

Chapter 11

Application of Behavioral Theory in Computer Game Design for Health Behavior Change

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ABSTRACT

Serious games are gaining profile as a novel strategy to impact health behavior change in the service of national health objectives. Research has indicated that many evidence-based programs are effective because they are grounded in behavioral and motivational theories and models such as the PRECEDE model, the Health Belief Model, Social Cognitive Theory, the Theory of Reasoned Action, the Transtheoretical Model, Attribution Theory, and the ARCS model. Such theories assist in understanding health behavior problems, developing salient interventions, and evaluating their effectiveness. It follows, therefore, that serious games can be made optimally effective in changing health behavior if they are also informed by these theories. A successful intervention development framework (Intervention Mapping) provides a means to enable game developers to use theory to inform the design of effective games for health. This chapter describes useful theories and models for health game design, introduces the intervention mapping process, and describes a case study of a theory- and empirically-based serious health game intervention that has used these approaches and has been rigorously evaluated.

SERIOUS GAMING AS A STRATEGY FOR HEALTH BEHAVIOR CHANGE

The application of gaming as a method to change health behavior carries with it the burden to impact the consequences of morbidity and mortality. Nowhere, then, is the contention of games having a

“serious” purpose more relevant than in the domain of serious games for health. Serious games are gaining profile as a potential strategy to educate the public about health in new and novel ways. Computer games represent an emerging approach to the continued research and development of health education and health promotion programs in the service of national health objectives. Research has indicated that many evidence-based health educa-

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tion and health promotion programs are effective because they are grounded in behavioral theory. It follows, therefore, that serious games might be made optimally effective in changing health behavior if they are also informed by behavioral and motivational theory.

Health Behavior

The Health Objectives for the Nation (US Dept of Health and Human Services, 1980) provided an initial blueprint for a federal strategy for public health education and for monitoring population-wide behavior patterns. Successors of this document include, most recently, Healthy People, 2010, which outlines 28 focus areas and 467 measurable national disease prevention and health promotion objectives. Such strategic plans are particularly relevant foundations for public health education efforts. A critical consideration is that modifiable behavioral risk factors are leading causes of mortality in the United States. Leading causes of death in 2000 were tobacco (18.1% of total US deaths), poor diet and physical activity (16.6%), and alcohol consumption (3.5%), all related to behavioral exigencies. Aside from environmental challenges of microbial and toxic agents, other actual causes of death were also heavily accented to human behavioral causes: motor vehicle crashes, incidents involving firearms, sexual behaviors, and illicit drug use (Mokdad, 2004).

Health behaviors not only include overt actions for health maintenance, restoration, or improvement but also encompass the cognitions and emotions (beliefs, expectations, motives, values, perceptions, affect) that can be measured (Gochman, 1982, 1997). Health behaviors can be categorized in the major categories of risky behavior, preventive health behavior, and sick role behavior. *Risky behaviors* include those behaviors undertaken by individuals despite associated health risks. Tobacco smoking, poor diet and physical activity, alcohol consumption, and unprotected sex have already been indicated as

major targets for national campaigns. *Preventive health behaviors* include those that are undertaken for the purpose of preventing or detecting illness in an asymptomatic state and maintaining health. This includes an array of health promoting self-management behaviors that are the antithesis of risk behaviors. These include eating low fat foods or using condoms and also include screening and early detection behavior (e.g. breast, testicular, and skin self-examination). *Sick-role behaviors* include behaviors that are undertaken by those who consider themselves ill with the intention of getting well. In the clinical domain this includes adherence to treatment (e.g. taking a full course of antibiotics) or management plans to control disease (e.g. balanced diet, energy expenditure, and timing of taking insulin; monitoring asthma symptoms to detect early changes) (Kasl & Cobb, 1966a; 1966b]

Health Education and Health Promotion

Changing human behavior is hard to do. It is inextricably linked within the milieu of our lives and it is complex. Health behavior is mediated by cognitions where people's knowledge and thinking precedes their actions. While knowledge is a necessary antecedent of behavior it is not sufficient to produce most behavior changes. An array of behavioral determinants, including perceptions, motivations, skills, and the social environment are key influences on behavior. The expectation that serious games should be conducive to impact behaviors, then, might appear somewhat wishful. Arguably, it is an insufficient expectation that serious games could seriously impact behavior unless they are able to impact an array of behavioral determinants in excess of achievement (knowledge) alone. Health education and health promotion program developers have wrestled with this challenge and have provided guidance in the application of theories and models that can prove invaluable to the armamentarium of the serious

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