



Well Researched. Well Designed. Well Being.

The Benefits, Science and Persuasive Technology of Successful eHealth Behavioral Interventions

EFFECTIVE USE OF EVIDENCE-BASED SCIENTIFIC TECHNIQUES TO CHANGE HEALTH BEHAVIOR

Dennis Ary, PhD
Chief Science Officer

Ann Glang, PhD
Director of Science

Blair Irvine, PhD, MAPE
Principal Investigator

Abstract

The US Healthcare system faces urgent challenges: cut costs, improve care, and prevent and manage disease. In the midst of this turbulence and turmoil, individuals and employers are seeking more effective healthcare solutions at more accessible prices. Successful healthcare industry innovations will help consumers, employers, insurers, and healthcare providers deliver improved care at a more affordable price.

ORCAS is a health innovation company focused on developing effective, engaging electronic programs that improve people's health. Some ORCAS programs are for employee assistance programs (EAPs) while others are delivered directly to the consumer. Because all ORCAS programs are delivered electronically, the price per user is far less than health interventions that are delivered in person.

ORCAS scientific development of and research into electronic health (eHealth) and mobile health (mHealth) programs show potential to:

- **Assist in improving healthy living by increasing healthful behaviors**
- **Reduce costs on the health care system to both employers and individuals**

This paper reviews twenty years of pioneering research and development at ORCAS that has resulted in a depth and breadth of behavioral health programs that leverage persuasive technology to effectively address health issues.

Introduction

Healthcare is one of the few bright spots in the sluggish US economy. The annual healthcare spending of the country was approximately \$2.6 trillion in 2010 and it is projected to soar to \$3.4 trillion by 2015 (RNCOS, 2011). The US healthcare system is also not working for everyone as it is often difficult to navigate and too expensive to use. This system is also highly regulated with frequent changes that involve an elaborate system of third party payments. The result is that consumer confusion and frustration abounds.

As such, key stakeholders are propelling dramatic change to the system. A key example of such efforts is the *National Prevention Strategy*, which was published in June 2011 and is paving the way for proposed reform efforts. Every consumer and every aspect of the healthcare industry will be impacted by the proposed reformations, depending on which provisions hold up over time.

ORCAS is a pioneer in providing simple, effective, and affordable electronic health solutions

ORCAS is a pioneer in addressing people's health. In 1989, two research scientists formed a company based on the simple idea that, given the right tools, ordinary people could improve their health using the latest scientific advancements. Dennis Ary, PhD and John Noell, PhD began to create these tools, combining the principles of behavioral science with state-of-the-art multimedia resources and online learning technologies. Together, they formed the Oregon Center for Applied Science, now ORCAS. Today, ORCAS provides web-based health (eHealth) and mobile app (mHealth) programs to address physical health, emotional health and condition management.

ORCAS combines the principles of behavior change with persuasive technology

For over two decades, ORCAS electronic health (eHealth) behavioral intervention programs have proven highly effective. The goal at ORCAS is to merge science with technology to promote health. We have developed eHealth interventions across a wide variety of health behaviors and conditions using a breadth of persuasive technologies. The combination of behavior change principles with persuasive technology has repeatedly resulted in successful brief interventions, as indicated and measured by extensive program testing. Because the interventions are electronic, the programs can be replicated for hundreds of thousands of users for pennies per person.

The benefits and science of successful eHealth behavioral interventions

To create this white paper, the authors reviewed more than twenty articles by ORCAS scientists that were published in peer-reviewed journals. This paper outlines the benefits of -- and the science behind -- twenty years of ORCAS pioneering experience in creating effective and engaging eHealth behavioral health interventions. Specific emphasis is placed on the benefits of eHealth behavioral interventions (vs. one-on-one interventions), the use of scientific evidence, and the application of persuasive technology.

Part 1 – The Benefits of eHealth Interventions

As an applied science company, ORCAS translates effective one-on-one behavioral health coaching techniques into effective eHealth interventions.

Providing eHealth behavioral interventions offers significant advantages over more traditional formats, including efficiency, ease of use, and tailoring of materials to individual users (Budman, 2000; Kreuter et al., 2000; Noell & Glasgow, 1999). The impersonalized nature of an automated programs may also provide a less intimidating learning environment compared to interacting one-on-one with a live therapist (MacKenzie & Hilgedick, 1999) and thus users may be more willing to honestly share personal or embarrassing information (Budman, 2000; Joinson, 1998; Kissinger et al., 1999).

In addition to delivering effective interventions, when compared to the one-on-one delivery of in-person health coaching, ORCAS eHealth programs provide the following key business benefits:

- **Increased Reach**
- **Large Scale Replication**
- **Lower Cost of Delivery**

Increased Reach

ORCAS eHealth programs have the potential to reach far more people than in-person interventions because they are delivered through electronic media. There are no appointments to set up or staff to schedule to service the interventions. These eHealth behavioral interventions allow anyone with Internet access and/or an app-equipped mobile phone to have immediate access to this level of quality healthcare.

As technology evolves, so do ORCAS programs. When ORCAS first started creating electronic health interventions, programs were made available on CD-ROM. Now, programs are developed for web-based and/or mobile technology.

The reach of electronic media in the US population is significant and continues to grow:

- 74% of adults use the internet.*
- 83% of adults own some kind of cell phone.**
- Half of adult cell-phone users now have apps on their phone.**
- 43% of adults purchased a phone already equipped with apps.**
- 38% of adults have downloaded an app to their phone.**

* Fox, 2011

** Smith, 2011

Large Scale Replication

EHealth behavioral interventions are self-contained programs that follow a specific treatment regimen for every user, every time. This replication is not dependent on an individual teacher or therapist. As such, a proven program and all of its elements can be repeated time and time again with an unlimited number of participants. Additionally, because the content is not interpreted, facilitated, or delivered by a human interventionist, perfect implementation fidelity is possible. As such, ORCAS eHealth programs have complete consistency, integrity of content delivery, and reliable quality.

Lower Cost of Delivery

Because eHealth program distribution costs are minimal in comparison to the costs of executing a live-person intervention (via onsite presence or phone), the cost benefit of delivering eHealth programs is dramatically higher than traditional interventions. Cost savings are realized from reduced staffing needs. ORCAS eHealth behavioral intervention programs also do not require the high costs of training staff to deliver the programs.

Part 2 - The Science of ORCAS Successful eHealth Behavioral Interventions

ORCAS eHealth programs are effective because they are based on a scientific approach that includes attention to several important elements:

1. Evidence-based Theoretical Frameworks
2. Evidence-based Instructional Design
3. Content that is Targeted and Tailored to the User
4. Incorporates Principles of Motivational Interviewing

Evidence-Based Theoretical Frameworks

ORCAS behavior change interventions are grounded in established theoretical frameworks that have been tested in behavioral interventions. ORCAS scientists conduct significant front-end effort to find the most effective theoretical approach for each intervention.

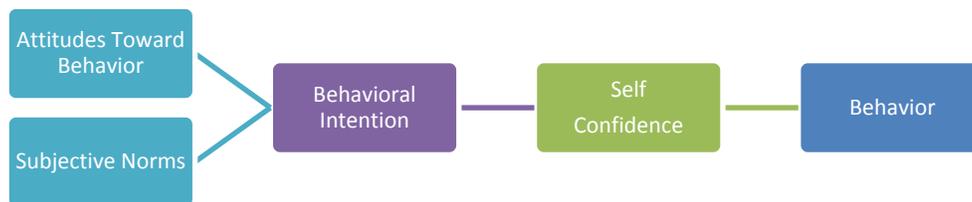
ORCAS eHealth program designs are informed by one or more of the following evidence-based theoretical frameworks to enhance program effectiveness (not all programs use all theories):

- **Expanded Theory of Reasoned Action**
- **Transtheoretical Model, including Stages of Change**
- **Social Cognitive Theory**
- **Behavioral Modeling**

Each of these four major theoretical frameworks are described on the following pages.

Expanded Theory of Reasoned Action

The Expanded Theory of Reasoned Action (ETRA) posits that a person's behavior is primarily determined by their intention to perform (or stop) that behavior. That person's intention is informed by their attitudes and beliefs about performing a behavior and his or her normative beliefs about the behavior (i.e., whether people who are significant to them view the behavior positively or negatively).



According to the ETRA, the best behavioral predictors are a combination of:

- **Attitudes Toward the Behavior**

The sum of that person's beliefs about that behavior.

- **Subjective Norms**

An individual's perception of whether people who they think are important (i.e., people whose opinions they value) think they should perform (or stop) a behavior.

- **Behavioral Intention**

A relative measure of how strong the person's intention is to do the behavior. Intention comes from the combination of a positive attitude (or set of attitudes) towards the behavior and the beliefs or expectations about the behaviors by one's peers.

- **Self Confidence**

Self confidence is the belief that one can successfully carry out a behavior. An individual who has a strong belief in their powers and abilities to do a particular behavior is more likely to try that behavior.

- **Evidence Base**

A recent meta-analysis study of eHealth programs indicates that the Theory of Reasoned Action has particularly strong evidence for its use in Internet-based health interventions (Webb et al., 2010). To take advantage of this proven efficacy, ORCAS uses the Expanded Theory of Reasoned Action in its eHealth programs to influence an individual's attitudes, normative beliefs, and behavioral intentions to best influence (and therefore predict) behavioral change.

ORCAS Women's Reproductive Health eHealth program uses the Expanded Theory of Reasoned Action to increase communication and decrease risky behavior

Intention to engage in conversations with sexual partners about risk and prevention has been shown to be a prerequisite for negotiating actual use of preventive measures (Swartz, et al., 2011).

- The *Women's Reproductive Health* user study demonstrates the program's ability to positively influence behavioral intention for partner communication about sexual risk and prevention.
- Program videos convey positive beliefs about the use of contraceptive methods and communicating with a sexual partner about risk. Additional video examples increase a woman's self-confidence for initiating sensitive conversations.
- Among sexually active, mid-life women, ORCAS Women's Reproductive Health eHealth program had significant effects increasing behavioral intention to speak with their partner(s) about risk and to use contraception methods to prevent unintended pregnancy and sexually transmitted infections.
- At 30-day follow up, women in the intervention group scored higher on measures of attitudes and beliefs and behavioral intentions than women in the comparison group.



The Transtheoretical Model (Stages of Change)

An essential part of an effective behavior change program is assessing and then addressing an individual's readiness to act on a new, healthier behavior (Prochaska & DiClemente, 1983, 1984). The person's relative readiness or stage is established on a continuum of change.



An effective behavioral intervention program, whether by a live coach or through an eHealth application, includes mechanisms that customize messaging to a participant, based on their stage on the change continuum.

ORCAS eHealth programs use stage-matched coaching messages to guide the participant through the behavior change process. Individuals thinking about changing (Contemplation stage) or just starting to make changes (Preparation stage) will receive different messages from those already making changes (Action stage), and those who are attempting to maintain their previous changes (Maintenance stage).

ORCAS *Healthy Eating: Catering to Your Heart* program to reduce dietary fat consumption is shaped to user readiness to change.

Healthy Eating: Catering to Your Heart, with Graham Kerr eHealth intervention provides stage-based strategies and education to motivate users to decrease their dietary consumption of high fat foods (Irvine et al., 2004).

- An Eating Habits Assessment interactively takes user input to determine stage-based program messaging. The program also recommends the highest priorities for dietary change based on the user's interest and eating habits.
- Eating strategies are identified for specific food groups, by environment (e.g., home, office, eating out), and include shopping and food preparation.
- Stage-based testimonials, tailored by gender and race-ethnicity, provide tips and support.
- The randomized trial indicated significant improvement in stage of change, attitudes, self-efficacy, and behavioral intentions at 30 days. The effects were replicated with a wait list group at 60 days.

Social Cognitive Theory

Social Cognitive Theory hypothesizes that part of a person's knowledge is directly related to observing other people's social interactions and experiences. People learn by watching what others will and will not do.

Social cognitive theory addresses important cognitive factors that lead to behavior change, including a person's ability to learn by watching others (behavioral modeling), to have confidence in his/her ability to perform the behavior (self-confidence), and to self-regulate behavior by setting goals and monitoring progress.

ORCAS eHealth programs have improved users' self confidence to implement new health behaviors. They provide real world behavior modeling examples in the context of the program's topic. Participants are encouraged and assisted as they set goals for targeted health behavior changes.

ORCAS Get Moving eHealth program uses Social Cognitive Theory to help sedentary workers become physically active

Get Moving, a website to increase physical activity, showed significant effects on sedentary office workers at a large manufacturing plant (Irvine et al., 2011).

- Get Moving is designed to increase the confidence and motivation of sedentary office workers to become physically active.
- Designed for “non-gym” users, it offered multi-week support and choice of exercise prescription, which empower the user to self-schedule the level of exercise and return visits.
- Supportive testimonials by peers (i.e., not overly thin and photogenic models) boosted the users self confidence while offering tips and education.
- In a randomized trial, the treatment group showed significant improvement in 11 outcome variables including physical activity, motivation, knowledge, attitudes, self efficacy, and overcoming perceived barriers to exercise. Multiple site visits produced a positive dose response effect.

Behavioral Modeling

Behavioral Modeling (BM) is a key component of Social Cognitive Theory. It is such an essential element of ORCAS eHealth programs that we are addressing it separately here.

Social Learning Theory, derived from the work of Albert Bandura, provides the foundation for Behavioral Modeling. Providing a model of new behavior can illustrate new skills so that users can learn how to emulate and use them. Behavioral Modeling is a key component of interventions that effectively deliver sustained skill improvement and behavior change (Taylor, Russ-Eft, & Chan, 2005).

ORCAS eHealth programs leverage behavioral modeling with significant effectiveness.

EHealth programs have the edge over one-on-one behavioral interventions because streaming video segments can show people with traits similar to the user, who are modeling the recommended behaviors. ORCAS eHealth programs use video and animation, sometimes in a comparison of “wrong-way” vs. “right-way” contexts, to model the desired skill(s). The ORCAS behavioral modeling approach has demonstrated success across a range of content areas and user groups. Our eHealth programs include the following key elements:

- **A description of the behavior or skills to be learned**
- **Models displaying the effective use of appropriate behaviors or skills**
- **Opportunities to practice those behaviors or skills**
- **Immediate feedback and social reinforcement**

ORCAS Parenting Toolkit: Skills for Stepfamilies eHealth program incorporates behavioral modeling to improve stepfamily functioning

- Effective communication and parenting practices are modeled through video “challenges” depicting a problematic stepfamily situation. After each video dramatization, the user chooses from among three alternative responses to the situation: one effective and two ineffective. Feedback on the users choices is provided.
- The use of video-based behavioral modeling is a unique format for stepfamily-focused education. Additionally, while other online family education programs exist, very few have been rigorously evaluated using appropriate scientific methods.
- *Parenting Toolkit: Skills for Stepfamilies*, showed significant effects on stepparents in families with children aged 11-15 (Gelatt et al., 2010).
- In a randomized trial study, findings suggest that participation in the stepfamily education program positively influenced several key areas of parenting and family functioning at post program and 60-day follow-up. No gender differences were noted.

Evidence-Based Instructional Design

ORCAS eHealth programs incorporate evidence-based instruction design to ensure that program users efficiently and effectively learn what is being taught.

Behavior management skills, communication skills, social skills, work skills and safety skills all require solid instructional design if learners are to master them.

Informed by extensive research on effective training/instructional design, many ORCAS interventions use a mastery learning approach. In mastery learning, clear instruction is provided with frequent acknowledgment of progress and opportunities to practice and review new skills.

Key elements of Evidence-Based Instructional Design:

- **Supported learning**

Guidance, clear models, and feedback, which are reduced as mastery is achieved.

- **Explicit instruction**

Teach component steps of each skill, then integrate steps into more complex skills.

- **Interactive testing and remediation**

Users practice and review new skills to ensure that new learning is maintained.

User Targeted and Tailored Content

Research indicates that messages and behavioral modeling are more effective when tailored to the specific user. When the user perceives a good match between the models/messages and their own situation, the intervention can have more impact.

Effective eHealth programs may be designed to reliably identify key user characteristics. The program automatically adjusts content based on those characteristics.

Twenty years ago, ORCAS first programs were tailored to the user's age, race and gender. Today, ORCAS eHealth behavioral interventions effectively leverage tailored content based on an array of user characteristics (e.g., stage of change, preferred activity type, personal barriers, severity of symptoms, content interest, common problems, and user personal history). Where contextually appropriate, and/or where it enhances user acceptance, programs are also targeted to specific user demographics including age, race/ethnicity and gender.

ORCAS 1-2-3 Smokefree tailors content to user characteristics and effectively assists smokers in quitting smoking.

- *1-2-3 Smokefree* is a fully automated smoking cessation intervention that assists the smoker in developing a personalized quit plan that includes proven strategies and methods for quitting.
- Evidence-based smoking cessation information is provided primarily through video narration and testimonials targeted to the gender, age, and race/ethnicity of the smoker.
- Content is also tailored by user choice based on interest and need; for example, the user may choose to view information about various smoking cessation aids, barriers to quitting, and strategies for cravings, among other topics.
- The smoking cessation rate among intervention participants was 12.3% at 90-day follow-up compared to 5.0% among control participants. The use of a completely automated behavioral intervention for smoking cessation proved effective in helping people quit smoking. (Swartz, Noell, Schroeder, & Ary, 2006).

Motivational Interviewing

Motivational Interviewing (MI) is a clinical method employed to strengthen an individual's personal motivation for change. "MI begins with the assumption and honoring of personal autonomy: that people make their own behavioral choices, and that such power of choice cannot be appropriated by another" (Miller & Rollnick, 2009, p. 131). MI can be used to reduce resistance to change and encourage an individual toward action; but the individual makes their own choices in their own time.

Successful motivational interviewing has three core elements:

- **Collaboration (vs. Confrontation)**

Rather than assuming the role of expert, in motivational interviewing the therapist forms a partnership with the client. This partnership builds both rapport and trust.

- **Evocation (vs. Imposition)**

Motivational Interviewing draws out a person's own motivations for change. Lasting change is more likely when people discover their own reasons for changing.

- **Autonomy (vs. Authority)**

Motivational Interviewing recognizes that it is up to the individual to make change happen. MI allows for people to make their own choices about behavior change, instead of relying on an authority to tell them how and when to make the change.

Using an MI approach, users are given free choice to learn about overcoming specific barriers to behavior and messaging is delivered as a short testimonial story relating how a peer-model overcame the barrier.

ORCAS blends Motivational Interviewing concepts throughout eHealth programs. For example, users often see and hear from models who are similar to themselves, thus evoking a sense of peer-to-peer trust and rapport. While an expert like a physician or therapist might be shown to add credibility, the pivotal messaging that offers support and reinforces strategic messages is often provided from peer models to avoid a top-down approach of the expert to learner approach.

**ORCAS Caregiver's Friend; Dealing with Dementia eHealth program uses
Motivational Interviewing to help family caregivers
of individuals with dementia**

Caregiver's Friend; Dealing with Dementia is an Internet support program for employed family caregivers of persons with dementia. Key elements of the program include:

- Caregivers tend to suffer from anxiety, stress and depression related to their efforts to help their loved ones with dementia.
- *Caregiver's Friend* offers individually tailored peer-based educational information, cognitive and behavioral skills, and affective learning opportunities.
- Every caregiver who uses the program is the acknowledged expert in the care of their loved one, but the program offers support and encouragement from peer models, who are portrayed as also being experienced caregivers.
- An MI philosophy is used throughout to support the users' needs for information or skills. The user's choice is always correct. Testimonials of personal stories provide education from a peer-peer perspective.
- In a randomized trial with family caregivers on the Internet, the treatment group at 30 days showed significant improvements in depression, anxiety, level and frequency of stress, caregiver strain, self-efficacy, and intention to seek help, as well as perceptions of positive aspects of caregiving (Beauchamp et al., 2005).



Part 3 - Persuasive Technology

In addition to evidence-based scientific techniques, ORCAS eHealth behavioral intervention programs also effectively employ persuasive technology. Persuasive technology is interactive technology specifically designed to change attitudes and behaviors.

“Persuasive computing technology is a computing system, device, or application intentionally designed to change a person’s attitude or behavior in a predetermined way.”

“Research in persuasive technologies and the associated usage of a computing system, device, or application intentionally designed to change a person’s attitude or behavior in a predetermined way is showing the potential to assist in improving healthy living [and] reduce the costs on the health care system.” (Chatterjee & Price, 2009, p. 171)

In the 20 years ORCAS has been developing eHealth programs, technology has rapidly and radically evolved - starting with CD-ROM programs, moving to web-based interactive multi-media programs, and now on to include mobile apps.

As technology continues to evolve, ORCAS will draw on the experience of the last two decades to continue to develop effective, engaging electronic behavioral health intervention programs. We will work collaboratively with behavioral health providers to design products that will supplement existing therapeutic and coaching interventions, in addition to developing stand-alone self-directed approaches.

ORCAS strongly believes in using on-trend technology, that is, meeting consumers where they are with adopting technology in their lives. We do not leapfrog current technology, instead we adopt current consumer-friendly technology for healthcare use.

Summary

ORCAS' highly effective eHealth behavioral interventions leverage twenty years of experience with evidence-based scientific theories and approaches.

Benefits of eHealth Behavioral Interventions

When compared to one-on-one, in-person health coaching, ORCAS eHealth programs deliver:

- **Increased Reach**
- **Large Scale Replication**
- **Lower Cost of Delivery**

Science of eHealth Behavioral Interventions

ORCAS behavior change interventions are grounded in established theoretical frameworks that have been tested in behavioral interventions. ORCAS eHealth programs use the following evidence-based scientific approaches to enhance program effectiveness. ORCAS programs are informed by one or more of these proven theoretical frameworks:

- **Expanded Theory of Reasoned Action**
- **Transtheoretical Model, including Stages of Change**
- **Social Cognitive Theory**
- **Behavioral Modeling**

ORCAS eHealth programs are successful in changing health behavior. ORCAS interventions:

- **Use evidence-based instructional design**
- **Target specific users and tailor content to user characteristics**
- **Incorporate Motivational Interviewing**

The health behavior change methods used in the development of ORCAS eHealth programs have proven to be highly effective across a wide variety of content areas, types of users, and technologies.

Persuasive Technology in eHealth Behavioral Interventions

In addition to evidence-based scientific techniques, ORCAS eHealth behavioral intervention programs also effectively employ persuasive technology. Persuasive technology is interactive technology specifically designed to change attitudes and behaviors. ORCAS programs use on-trend technology, which meets consumers where they are with adopting technology in their lives. We adopt current consumer-friendly technology for healthcare use.

References

- Budman, S. (2000). Behavioral health care dot-com and beyond: Computer-mediated communications in mental health and substance abuse treatment. *American Psychologist, 55*(11), 1290-1300. doi:10.1037/0003-066X.55.11.1290
- Chatterjee, S., & Price, A. (2009). Healthy living with persuasive technologies: Framework, issues, and challenges. *Journal of the American Medical Informatics Association, 16*(2), 171-178. doi:10.1197/jamia.M2859
- Fogg, B. J. (2003). *Persuasive technology: Using computers to change what we think and do*. San Francisco: Morgan Kaufmann Publishing.
- Fox, S. (2011). *The social life of health information, 2011*. Available from: http://pewinternet.org/~media/Files/Reports/2011/PIP_Social_Life_of_Health_Info.pdf
- Joinson, A. (1998). Causes and implications of disinhibited behavior on the Internet. In J. Gackenbach (Ed.), *Psychology and the Internet: Intrapersonal, interpersonal, and transpersonal Implications* (pp. 43-60). San Diego, CA: Academic Press.
- Kissinger, P., Rice, J., Farley, T., Trim, S., Jewitt, K., Margavio, V., & Martin, D. H. (1999). Application of computer-assisted interviews to sexual behavior research. *American Journal of Epidemiology, 149*(10), 950-954. Available at: <http://aje.oxfordjournals.org/content/149/10/950.short>
- Kreuter, M., Farrell, D., Olevitch, L., & Brennan, L. (2000). *Tailoring health messages: Customizing communication with computer technology*. Mahwah, NJ: Lawrence Erlbaum Associates.
- MacKenzie, E., & Hilgedick, J. (1999). The Computer-Assisted Parenting Program (CAPP): The use of a computerized behavioral parenting training program as an educational tool. *Child and Family Behavior Therapy, 21*(4), 23-43. doi:10.1300/J019v21n04_02
- Miller, W., & Rollnick, S. (2009). Ten things that Motivational Interviewing is not. *Behavioural and Cognitive Psychotherapy, 37*, 129-140. doi:10.1017/S1352465809005128
- Noell, J., & Glasgow, R. (1999). Interactive technology applications for behavioral counseling: Issues and opportunities for health care settings. *American Journal of Preventive Medicine, 17*(4), 269-274. pii:S0749379799000938
- Prevention Institute & California Endowment. (2007). *Reducing health care costs through prevention: Working document*. Los Angeles: The California Endowment.
- Prochaska, J., & DiClemente, C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*(3), 390-395. doi: 10.1037/0022-006X.51.3.390
- Prochaska, J., & DiClemente, C. (1984). *The transtheoretical approach: Crossing traditional boundaries of therapy*. Homewood, IL: Dow Jones-Irwin.
- RNCOS Industry Research Solutions. (2011). *US healthcare market outlook, 2013*. Noida, India: Author.

References Continued

- Smith, A. (2011). *Americans and their cell phones*. Available from: <http://www.pewinternet.org/~media/Files/Reports/2011/Cell%20Phones%202011.pdf>
- Taylor, P., Russ-Eft, D., & Chan, D. (2005). A meta-analytic review of behavior modeling training. *Journal of Applied Psychology, 90*(4), 692-709. doi:10.1037/0021-9010.90.4.692
- Webb, T., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research, 12*(1), e4. doi:10.2196/jmir.1376

ORCAS Published Research

- Beauchamp, N., Irvine, A. B., Seeley, J. R., & Johnson, B. (2005). Worksite-based Internet multimedia program for family caregivers of persons with dementia. *Gerontologist, 45*(6), 793-801. doi: 10.1093/geront/45.6.793
- Dominick, S. A., Irvine, A. B., Beauchamp, N., Seeley, J. R., Nolen-Hoeksema, S., & Doka, K. J., & Bonanno, G. A. (2009). An Internet tool to normalize grief. *Omega: Journal of Death and Dying, 60*(1), 71-87. doi: 10.2190/OM.60.1.d
- Duncan, T., Duncan, S., Beauchamp, N., Wells, J., & Ary, D. (2000). Development and evaluation of an interactive CD-ROM refusal skills program to prevent youth substance use: "Refuse to use". *Journal of Behavioral Medicine, 23*(1), 59-72. doi:10.1023/A:1005420304147
- Gelatt, V. A., Adler-Baeder, F., & Seeley, J. R. (2010). An interactive web-based program for parents in stepfamilies: Development and evaluation of efficacy. *Family Relations, 59*(5), 572-586. doi:10.1111/j.1741-3729.2010.00624.x
- Glang, A., Koester, M., Vondy Beaver, S., Clay, J., & McLaughlin, K. (2010). Online training in sports concussion for youth sport coaches. *International Journal of Sports Science and Coaching, 5*(1), 1-12. doi:10.1260/1747-9541.5.1.1
- Glang, A., McLaughlin, K., & Schroeder, S. (2007). Using interactive multimedia to teach parent advocacy skills: An exploratory study. *Journal of Head Trauma Rehabilitation, 22*(3), 196-203. doi:10.1097/01.HTR.0000271121.42523.3a
- Glang, A., Noell, J., Ary, D., & Swartz, L. (2005). Using interactive multimedia to teach pedestrian safety: An exploratory study. *American Journal of Health Behavior, 29*(5), 435-442. doi:10.5555/ajhb.2005.29.5.435
- Henderson, J., Noell, J., Reeves, T., Robinson, T., & Strecher, V. (1999). Developers and evaluation of interactive health communication applications. *American Journal of Preventive Medicine, 16*(1), 30-34. pii:S0749-3797(98)00106-8
- Irvin, L. K., Walker, H. M., Noell, J., Singer, G. H. S., Irvine, A. B., Marquez, K., & Britz, B. (1992). Measuring children's social skills using microcomputer-based videodisc assessment. *Behavior Modification, 16*(4), 475-503. doi:10.1177/01454455920164003
- Irvine, A. B., Ary, D. V., & Bourgeois, M. S. (2003). An interactive multimedia program to train professional caregivers. *Journal of Applied Gerontology, 22*(2), 269-288. doi:10.1177/0733464803022002006
- Irvine, A. B. (2002). Use of interactive multimedia to promote health and wellness. *Wellness Management, 18*(3). Available at: <http://www.nationalwellness.org/>
- Irvine, A. B., Ary, D. V., Grove, D. A., & Gilfillan-Morton, L. (2004). The effectiveness of an interactive multimedia program to influence eating habits. *Health Education Research: Theory and Practice, 19*(3), 290-305. doi:10.1093/her/cyg027 pii:19/3/290
- Irvine, A. B., Beauchamp, N., Ary, D. V., Noell, J. W., & Wells, J. (1998, October). *Use of interactive multimedia HRA's: Three studies*. Paper presented at the 34th Annual Meeting of Society of Prospective Medicine, Newport, RI.

ORCAS Published Research Continued

- Irvine, A. B., Beauchamp, N., & Wells, J. (1997). Interactive health risk appraisal for behavior change. *Health Education and Behavior, 24*(1), 8-9.
- Irvine, A. B., Billow, M. B., Bourgeois, M., & Seeley, J. R. (2012). Mental illness training for long term care staff. *Journal of the American Medical Director's Association, 13*(1), 81.e7-81.e13 doi:10.1016/j.jamda.2011.01.015
- Irvine, A. B., Bourgeois, M., Billow, M. B., & Seeley, J. R. (2007). Internet training for nurse aides to prevent resident aggression. *Journal of the American Medical Director's Association, 8*(8), 519-526. doi:S1525-8610(07)00254-X
- Irvine, A. B., Philips, L., Duncan, S., Seeley, J., Wyant, R., & Moore, R. W. (2011). A web program that improves sedentary employee exercise behavior. *American Journal of Health Promotion, 25*(3), 199-206. doi:10.4278/ajhp.04121736.
- McLaughlin, K., & Glang, A. (2009). The effectiveness of a bicycle safety program for improving safety-related knowledge and behavior in young elementary students. *Journal of Pediatric Psychology, 35*(4), 343-353. doi:10.1093/jpepsy/jsp076
- McLaughlin, K., Glang, A., Vondy Beaver, S., Gau, J., & Keen, S. (in press). Web-based training in family advocacy. *Journal Head Trauma Rehabilitation*
- Noell, J., Ary, D., & Duncan, T. (1997). Development and evaluation of a sexual decision-making and social skills program: "The choice is yours-preventing HIV/STDs". *Health Education & Behavior, 24*(1), 87-101. doi:10.1177/109019819702400109
- Noell, J., & Glasgow, R. (1999). Interactive technology applications for behavioral counseling Issues and opportunities for health care settings. *American Journal of Preventive Medicine, 17*(4), 269-274. pii:S0749379799000938
- Swartz, L. H., Sherman, C. A., Harvey, S. M., Blanchard, J., Vawter, F., & Gau, J. (2011). Midlife women online: Evaluation of an internet-based program to prevent unintended pregnancy & STIs. *Journal of Women and Aging, 23*(4), 342-359. doi:10.1080/08952841.2011.613255
- Swartz, L. H. G., Noell, J. W., Schroeder, S. W., & Ary, D. V. (2006). A randomized control study of a fully automated internet based smoking cessation programme. *Tobacco Control, 15*(1), 7-12. doi:10.1136/tc.2003.006189
- Swartz, L. H. G., & Noell, J. W. (1997). A clinic-based adolescent pregnancy prevention project. In: Practice notes: Strategies in health education. *Health Education Quarterly, 24*(1), 7-8. doi:10.1177/109019819702400102
- Woodward, J., & Noell, J. (1993). Software development in special education. *Journal of Special Education Technology, 12*(2), 149-163. <http://www.tamcec.org/jset/>