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Family Self-tailoring: Applying a Systems Approach to Improving Family Healthy Living Behaviors

Shirley M. Moore, PhD, RN^a [Edward J. and Louise Mellen Professor and Associate Dean for Research], Lenette Jones, PhD, RN^a [Postdoctoral Fellow], and Farrokh Alemi, PhD^b [Professor of Administration and Policy]

^aFrances Payne Bolton School of Nursing, Case Western Reserve University

^bGeorge Mason University

Abstract

The adoption and maintenance of healthy living behaviors by individuals and families is a major challenge. We describe a new model of health behavior change, SystemCHANGE™ (SC), which focuses on the redesign of family daily routines using system improvement methods. In the SC intervention families are taught a set of skills to engage in a series of small, family self-designed experiments to test ideas to change their daily routines. The family system-oriented changes brought about by these experiments build healthy living behaviors into family daily routines so that these new behaviors happen as a matter of course, despite wavering motivation, willpower or personal effort on the part of individuals. Case stories of the use of SC to improve family healthy living behaviors are provided. Results of several pilot tests of SC indicate its potential effectiveness to change health living behaviors across numerous populations.

Keywords

behavior change interventions; system improvement; process improvement; habit building; system change; healthy living habits; family lifestyle change

Introduction

Healthy living behaviors include adequate physical activity, healthy eating, sufficient sleep, and stress management. Assisting individuals and families to adopt and maintain healthy living behaviors, however, remains a major challenge for health care professionals. Although social learning theory¹⁻³ and cognitive-behavioral approaches (i.e., motivational

Contact author: Shirley M. Moore, RN, PhD, FAAN, Edward J. and Louise Mellen Professor of Nursing, Frances Payne Bolton School of Nursing, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH, USA 44106-4904, smm8@case.edu.

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interviewing,⁴ self-efficacy enhancement,⁵ cognitive behavioral therapy)^{6,7} to behavior change have greatly contributed to our understanding of how people are motivated to change and maintain their behaviors, these theories have shown only limited effectiveness in producing lasting behavior change. The ecological models of behavior change^{8,9} are promising new approaches in which the environment is posited as a major influence on peoples' behavior. The ecological models of behavior change (e.g., choice architecture,¹⁰ nudge theory,¹⁰ habit building¹¹) propose that changing the environment is key to creating lasting behavior change. Ecological frameworks of behavior change shift the focus from the individual to the person's immediate environment surrounding the performance of habitual behaviors. The most immediate environments influencing healthy living behaviors are the daily activities that comprise a family's home, school, and work routines. These daily routines comprise a system of activities resulting in behaviors that lead to health outcomes. Systems theory implies that every system is perfectly designed to achieve the outcomes it gets. Assisting families to focus on changing the daily systems in their lives (events, circumstances or activities) that affect healthy lifestyle behaviors may be a more fruitful approach to health behavior change than an emphasis on motivational approaches. The Systems Improvement Model¹²⁻¹⁵ is an ecological model that consists of a set of strategies to change a system to achieve a specific goal. The purpose of this paper is to describe a new model of health behavior change, SystemCHANGE™ (SC), which focuses on the redesign of family daily routines using system improvement methods to support healthy living behaviors. In contrast to the current predominate cognitive-behavior change models that focus on peoples' motivation and personal efforts to improve healthy living behaviors, the SC intervention helps families to slowly re-engineer their daily routines that lead to better health behavior habits.

A System Improvement Approach to Health Behavior Change

The System Improvement Model¹⁵ is a philosophy and methodology for making change. System improvement techniques were introduced in the 1950's by Edward Deming¹² to improve the work processes of Japanese and American factories and more recently has been adopted as a major framework to improve systems in the health care industry. Figure 1 lists the steps in the System Improvement Model by which change in a system is best accomplished.¹⁶

A major emphasis of system improvement is *systems thinking*. We define systems thinking as the ability to recognize, understand, and synthesize the interactions and interdependencies in a set of components designed for a specific purpose. This includes the ability to recognize patterns and repetitions in the interactions and an understanding of how actions and components can reinforce or counteract each other. These relationships and patterns occur at different dimensions: temporal, spatial, social, technical or cultural.^{17,18} Systems thinking enhances the awareness of the interdependencies in people, activities, and routines and to view an event, activity, or problem as occurring as part of a chain of events of a larger system rather than as an independent event. It includes the process of accounting for the influence of various people, circumstances and historical choices on the outcome (behavior) we wish to modify. By definition, systems thinking links a person's environment to his/her

behavior. Few people, however, view their daily routines as a system or realize that all systems can be changed.

A significant difference between the cognitive-behavioral models and the system improvement model to change behavior is the role of motivation. Motivation is an inwardly focused function; it varies over time and periodic lack of motivation can ultimately produce a complete absence of the desired behavior (“Why should I even bother trying to exercise when I never follow through?”). The System Improvement model focuses on the environment and how personal routines enable or inhibit a particular behavior. An emphasis is placed on re-engineering the environment (such as a daily routine), rather than making changes that focus on an individual's willpower, reliance on memory, or increased personal effort. Another important distinction between a cognitive-behavioral approach and a system improvement approach to behavior change involves the participation of others. In cognitive-behavioral approaches, other people in a person's environment may function to encourage and support the person's motivation to reach his or her goal (e.g., to continue to exercise), while in the system improvement method other people function in a different capacity. Considered an element of the subject's environment, other people are crucial in determining whether and when the participant can achieve his or her goals. For example, in a cognitive-behavioral intervention friends or family members of a person might encourage the participant to exercise, remind them to exercise, or even exercise with them (“exercise buddies”). In contrast, in a system improvement behavior change approach, participants consult with friends and family members to determine how their personal environments are interconnected and how these interconnections (e.g., family obligations, personal schedules) influence the performance of exercise.

Another difference in a behavioral intervention based on the system improvement model as compared to a cognitive-behavioral model of behavior change is the emphasis on discovering and understanding the root cause of a particular behavior pattern. Using the tools of system improvement, participants are assisted to gain insight into the cause and effect relationship of their environment and the current and desired behavior. For example, a common method used in system improvement is to develop a fishbone diagram,^{13,19} a visualization tool in which the branching of fish bones from a spine provides a way for categorizing the potential causes of a problem in order to identify its root causes. In the SC intervention, participants develop a fishbone diagram to elicit the personal enhancers and constraints to performing a particular behavior. A Cause & Effect Diary^{14,16} is also kept by participants in which they track the extent to which personal enhancers and constraints are present on any given day. Lastly, in system improvement, it is important that the test of a change idea be focused on a *system-oriented* change as opposed to a change aimed at an individual. Figure 2 provides examples of behavior change ideas (in this case, for exercise) that are on a continuum of individual-oriented to system-oriented. The goal of system-oriented change strategies is to change environmental patterns (daily routines) so that the target behavior happens as a matter of course, with little or no personal effort or willpower on the part of the individual. The environment supports the automaticity of the new behavior, thus creating a new habit. The SC intervention employs features of choice architecture theory¹⁰ that specifies that in situations where choices could be made, people often use default options (doing nothing or not making a decision). In the SC intervention, the small

environmental changes made in family daily routines eventually structure an environment in which their decisions are environmentally-engineered to be healthier choices. In other words, even default decisions are healthier ones. As such, we highlight the primacy of the redesign of family daily routines.

Systems thinking for personal health behavior change is relatively new. Green and Kreuter in 1990⁹³ introduced the Precede-Proceed model emphasizing that people should look at what precedes a behavior and what follows to understand the barriers and reinforcements. The Precede-Proceed approach was one of the earliest approaches to system thinking within a personal context and has shown some success in producing desired health behavior change.^{20,21} Roberts and Sergesketter²² suggested that the philosophy and methods of system improvement be applied in learning how to make personal improvements. Our team has gone beyond the work of these investigators and has designed and tested the first health behavior change intervention based on the System Improvement Model.

The SystemCHANGE™ Intervention

The new behavior change intervention (SC), is designed to assist individuals and families to change their daily routines. In this intervention, family, work, and school routines are considered the intimate environment affecting healthy living behaviors. SC focuses on system redesign of the family daily routines using a series of small, family self-designed experiments using the process described in Figure 1. Our results to date using this approach to increase the adoption and maintenance of health-promoting behaviors have been encouraging in that SC has shown to be effective to change health-promoting behaviors in adults following cardiac events,²³ stroke,²⁴ end stage renal disease,²⁵ and in persons with HIV.^{26,27} The health behaviors addressed in these studies include healthy eating, exercise, reducing screen time, sleep, and medication adherence. SC also is currently being tested in a large randomized trial for weight management in obese urban-dwelling adolescents.

SC involves the use of a distinct theoretical underpinning, overall focus, approach, process, and tools (see Table 1). We have manualized the intervention and have found that children as young as 10 years successfully understand the concept of making a change in a system as opposed to trying harder to do something different. They also understand the process of experimenting to see if a new idea works.²⁸ We have found that this less prescriptive and more trial-and-error approach to making a change in routines is an acceptable and empowering approach to behavior change for both children and adults. Participants describe that it reduces their feelings of needing to make “enormous” changes by viewing their daily routines as a series of small steps that can be manipulated by them. As part of the intervention, families are taught how to hold family discussions to discuss the design and progress of their experiments and how to create and use storyboards to monitor and describe the change process. SC can be taught in small groups of families in which families learn the skills together and discuss the progress of their experiments with their group members using their storyboards or it can be used in individual health behavior change counseling sessions. Our experience is that the system change processes are best learned in 5 to 8 sessions of an hour in length spread over a four to five-month period (a long enough period to engage in 3-4 experiments of at least 2 weeks each in length). Importantly, we have found that level of

literacy of participants is not an issue in the use of SC. The first author has used it successfully with a young adult family member with a developmental delay (IQ in the low 40s). This person was able to understand the idea of trying something new to see if it works and marking observed results on a simple calendar using check marks. Our team also has created SC tools that are accessible by individuals who are blind. Another important feature of the SC approach to behavior change is that because families use their own daily routines as a basis for making change and design their own experiments, the change strategies that they select are culturally self-tailored. The intervention has been used successfully by children and older adults, and in Hispanic (primarily Puerto Rican), African American, and Caucasian families, and with families across a wide income range.

Examples of the use of family self-designed experiments to improve healthy living behaviors are provided below in three brief stories.

SystemCHANGE™ Story #1

A family wanted to increase the number of fruits and vegetables in their diet. They set a goal of getting more fruits and vegetables in the house. They created a detailed flowchart of how food shopping was done – who did it, how often it was done, the steps in the process. Using a Fishbone Diagram, they generated a list of possible changes to make in their shopping routines that could potentially increase the number of fruits and vegetables in the refrigerator. They selected to test the idea of shopping with a list. They evaluated the success of the experiment by counting the number of fruits and vegetables that they placed in the refrigerator at the end of a weekly grocery shopping trip. (These counts were kept on an index card on the refrigerator door for 4 weeks prior to and after the decision to try shopping with a list as an experiment). Results indicated a dramatic increase in the number of fruits and vegetables in the house. This family continued with two other experiments regarding eating more fruits and vegetables. A next experiment was to move the fruits and vegetables from the bottom bins of the refrigerator to the middle of the refrigerator, with the outcome measured being the number of fruits and vegetables that were packed in the children's lunches. Another experiment in this family's goal of getting more fruits and vegetables in their diet was to use a preprinted shopping list that included fruits and vegetables. This story illustrates the use of a series of experiments to slowly change an important household routine that can impact health.

SystemCHANGE™ Story #2

After completing cardiac rehabilitation following a myocardial infarction, a 67 year-old man wanted to adopt and maintain exercise as part of his lifestyle. When he completed a flowchart of his daily activities as part of the SC intervention, he noticed that the first activity of each day was to drive his grandchildren (ages 6 and 7) to school. He realized that the school was only one mile from the children's home. He decided that his experiment would be to walk the children to school each day instead of drive them and that he would track the number of minutes walked each day as a measure of success. His experiment quickly showed that he was regularly getting at least two miles of walking each day at least five days a week. His new behavior was reinforced in that the time with his grandchildren allowed him to hold their hands, talk about nature and what was going on in their lives, and

enjoy their company each day. This SC participant went on to do more experiments regarding walking his grandchildren to school, including how to maintain the behavior when the ice and snow of winter came (purchased warm, water-proof winter clothes for all) and during summer vacation (enrolled the grandchildren in a summer recreation program that was within walking distance). Part of the success of this behavior change is that it was attached to another automatic behavior in his life (his commitment to his daughter to take his grandchildren to school each day), thus increasing the likelihood of maintaining the new behavior. An interesting note is that this participant eventually worked with the city council to get a light installed at a major street near the school to encourage more children to walk to school and improve their safety.

SystemCHANGE™ Story #3

An urban-dwelling 11 year-old girl with obesity who was participating in a weight management program used the SC intervention. When she created a flowchart of her daily routine, it revealed that she ate two candy bars and a bag of chips on the way home from school each day when she and her best friend stopped at a corner store on the way home from school. She decided on an experiment in which she and her friend would join a club after school that met two days a week. Her rationale was that the most important thing was to spend time with her best friend each day and being together at the afterschool club provided that social contact and reduced the free time before she was due home. To measure the success of the experiment she kept a running total each week (before and after starting the experiment) of the number of “sweets” eaten on the way home from school. This experiment proved a success and she went on to design other experiments to reduce the chance of eating unhealthy snacks at corner stores after school.

Summary

The SC intervention has promise as a new approach to health behavior change. Its advantages are that the self-tailoring by use of family-designed experiments promotes cultural appropriateness, it does not rely on a high level of literacy, and it is easily standardized. One of the biggest challenges in the use of the SC intervention is its theoretical difference from the predominant models of behavior change that are primarily cognitive-behavioral in approach. Health care professionals, who are trained in the cognitive-behavioral approaches (i.e., motivational interviewing, cognitive-behavioral therapy, self-efficacy enhancement, problem solving barriers to change, values clarification) have a difficult time switching from the cognitive-based approaches to system improvement approaches that focus on changing daily routines using a trial-and-error method. Our experience is that an effective way to help health care professionals make this “conceptual switch” in their approach to promoting health behavior change is to have them practice making system changes in their own lives using the system improvement processes and tools. Feedback to professionals regarding not using terms such as “motivation,” “willpower,” “trying harder,” or “remember,” when applying the SC approach to behavior change is necessary. Although the theoretical underpinnings of the SC intervention differ from the traditional cognitive behavioral approach to behavior change, we do acknowledge that cognitive processes do play a role in the SC intervention. For example, it is likely that

self-regulation and self-efficacy are factors carrying out the SC process. Our goal, in this paper however, is to highlight the important differences in the two approaches to behavior change, some of which represent a radical change in how we assist families to adopt and maintain healthy living behaviors. To date, SC has been delivered only in a face-to-face format (small group and individual sessions). Face-to-face delivery of behavior change interventions have the drawback of requiring people to come at a specific time and place, which often is inconvenient and may reduce participation in the intervention. The SC is currently being designed for use in delivery methods other than face-to-face, including telephone, tablet, and computer-based. In summary, SC has shown to be effective in several pilot studies^{24,26} and a large randomized trial²³ and is now being tested in a large of randomized trial addressing obesity in inner city adolescents.²⁸ The mounting evidence for its usefulness in making lasting behavior change suggest that it be incorporated into practice settings.

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References

1. Bandura, A. Social foundations of thought and action. Prentice-Hall; Englewood Cliffs: 1986.
2. Becker M. The health belief model and personal health behavior. Health education monographs. 1974; 2:324–473.
3. Mennin DS, Ellard KK, Fresco DM, Gross JJ. United we stand: emphasizing commonalities across cognitive-behavioral therapies. Behavior Therapy. 2013; 44(2):234–248. [PubMed: 23611074]
4. Miller WR. Comments on Dunn et al.'s "The use of brief interventions adapted from motivational interviewing across behavioral domains: a systematic review". When is it motivational interviewing? Addiction. 2001; 96(12):1770–1772. [PubMed: 11791528]
5. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev. 1977; 84(2): 191–215. [PubMed: 847061]
6. Safren S, Hendriksen E, Mayer K, Mimiaga M, Pickard R, Otto M. Cognitive-behavioral therapy for HIV medication adherence and depression. Cognitive and Behavioral Practice. 2004; 11(4):415–424.
7. Ewart, C. A social problem-solving approach to behavior change in coronary heart disease.. In: Shumaker, S.; Chron, E.; Ockene, J., editors. The handbook of health behavior change. Springer Publishing Company; New York: 1989. p. 152-190.
8. Kok G, Gottlieb NH, Commers M, Smerecnik C. The ecological approach in health promotion programs: a decade later. Am.J.Health Promot. 2008; 22(6):437–442. [PubMed: 18677885]
9. Bronfenbrenner, U. The Ecology of Human Development: Experiments by Nature and Design. Harvard University Press; Cambridge, MA: 1979.
10. Thaler, RH.; Sunstein, CR. Nudge: Improving Decisions About Health, Wealth, and Happiness. Penguin Books; 2009.
11. Duhigg, C. The Power of HABIT Why We Do What We Do in Life and Business. Random House Publishing Group; New York: 2012.
12. Deming, WE. The New Economics. Massachusetts Institute of Technology, Center for Advanced Engineering Study; Cambridge, MA: 1993.
13. Langley GJ, Nolan KM, Nolan TM. The Foundation of Improvement. Quality Progress. 1994:81–86.

14. Alemi F, Moore S, Baghi H. Self-experiments and analytical relapse prevention. *Qual.Manag.Health Care*. 2008; 17(1):53–65. [PubMed: 18204378]
15. Batalden PB, Stoltz PK. A framework for the continual improvement of health care: building and applying professional and improvement knowledge to test changes in daily work. *Jt.Comm J.Qual.Improv*. 1993; 19(10):424–447. [PubMed: 8252125]
16. Alemi, F.; Neuhauser, D. *A Thinking Person's Step by Step Guide to Changing Your Life Style Weight Loss and Exercise Program*. Trafford Publishing; 2005.
17. Moore, SM.; Dolansky, MA.; Singh, M.; Palmieri, P.; Alemi, F. The Systems Thinking Scale. 2010. Retrieved from http://fpb.case.edu/systemsthinking/docs/STS_Manual.pdf.
18. Oshry, B. *Seeing systems: Unlocking the mysteries of organizational life*. 2nd ed.. Baret Koehler Publishers, Inc.; San Francisco: 2007.
19. Berwick DM. Continuous improvement as an ideal in health care. *N.Engl.J.Med*. 1989; 320(1):53–56. [PubMed: 2909878]
20. Drory Y, Kravetz S, Hirschberger G. Sexual activity of women and men one year before a first acute myocardial infarction. *Cardiology*. 2002; 97(3):127–132. [PubMed: 12077564]
21. Stanken BA. Promoting helmet use among children. *J Community Health Nurs*. 2000; 17(2):85–92. [PubMed: 10846294]
22. Roberts, HV.; Sergesketter, BF. *Quality is Personal*. The Free Press, a Division of Macmillan, Inc; 1993.
23. Moore SM, Charvat JM, Andrisin S, et al. SystemCHANGE: Using system improvement for health behavior change. *Annals of Behavioral Medicine*. 2009; 37:2078.
24. Plow M, Moore SM, Kirwan JP, et al. Randomized controlled pilot study of a SystemCHANGE weight management intervention in stroke survivors: rationale and protocol. *Trials*. 2013; 14:130. [PubMed: 23782741]
25. Russell CL. A clinical nurse specialist-led intervention to enhance medication adherence using the plan-do-check-act cycle for continuous self-improvement. *Clinical Nurse Specialist*. 2010; 24(2): 69–75. [PubMed: 20168141]
26. Webel AR, Moore SM, Hanson JE, Patel SR, Schmotzer B, Salata RA. Improving sleep hygiene behavior in adults living with HIV/AIDS: a randomized control pilot study of the SystemCHANGE(TM)-HIV intervention. *Applied Nursing Research*. 2013; 26(2):85–91. [PubMed: 23265919]
27. Webel AR, Moore SM, Hanson JE, Salata RA. The Rationale, Design, and Initial Efficacy of SystemCHANGE -HIV: A Systems-Based Intervention to Improve Physical Activity in People Living with HIV. *Journal of AIDS & clinical research*. 2013; 4(3)
28. Moore SM, Borawski E, Cuttler L, Ievers-Landis CE, Love TE. IMPACT: A multi-level family and school intervention targeting obesity in urban youth. *Contemporary clinical trials*. 2013; 36(2): 574–586. [PubMed: 24008055]

Highlights

- In contrast to the health behavior change strategies based on cognitive-behavioral models, the SystemCHANGE™ behavior change intervention is based on a systems improvement model.
- Using the SystemCHANGE™ intervention, families are taught a set of skills to engage in a series of small, family self-designed experiments to test ideas to change their daily routines.
- Initial evidence indicates that the SystemCHANGE™ intervention is effective to produce health behavior change in adults following cardiac events, stroke, end stage renal disease, and in persons with HIV.

Steps in the System Improvement Process

1. Identify a measurable goal.
2. Examining the system processes surrounding the attainment of that goal.
3. List several ideas about how best to improve the system.
4. Engage in a series of experiments to test the best ideas to improve the process.
5. Implement the most successful ideas based on data from the experiments.
6. Monitor the system to hold the gains.

Figure 1.
Steps in the System Improvement Process.

Figure 2.
Continuum of Systems Thinking

Table 1

Theoretical underpinning, overall focus, approach, and processes/tools of the SystemCHANGE™ intervention.

I. Theoretical Bases	Ecological Theory System Improvement Theory
II. Overall Focus	System re-design of the family environment/daily routines
III. Approach	Identify steps/events that comprise family daily routines Conduct small tests of change (family-designed experiments) Track data about experiments Use data to understand cause and effects in family routines affecting lifestyle behaviors
IV. Processes/Tools	Flowchart routines
	Storyboards
	Fishbone diagrams
	Select system ideas for change
	Conduct small experiments
	Keep Cause & Effect Diaries