (S-R) association occurs in both accidental and planned situations and leads to a conditioned response, or habit formation. Teaching from this perspective involves arranging stimuli to elicit desired responses and then positively reinforcing the learned responses. Reducing or eliminating undesired, or unhealthy, behavior is a matter of ignoring or negatively reinforcing undesired responses. The ultimate goal of behaviorism is the transferability of learned behavior to new situations that fall under the control of the learner.

Behavioral therapists generally base their interventions on operant conditioning and reinforcement theory, and work under the assumption that unhealthy or maladaptive behavior can be changed through a system of rewards and punishments rather than the development of psychological insights.[6-8] These principles underlie many learning and behavioral interventions such as behavior modification, aversion therapy (negatively reinforcing undesired behavior such as smoking), and contingency contracting (negotiating an agreement that reinforces a targeted behavior change within a specified time frame).

Interpretation. A view of the Thomas family from the behaviorist perspective reveals that Sam had experienced many years of conditioning and reinforcement of his lifestyle as being healthy, satisfying, and productive. As far as he was concerned, his established patterns of eating and working were producing consistent desired outcomes for him and his family. Over the years, Sam, Janet, and Ted developed mutually reinforcing lifestyle and dietary habits consistent with their farm life and resources. Janet was able to cook with fresh animal and dairy products that satisfied the men's hearty appetites. The men's eating styles became secondary reinforcements that encouraged Janet to prepare meals featuring rich cream and animal products high in fat content. This interacting set of attitudes, behaviors, and past experiences became antecedent conditions that shaped the health profile of the family.

When Sam received notice that he had developed high cholesterol levels, he indicated no interest to act. Janet only became noticeably concerned when she connected several indicators that something was wrong, including the presence of multiple

cardiovascular risk factors for her husband and son. This stimulus-response reaction prompted Janet to act by voicing concern about her husband and son's lack of motivation to the health educator.

Constructivism

Constructivism involves a cognitive rather than behavioral approach to learning in which individuals construct mental representations that direct behavior and problem solving. Constructivist approaches to health education are particularly relevant because of the complex mixture of attitudes, beliefs, and experiences associated with an individual's behavior. Principles of constructivism have been applied in such health initiatives as reducing chronic risk factors,[9] assisting women with fibromyalgia to develop meaningful health interventions,[10] and motivating heart healthy-behavior through community building and development.[11]

Constructivists view learning as a process through which the learner takes in and organizes knowledge structures called schema. The learner continually modifies the structure and linkages of information, forming a ground to which other knowledge structures are attached.[12] Learners respond to their sensory experience by constructing these schema, or mental maps, which constitute the meaning and understanding of their world.[13-15] Through assimilation of new information with existing knowledge, and reflection upon past experiences and understandings, individuals can construct schema that facilitate the formation of desired goals and behavioral intentions. Many researchers have found that behavioral intentions predict behavior much more effectively than do attitudes alone.[16,17]

The most salient feature of the constructivist perspective is the notion that individuals create knowledge by linking new knowledge with old. New knowledge becomes meaningful by the ways in which learners integrate it with existing knowledge and beliefs, previous experiences, and the context in which learning occurs. Lambert and colleagues[16] identify the following essential principles of constructivist learning theory: knowledge and beliefs are formed within the learner; learners personally imbue experiences with meaning; learning activities prompt learners to gain access to their experiences, knowledge and beliefs; learning is a social activity that is enhanced by shared inquiry; and reflection and metacognition are essential aspects of constructing new knowledge and meaning.

Interpretation. From a constructivist perspective, the Thomas family's behaviors may be interpreted to reflect the learning process within the context of their life circumstances. Many critical factors have contributed to the development of the final mental maps from which their attitudes, beliefs, and behaviors have derived. Personal insights into existing beliefs and values, meaning imbued from past experiences, and referent group influences all factor into the learning process. In this light, Sam and Ted's seeming complacency with their present lifestyle can be understood even though it may not be the reaction Janet desires. Their mental maps have been well entrenched over many years and reinforced by referent groups at school and in the community. They have lived and worked on a dairy farm all their lives and this has imbued their lifestyle and eating behaviors with special meaning. Although both men acknowledge their risk for heart disease, neither is prompted to reflect on it nor seek new information. Janet adds to her existing worry a new layer of concern about the men's health.

Transtheoretical Model of Health Behavior Change

The Transtheoretical Model of Health Behavior Change (TTM), formerly referred to as the Transtheoretical Model of Change, is derived from a comparative analysis of leading theories of behavioral change and psychotherapy culminating in the conception of change as a process that takes place in stages over time.[19] The model addresses how people change their behaviors, with a person's readiness for change as the focus. The TTM has been successfully applied to a variety of behavior-change programs including exercise promotion,[18-20] smoking cessation,[21,22] and dietary compliance.[23]

TTM integrates individual decision-making processes with a stepwise process of change that occurs in six stages: pre-contemplation, contemplation, preparation, action, maintenance, and termination. Identification of an individual's stage of change facilitates appropriate goal setting and intervention. In addition to the stages of change, TTM includes the components of decisional balance and self-efficacy.[24] The advantage of using the TTM approach for behavioral change is that it not only assesses one's stage of change but also the level of confidence one has in employing strategies to carry out the change.[25]

Using the TTM to promote behavioral change requires individualization of education and counseling strategies in order to match the strategy to the stage of the person. An understanding of the model is essential to meeting the client's needs at the assessed stage of change. By asking specific questions about the target behavior, the health educator can not only identify the particular stage of change but also tailor interventions to that stage. For example, providing written material about the benefits and risks of unhealthy behavior would be appropriate for individuals in the pre-contemplation stage in order to raise consciousness and provoke self-evaluation. On the other hand, mutual planning would not be effective in this stage since the client does not yet intend to change.[20]

Interpretation. From the perspective of TTM, Sam is in the pre-contemplation stage as he demonstrates complacency, even comfort, with his present situation, and no intention to change his high-risk lifestyle. He has been made aware of his coronary health risks through screening, treatment for hypertension, and concerns expressed by his wife. Even though he does not lack knowledge of his health status, Sam avoids confronting the problem and learning more about his risks. Sam shows no evidence of decisional conflict regarding his health, although he could doubt his self-efficacy in committing to action.

Ted understands that he is showing signs of heart risk but is not motivated to change

his behavior soon. Instead, Ted avoids dealing with the issue by keeping himself busy with school and farm activities. Encouragement and support from Janet may help bolster a sense of self-efficacy in both men and prompt them toward a contemplative position. Janet appears to be at a higher stage of change than either Sam or Ted in that she appears to be ready to make lifestyle changes in spite of being discouraged by the men's complacency.

Social Ecological Theory

The social ecological perspective suggests that a way to achieve necessary change toward desired behavior is to implement comprehensive, community-based strategies that are grounded within the social and cultural context in which the target behavior occurs.[26,27] The defining feature of a social ecological view is that strategies for behavior change must take into account the physical and social environments and their relationships to the intrapersonal, interpersonal, organizational, and community levels of human experience. The social ecological perspective has been effectively applied to interventions targeting behavior change, including the promotion of heart-health activities,[28] worker participation in health promotion and protection activities,[29] and reduction of adolescent alcohol consumption.[30]

Social ecologists do not view knowledge, attitudes, and behavior from the perspective of individual cognitions or habits, but rather across the entire social and ecological spectrum within which individuals operate. According to this perspective, changes in health behavior require intervention strategies that target families and groups as a whole and take into consideration the shared social and cultural influences that shape their collective identity.[31] These factors are organized into levels of influence that include intrapersonal (e.g., individual knowledge, attitudes, and behaviors), interpersonal (e.g., family, friends, acquaintances), institutional (e.g., vocational, educational, health care entities), community (e.g., agencies, groups, coalitions), and public policy (e.g., civic and governmental regulations and laws). The relevance of this learning theory is that strategies used to promote behavior change are not achieved at the individual level but rather at the interactive levels of social experience.

Interpretation. The social ecology perspective focuses on the interactions and environmental forces that impact the everyday life activities of the Thomas family as they work toward common goals. A collective identity has developed among the family members that is the product of an ongoing exchange with the farm work at hand, shared lifestyle activities, and lifelong interactions with referent groups in the community.

Intrapersonal, interpersonal, and social forces influence the family's attitudes about health. The intrapersonal level of social ecology takes into account each person's knowledge, attitudes, values, and skills in relation to health. The Thomases have farmed all their lives and have well-established eating habits and work routines that are satisfying and productive. Interpersonal influences on the family include social networks, family members, work groups, neighbors, and people in the community. Ted is subject to fast-food marketing and media advertising and may join peers in eating foods high in calories and trans fats after school. Social stressors on Sam and Janet include the economic burdens of farm life and their implications for family security. Environmental stressors include temperature extremes, loud noises, and exhaust fumes that the men are subject to while farming.

At the organizational level, the social ecology model includes community resources, neighborhood organizations, social and health services, organizational relationships, and governmental bodies. As part of a community of farmers, Sam attends farm organizational meetings that are helpful from an educational and social perspective, but which expose him to political and economic stressors beyond his control.

THEORY-BASED INTERVENTIONS FOR THE THOMAS FAMILY

The learning theories described above reflect different assumptions, attitudes, and processes within the learner as well as unique perspectives regarding the focus and role of the educator. In order to provide clarity about how the theories would guide the educational process, this section will provide case-specific examples of how each could be applied in a health education context to help motivate healthy behavior change. Guidelines that highlight the practical applications of each theory are also presented (Table 1).

Behaviorism

One behavioral intervention used by the health educator to motivate Sam to exercise regularly and lose weight might be the use of a tool known as a contingency contract. A contingency contract is a mutually negotiated agreement that stipulates the means of achieving specific behavioral change in an identified person. The contingency aspect specifies reinforcements that reward the desired behavior when it occurs. In this example, the educator would develop a written contract with Sam in which he would agree to specific behaviors related to the promotion of heart health; rewards that Sam would receive when he is in compliance with the terms would also be stipulated. For instance, the contract might specify that Sam lose one to two pounds a week by reducing his dietary intake by 800 calories per day and briskly walking two miles five times a week. The contract would include Sam's agreement to continue these activities until he reached his desired weight as validated by weekly recordings by Janet. The educator could provide Janet with low-calorie dessert recipes and instruct her to reward Sam with a homemade dessert of his choice if he met his weekly goal. If he failed to meet his goal, Janet would be instructed to remain neutral and provide no praise or dessert. When Sam met his weight goal, the contract would specify that Janet and Ted accompany him to the western store to buy new clothes in his smaller size.

In this example, specific short- and long-term goals were set in the contingency contract with measurable behavioral objectives (reduced calories and increased exercise) and outcome goals (weight loss). Goals were clearly established so that success could be

Table 1. Guidelines for Practical Application of Learning Theories

Behaviorism: uses conditioning and reinforcement techniques to alter human behavior
▪ Mutually identify with the learner a behavior target for change. ▪ Provide positive feedback (reward) to the learner when desired behavior occurs. ▪ Offer prompt feedback (reinforcement) that is satisfying and beneficial when desired behavior occurs. ▪ Ignore or refuse to respond positively to undesired behavior by the learner. ▪ Encourage family members and/or significant others to reinforce desired behavior.
Constructivism: employs mental mapping to guide progress toward desired behavior
▪ Assess learner's current knowledge and beliefs about the targeted behavior. ▪ Design teaching activities that prompt learner to access past experiences, knowledge, and beliefs concerning the behavior. ▪ Employ reflection and problem solving to form new behavioral intentions. ▪ Encourage learner to construct new mental images (maps) of desired behavior using real-life situations. ▪ Assist learner to integrate new mental images with their previous knowledge and beliefs.
Transtheoretical Model: integrates decision making with stage of change to modify behavior
▪ Identify learner's stage of change within the TTM model. ▪ Assess learner's readiness for change and confidence level. ▪ Develop behavioral goals appropriate to the stage of change. ▪ Negotiate realistic steps for change that take into account the need for social support. ▪ Develop stage-matched interventions tailored to the learner's goals and needs.
Social Ecological Theory: focuses on social and physical environmental cues to shape behavior
▪ Identify key individuals and groups to help determine desired behavioral change. ▪ Examine factors interacting with current behavior including individual and community influences. ▪ Determine community's stage of readiness and competence to address relationships among the interacting factors and the identified behavior. ▪ Establish an organizational structure to address community goals and evaluate the community's capacity for action. ▪ Target multiple intervention strategies at the intrapersonal, interpersonal, organizational, community, and/or policy-formation levels.

measured and validated by a meaningful person in the environment—in this case, his wife. Janet's role in monitoring and reinforcing Sam's behavior was clearly stated in the contract and occurred on a regular, sequential basis. Rewards (low-cal homemade desert and new clothes) and consequences (absence of dessert and praise) of Sam's agreed-upon behavior change were integrated into the contract as positive and negative reinforcements. The positive reinforcements, or rewards, were compatible with the outcome goals and served to educate the family on healthy dietary choices and exercise patterns.

Constructivism

A constructivist approach to the Thomas family would include measures that would help them organize information to facilitate their ability to solve problems and make healthy choices. Assimilation of new information with existing knowledge and experience should be consistent with each family member's level of understanding. For instance, the health educator could help Sam integrate the results of his screening tests with his understanding of hypertension to allow him to add to his knowledge and reappraise his health needs. For Ted, the educator would support his efforts to construct a new mental picture of his altered health status and acquire new information to make sound dietary choices. Janet would be encouraged to appreciate her role in preparing meals and could look to the educator to help her resolve problems about adjustments to make in her cooking.

The educator can draw on information from a detailed assessment of the family's medical history, dietary practices, exercise patterns, concerns, and occupational risks to help them identify and prioritize their concerns. Each member can assimilate the new information with existing knowledge and reflection upon past experiences and construct new schema that facilitate goal setting and behavioral intentions.

The health educator would assist Sam and Ted to make mental connections between their heart risk factors and possible adverse outcomes that could facilitate a decision to change their lifestyle. Sam could be encouraged to draw on knowledge of friends, family, or neighbors who had dealt with heart disease and the changes that ensued in their lives. This might provoke him to contemplate what would happen to his family, farm, and livelihood in the event he had a heart attack and needed to go through a lengthy recovery.

Transtheoretical Model of Health Behavior Change

Goals and interventions that are based on the TTM are stage-specific and unique to the individual. During the time Sam remains in the pre-contemplation stage and no intention to change has been formed, he may still be receptive to information from health educators and literature in health clinics and farm journals. The goal of intervention at this stage would be to increase Sam's awareness of the need to change. Lack of knowledge or an unfortunate past experience may affect his readiness to change at this stage. Sam may be willing to take medication for hypertension, yet unwilling to change other factors. Janet may be at a higher stage of change than Sam, and ready to introduce some behavioral modifications.

In the contemplation stage, the health educator should include questions for discussion that confront the health problem. Asking Sam to identify barriers to change and ways he might remove them may provoke him to reflect on the consequences of his current lifestyle. Sam's motivation and confidence may be enhanced by discussion of a tailored, realistic action plan that includes education elements. At this stage, Sam may acknowledge the need for change but may not be ready to commit to action.

As Sam reaches the preparation stage, a plan for one or more changes can be negotiated with the health educator. Identifying areas in which Sam can experience early success is especially important at this stage. Also, the educator should involve other family members who may be affected by the plan to help activate the plan and support Sam' efforts.

Social support is an important positive reinforcement in the action and maintenance stages of change. Here, Sam can be expected to have made one or more lifestyle changes such as modifying dietary habits to reduce cholesterol and initiating exercises to promote weight loss. Positive reinforcement and plans to avoid non-compliance will help Sam maintain his commitment to new behaviors. The health educator can support change efforts by making follow-up telephone calls to Sam, discussing meal preparation options with Janet, and suggesting ways for Sam and Ted to integrate exercise into their farm activities. Encouragement and reinforcement will not only facilitate their efforts to change but also forestall relapse, which is a frequent problem during the action and maintenance stages.

Social Ecological Theory

Using the ecological model for health education with the Thomas family will require focusing attention on each member within the context of their social environment. The goal of intervention is to target multilevel influences. First, the intrapersonal and interpersonal influences need to be identified through careful analysis of the home environment (e.g., individual health behaviors and interactions) and social groups (e.g., impromptu gatherings at the feed store or local cafe). The health educator would select intrapersonal interventions that promote healthy food choices and activity levels within the family. At the interpersonal level, the educator would target extended family and social networks regarding their shared experiences with meals, farm life, and occupational stressors.

Organizational and community entities such as school, work, religious, and civic groups also have the capacity to influence the health perceptions and behaviors of the Thomas family. The community provides the family with a cultural identity, resources, relationships, and opportunities for influence. Since they are important transmitters of social norms and values, organizational and civic groups can offer a forum for building support for change.[31] For instance, cooperative extension agencies sponsor meetings and events that can help farm families with similar interests share information and organize coalitions for action. The Thomases could be encouraged to form a coalition from multiple sectors of the community to mobilize a community-wide plan to address farm-related stressors and health problems. This could help Sam interpret his own health problems across multiple social strata and involve a network of supporters in the promotion and reinforcement of desired change.

CONCLUSION

The contrast of the four theoretical perspectives demonstrates how they lead to very different conclusions regarding the range and nature of interventions available to health educators. Each reflects a different view of teaching, learning, and motivation. Three theories—the behaviorist, constructivist, and transtheoretical model of health behavior change—primarily focus on the individual as the locus of change, while the social ecological perspective targets social interactions within the contextual environment for change.

The HFFI project has provided an opportunity for faculty and students to draw on the tenets of learning theory to help motivate healthy behavior change among farm families in a real-world context. Students are encouraged to match the theoretical approach with the nature and scope of the learning task. For instance, behaviorist reinforcement strategy is useful for modifying targeted or habitual behaviors (e.g., eating patterns, substance abuse); information processing and problem-solving draw on the cognitive tasks of constructionism; building confidence and commitment to change fit a transtheoretical approach; and multi-level community education and marketing efforts are compatible with social ecology.

In working with populations with indigenous risks such as farm families, it is important to consider a combination of approaches that feature individual as well as socio-cultural elements. Lifestyle and occupational attributes draw on a plethora of affective, behavioral, and social influences and the methods used to impact them must be multifaceted. The challenge is to select and integrate relevant elements of complementary frameworks while making adjustments to the realities and uniqueness of learners and their respective environments.

REFERENCES

1. Steenland K. Shift work, long hours, and cardiovascular disease: A review. *Occupational Med.* 2000; 15: 7–17.

2. Penney PJ. Occupational noise and effects on blood pressure: Exploring the relationship

of hypertension and noise exposure in workers. *Am Assn Occupational Health Nurses*. 2004; 52 (11): 476–480.

3. Stern FB, Lemen RA, Curtis RA. Exposure of motor vehicle examiners to carbon monoxide: A historical prospective mortality study. *Arch Environ Health.* 1981; 36: 59–66.

4. Boyd MD, Graham BA, Gliet CJ, et al. *Health teaching in nursing practice: A professional model*. Stamford, CN: Appleton & Lange; 1998.

5. Skinner BF. *Science and human behavior*. Riverside, NJ: Macmillan; 1953.

6. Coates VE. *Education for patients and clients*. New York, NY: Routledge; 1999.

7. Littell J, Girvin H. Stages of change: A critique. *Behavior Modification*. 2002; 26: 223–274.

8. Skinner BF. *Contingency of reinforcement: A theoretical analysis*. New York, NY: Appleton-Century-Crofts; 1969.

9. Labonte R, Robertson A. Delivering the goods, showing our stuff: The case for a constructivist paradigm for health promotion research and practice. *Health Educ Q*. 1996; 23 (4): 431–437.

10. Sylvain H, Talbot L. Synergy towards health: A nursing intervention model for women living with fibromyalgia and their spouses. *J Adv Nursing*. 2002; 38 (3): 264–273.

11. Campos M. A constructivist method for the analysis of networked cognitive communication and the assessment of collaborative learning and knowledge-building. *J Asynchronous Learning Networks*. 2004; 8 (2): 1–29.

12. Saunders W. The constructivist perspective: Implications and teaching strategies for science. *School Science and Mathematics*. 1992; 92: 136–141.

13. Ausubel DP, Novak JD, Hanesian H. *Educational psychology: A cognitive view.* 2nd ed. New York, NY: Werbel & Peck (reprinted); 1986.

14. Brunner J. *Acts of meaning*. Cambridge, MA: Harvard University Press; 1990.

15. Novak J. *Learning, creating and using knowledge: Concept Maps™ as facilitative tools in schools and corporations*. Mahwah, NJ: Lawrence Erlbaum Associates; 1998.

16. Lambert L, Walker D, Zimmerman D, et al. *The constructivist leader*. New York, NY: Teachers College Press; 1995.

17. Maddux JE, DuCahrme KA. Behavioral intentions in theories and health behavior. In Gochman DS, ed. H*andbook of health behavior research: Personal & social determinants*. New York, NY: Plenum; 1997: 133–151.

18. Kao Y, Lu C, Huang Y. Impact of a transtheoretical model on the psychosocial factors affecting exercise among workers. *J Nur Rsch,* 2002; 10: 303–309.

19. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. A*m J Health Promotion,* 1997; 12: 38–48.

20. Burbank PM, Reibe D, Padula CA, et al. Exercise and older adults: Changing behavior with the transtheoretical Model. *Orthopaedic Nur.* 2002; 21: 51–62.

21. Clarke KE, Aish A. An exploration of health beliefs and attitudes of smokers with vascular disease who participate in or decline a smoking cessation program. *J Vascular Nur.* 2002; 20: 96–105.

22. Velicer WF, Prochaska JO, Fava N, Redding CA. Smoking cessation and stress management: Applications of the transtheoretical model of behavior change. *Homeostasis*, 1998; 38: 216–233.

23. Kasila K, Poskiparta M, Karhila P, et al. Patients' readiness for dietary change at the beginning of counseling: A transtheoretical model-based assessment. *J Human Nutrition and Dietetics.* 2003; 16: 159–166.

24. Prochaska JO, DiClemete CC. Stages of change in the modification of problem behaviors. In: Hersen M, Eisler, RM, Miller PM, eds. *Progress in behavior modification*. Sycamore, IL: Sycamore Press; 1992: 184–214.

25. Astroth DB, Cross-Poline GN, Stach DJ, et al. The transtheoretical model: An approach to behavioral change. *J Dental Hygiene,* 2002; 76: 286–295.

26. Glanz K, Lewis ML, Rimer B. *Health behavior and health education*. San Francisco, CA: Jossey-Bass; 1997.

27. Goodman RM, Wandersmann A, Chinman M, et al. An ecological assessment of community-based interventions for prevention and health promotion: Approaches to measuring community coalitions. *Am J Community Psychology.* 1996; 24: 33–61.

28. Riley B, Taylor M, Elliot S. Determinants of implementing heart health promotion activities in Ontario public health units: A social ecological perspective. *Health Educ Res*. 2001; 16 (4): 425–441.

29. Sorensen GI, Stoddard A, Ockene JK, et al. Worker participation in an integrated health promotion/health protection program: Results from the Wellworks Project. *Health Educ Q*, 1996; 23 (2): 191–203.

30. Perry CL, Williams CL, Mortenson SV, et al. Project Northland: Outcomes of a community wide alcohol use prevention program during early adolescence. *Am J Pub Health*. 1996; 86: 956–965.

31. Stokols D. Translating social ecological theory into guidelines for community health promotion. *Am J Health Promotion*. 1996; 10: 282–293.