



Research report

Applying the stages of change to multiple low-fat dietary behavioral contexts. An examination of stage occupation and discontinuity

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ABSTRACT

Consuming a diet lower in total fat is important for the prevention of many chronic diseases. Individual and population-based programs targeting this behavior must be theoretically grounded and consider the context within which dietary behavior change may be attempted. To identify the factors differentiating stage of readiness to follow a low-fat diet, a sample ($N = 1216$) of adults was surveyed using 4 different staging algorithms to assess stages of change and associated social-cognitive variables (*pros*, *cons*, and *temptation*). Approximately 75% of the sample occupied the Action/Maintenance stages for all staging algorithms. In general, *pros* increased and *cons* decreased with higher stage occupation. *Temptation* decreased from the early pre-action to the action stages for the different staging algorithms. When developing programs to decrease dietary-fat intake, social-cognitive variables associated with stage transition for behaviors related to consuming a low-fat diet may have relevance to researchers and clinicians.

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Introduction

Both the quantity (i.e., $\leq 30\%$ total daily energy intake) and quality of dietary fat (i.e., high monounsaturated:saturated fat ratio) are associated with health benefits that include a reduced risk of cardiovascular morbidity and mortality, some cancers and the development of type 2 diabetes (Harding et al., 2004; Hooper et al., 2000; Leitzmann et al., 2004; Mozaffarian et al., 2005; Mozaffarian, Katan, Ascherio, Stampfer, & Willett, 2006; Oh, Hu, Manson, Stampfer, & Willett, 2005; Trichopoulou & Lagiou, 1997). Correspondingly, the consumption of between 20% and 35% of total daily caloric intake from dietary fat is generally recommended (U.S. Department of Health & Human Services, 2005). This goal consists of different behavioral facets such as purchasing low-fat

foods, cooking foods to reduce fat and limiting added fat at the table and are often salient behavioral targets of health professionals. Despite the well-known benefits associated with consuming a diet lower in fat, current population data suggest achieving this broad dietary behavioral target and its sub-facets remains challenging (Kennedy, Bowman, & Powell, 1999; WHO, 2003). To further characterize why consuming a diet lower in fat remains a challenge, we sought to explore important sub-facets of low-fat dietary behavior and their social-cognitive characteristics.

One of the more popular models for interpreting dietary behaviors is the Transtheoretical model (TTM) or stages of change (Glanz et al., 1994). According to stage models, changes in a health behavior consist of movements through a sequence of discrete, qualitatively distinct stages, characterized by distinct mindsets. As individuals move through these stages, specific social-cognitive variables influence stage progression (Weinstein, Rothman, & Sutton, 1998). The TTM proposes five stages of change: Precontemplation (no intention to change behavior), Contemplation (considering changing behavior), Preparation (intending to change behavior), Action (initiation of a new behavior), and Maintenance

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(execution of the behavior for more than 6 months) (Prochaska, DiClemente, & Norcross, 1992).

The TTM also integrates other social-cognitive variables, which are hypothesized to drive stage transition (Prochaska & DiClemente, 1983) and include *pros*, *cons* and situational *temptation* (*self-efficacy*). The first two variables are derived from Decisional Balance theory (Janis & Mann, 1977) and reflect an individual's relative weighting of the possible gains (*pros*) and disadvantages (*cons*) for adopting a new behavior. *Pros* are positive gains and are the consequences realized through the target behavior whereas in opposition, *cons* refer to the potential costs and disapproval that may materialize by performing the goal behavior. Typically, individuals in Precontemplation perceive substantially lower scores for *pros* compared to individuals in all other stages, while those in the other stages report a similar mean on this construct. Individuals in the stages Precontemplation, Contemplation and Preparation typically perceive the same level of *cons* while those in Action have lower scores than individuals in the preceding stages but still higher than those in Maintenance (Prochaska et al., 1994).

Temptation (the opposite of *self-efficacy*) is the belief and the extent to which one has control over his or her own actions on the face of difficulties under different conditions or situations (Bandura, 1986). *Self-efficacy* for positive health behaviors (e.g., consuming a low-fat diet) has been shown to increase (decrease in *temptation*) from the early intentional stages to the Action/Maintenance stages (Boudreaux et al., 2003; Ounpuu, Woolcott, & Rossi, 1999) and was found to be an important intermediary in forward stage transition (e.g., De Vet, Brug, De Nooijer, Dijkstra, & De Vries, 2005).

Stage models have been criticized for a lack of clear rules for assigning individuals to stages (Sutton, 2000). The main question raised by critics is whether the "stages" are qualitatively different or are they based upon an arbitrary distinction along an underlying continuum. If they are distinguished arbitrarily, stages do not provide any additional theoretical insight over and above a parsimonious, continuous measurement of the readiness to change (Bandura, 1997; Weinstein et al., 1998).

Sutton (2000) suggests determining whether behavior change is continuous can be achieved by testing if discontinuity patterns reveal non-linear trends. A linear trend would produce a series of ordered significant differences between stages (Precontemplation < Contemplation < Preparation < Action < Maintenance), with approximately equal differences between each adjacent pair of means. The existence of a non-linear trend is indicated not only by significant increases in means of test variables, but also by unequal magnitudes in the difference between pairs of adjacent means. A linear trend, in contrast, would imply a continuum (Sutton, 2000; Weinstein et al., 1998). Thus, testing the explicit assumptions of linearity between stages is another test of the assumptions of a stage model (Sutton, 2000). The results of the few studies that have tested linearity/discontinuity patterns in the TTM have been inconsistent (e.g., support found by Armitage, Povey, & Arden, 2003; no support, Armitage & Arden, 2002). However, the majority of the TTM studies have not explicitly tested for non-linear trends even if they have found discontinuity patterns (e.g., studies on smoking cessation Herzog & Blagg, 2007; Prochaska et al., 1994; Velicer, Prochaska, Rossi, & DiClemente, 1996). Two recent studies have shown that discontinuity pattern exist for physical activity (Lippke & Plotnikoff, 2009) and for dietary behavior (Lippke, Ziegelmann, Schwarzer, & Velicer, 2009).

The implications of pseudo-stage occupation are important when targeting dietary behavior change. As such, appropriately contextualizing low-fat dietary behaviors within TTM is important when attempting to identify if individuals are occupying pseudo-

stages (no actual stages but rather a state along a continuum higher or lower for behavior and intention). Essentially, it is important to characterize whether the stages we measure are actually 'true' stages and not just arbitrary subdivisions of linear increases of one-dimensional estimates of behavior. A valid stage measure is needed to identify 'true' stage occupation.

With this in mind, the general objectives of this study were to, in a large randomly selected population-based sample: (1) describe stage distributions for the overall consumption of a low-fat diet and across three context specific low-fat diet behaviors (i.e., purchasing low-fat foods, cooking foods to reduce fat, limiting added fat at the table), (2) examine whether the test variables (*pros*, *cons* and *temptation*) would discriminate between the overall and context specific stages of change and, (3) determine if non-linear trends for the test variables rejects overall and context specific pseudo-stage occupation. More specifically, and based on the current TTM literature (e.g., Greene et al., 1999; Hall & Rossi, 2008; Ounpuu et al., 1999; Rosen, 2000), we hypothesized: *pros* would increase across all stages but only be significantly different between Precontemplation and Contemplation stages; *cons* would decrease across all stages, and be significantly different between all adjacent stages; and that *temptation* would decrease across all stages but not be significantly different between any adjacent stages.

Method

Participants and procedures

The overall purpose of the project was to enhance our understanding of demographic and social-cognitive correlates of dietary fat related behaviors and readiness to change in a random adult population sample. The methodological details of the overall project, which include sampling procedures and instrument validation, are presented elsewhere (Plotnikoff et al., 2009). The main paper also examined psycho-social correlates (from three social-cognitive theories) of dietary fat shopping behavior (Plotnikoff et al., 2009). The current paper focuses on testing the TTM for low-fat dietary behaviors across multiple behavioral contexts.

English-speaking adult (≥ 18 years) residents on the Census List of the Regional Municipality of Ottawa-Carleton, Ontario, Canada, were randomly sampled and study materials were distributed in three waves according to a modified Dillman method (Dillman, 1978) in the Regional Municipality of Ottawa-Carleton, Ontario, Canada (Plotnikoff et al., 2009).

Packages for wave one including a cover letter, a questionnaire, and a stamped return envelope were mailed to 2127 participants. From this first wave, 887 completed questionnaires were returned (41.7%). Exactly one week after the first mailing, a follow-up postcard was mailed to all recipients of the first mailing, containing a reminder to those who had not returned their questionnaires and a thank-you to those who had done so. A second wave of questionnaires was mailed to all non-respondents three weeks after the first wave. This mailing contained a modified cover letter that indicated the questionnaire had not yet been returned by the respondent, an additional questionnaire and a stamped, addressed envelope for its return. This second mailing resulted in 238 additional questionnaires. The third and final wave of mailing took place seven weeks after the first mailing, with the same contents as the second wave mailed to the remaining non-respondents. The final wave resulted in 91 additional returns. In total, 1216 (57.2% of the total potential returns) completed questionnaires were received, with equal representation by sex (55.6% females). A further 413 (19.4%) were deemed ineligible (i.e., deceased, infirmed, language barrier, moved/address unavailable, incorrect

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