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Review

Meta-analytic examination of the strong and weak principles across 48 health behaviors

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Abstract

Objective. The strong and weak principles of change state that progress from the precontemplation to the action stage of change is associated with a one standard deviation increase in the pros and a one-half standard deviation decrease in the cons of change. In this study these relationships, originally developed by Prochaska [Prochaska, J.O., 1994. Strong and weak principles for progressing from precontemplation to action on the basis of 12 problem behaviors. Health Psychology, 13, 47–51] based on an examination of 12 studies of 12 different behaviors, were re-examined using many more datasets and much more rigorous statistical methods.

Methods. The current study analyzes 120 datasets from studies conducted between 1984 and 2003 across and within 48 health behaviors, including nearly 50,000 participants from 10 countries. The datasets were primarily analyzed utilizing meta-analytic techniques.

Results. Despite the range of behaviors and populations, the results were remarkably consistent with the original results (pros = 1.00 standard deviation, cons = 0.56 standard deviation). Few potential moderators showed any impact on effect size distributions.

Conclusions. This updated and enhanced examination of two important principles of behavior change is a significant contribution to the field of multiple health risk behaviors, as it clearly demonstrates the consistency of the theoretical principles across multiple behaviors, which has implications for developing multiple health risk behavior interventions.

Keywords: Transtheoretical Model; Stages of change; Decisional balance; Pros and cons; Behavior change

Contents

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Introduction

The Transtheoretical Model (TTM) of behavior change has been utilized internationally across a large variety of health behaviors for more than 25 years. The model not only delineates a way to conceptualize behavior change, it also provides the foundation for developing assessments of an individual's readiness to change and for tailoring interventions to actualize behavior change. The central organizing construct of the TTM characterizes behavior change through five distinct stages of change (SOC): precontemplation, contemplation, preparation, action, and maintenance. Two intermediate indicators of when these changes occur are decisional balance (DB; the pros and cons of change) and self-efficacy (situational confidence or temptation). Additionally, the TTM explains behavior change strategies through 10 processes of change.

This study focuses on testing the theoretical relationship between SOC and DB across multiple health behaviors. Originally developed in 1985 to study decision-making for smoking (Velicer et al., 1985), the use of DB expanded to a dozen behaviors by 1994 (Prochaska et al., 1994). Lewin (1948) postulated that behavior changes as a function of the increases and decreases in motivation to contemplate gains and losses. The TTM builds on this notion by suggesting a clear directionality to the function as well as a characteristic way of examining it. The function is based on the relationship of when and how much the pros increase and the cons decrease. The initial research on SOC and DB suggested that progress from precontemplation to contemplation involved an increase in pros whereas progress from contemplation to action involved a decrease in cons; that is, participants endorsed more negative aspects of change in the earlier stages and more positive aspects of change in the later stages. A more detailed analysis of the results of Prochaska et al. (1994) by Prochaska (1994) found that the average maximum increase in the pros from precontemplation to action was 1.06 standard deviation (S.D.) units. For cons, the average maximum decrease from precontemplation to action was 0.45 S.D. These results led to the formulation of the strong and weak principles of change, which state that progress from the precontemplation to the action stage of change is associated with a one standard deviation increase in the pros and a one-half standard deviation decrease in the cons. More simply, these data showed that the pros increase twice as much as the cons decrease from precontemplation to action.

Since 1994, numerous additional studies have examined the SOC–DB relationship. These new studies included many new behaviors as well as many more studies examining some of the original 12 behaviors in new populations and settings. In addition, a reevaluation of the staging paradigm by DiClemente et al. (1991) resulted in the addition of a new stage, preparation. In 1994, only 2 of the 12 studies included the preparation stage. Since this stage is now considered an integral part of the TTM, its inclusion is essential for validation of the SOC–DB relationship. The current investigation re-examines the strong and weak principles more comprehensively by including many more datasets, behaviors, study populations and settings, and employs more systematic and rigorous quantitative meta-analytic methods to examine potential moderating variables of the strong and weak principles.

Method

Procedure

Literature searches

Datasets were identified through literature searches on several computerized databases (PUBMED, Cancerlit, Cinahl, Health and Wellness Resource Center and PsycLIT), conference proceedings, personal communications with authors, and reviews of reference lists from acquired articles. This included published articles, manuscripts in progress, and raw data from 1984 to October 2003. Studies involving any behavior that examined SOC and DB were included if (1) the dataset contained sufficient data to extract ES information; (2) at least the precontemplation and action SOC were reported; and (3) SOC was assessed by an algorithm procedure that classifies individuals into one of the five stages.

Data extraction and coding

The following were extracted for each dataset: a brief description of the study population, study recruitment setting, sample size, participant age groups, publication status, country, percent of males/females, response format, cessation vs. acquisition behavior, and behavior. Since many behaviors included very few studies, some behaviors were aggregated to form conceptually consistent categories for subsequent moderator analyses. For instance, the category "condom use" combined datasets that examined condom use: 1) for vaginal intercourse; 2) for anal intercourse; 3) with main partners; 4) with other partners; and 5) condom use in general. Each behavior in a multiple behavior study was evaluated and coded separately.

Analysis

Primary analyses included effect size (ES) for the maximum change in the pros and cons across SOC from precontemplation to action. Secondary analyses included homogeneity tests of ES distributions for pros and cons and exploration of potential moderators.

Assessment of ES

ES was calculated based on Prochaska's (1994) definitions of strong and weak principles of change. As specified by Prochaska (1994), for pros, the lowest mean of a stage from precontemplation to action was identified along with the highest value following the low. Similarly for cons, the highest value from precontemplation to action was identified along with the lowest value following the high. Once these two values were identified, ES was calculated using Hedges' g, which is defined as the difference between group means divided by the pooled within-group S.D. (Hedges, 1981). Because different SOC would be used for the calculation of g across studies, and since n's could vary substantially by stage, the pooled S.D. was based on data from all available SOC, not just those contributing to the high and low scores, to provide a more reliable basis for estimating g. The ESs were corrected for sample size bias.

Modeling the distribution of effect sizes

A random effects model was used to model the distribution of effect sizes for the pros and cons. This model assumes that subject-level sampling error is