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Research report

Validated scales to assess adult decisional balance to eat more fruits and vegetables☆

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ABSTRACT

A scale to measure adult decisional balance to eat more fruits and vegetables was developed and confirmed, and its psychometric properties were assessed. Two simple random samples of adults ages 25–60 years were selected from a nationally representative sampling frame. The development survey had a 72% response rate (n = 231). The confirmation survey had a 67.4% response rate (n = 2132). In both surveys, a self-administered questionnaire assessed demographics, fruit and vegetable intakes, stages of change, and decisional balance. Principal components analysis with varimax rotation and confirmatory factor analysis were performed. The decisional balance scale had three reliable subscales: "health pros," "non-health pros," and "cons." Model fit was adequate for a "pros" and "cons" hierarchical structure. For both fruits and vegetables, health pros increased significantly between precontemplation and contemplation stages, surpassing the cons. Non-health pros increased significantly between precontemplation and contemplation fruit stages, surpassing the cons in preparation stage. Between precontemplation and action stages, health pros increased (mean effect size = 0.90 [fruit] and 0.80 [vegetables]) and cons decreased (mean effect size = 0.27 [fruit] and 0.35 [vegetables]). Heterogeneity in this sample may have diluted these effect sizes. This decisional balance scale is valid and reliable.

Introduction

In the United States and elsewhere, most adults do not consume at least five servings of fruits and vegetables a day (Centers for Disease Control and Prevention, 2007; Ministry of Health & University of Auckland, 2003; Office for National Statistics, 2002). Given that many of these individuals are unmotivated to change their behavior (Prochaska & Velicer, 1997), interventions using expectancy-value theories, such as decisional balance, are needed to build motivation to eat more fruits and vegetables (Contento et al., 1995).

The aim of this research was to develop and confirm a psychometrically sound scale to assess decisional balance to eat more fruits and vegetables in a nationally representative sample of multi-ethnic adults ages 25–60 years in New Zealand. This age range represents people with relatively stable work and family commitments that may benefit from motivational intervention. Psychometrically sound decisional balance instruments are needed to investigate to what extent pros, cons, and decisional balance explain behavior, predict early stage transitions, and mediate changes in fruit and vegetable consumption.

The Transtheoretical Model defines decisional balance as "the individual's relative weighing of the pros and cons of changing" (Prochaska, Redding, & Evers, 1997; Prochaska & Velicer, 1997). It is based on Janis and Mann's (1977) Decisional Balance Sheet of Incentives covering cognitive and motivational aspects of human decision making (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). Decisional balance goes a step beyond perceived benefits and barriers (Strecher & Rosenstock, 1997) in assessing the extent to which an individual values specific outcomes: a gain/loss to self, a gain/loss to others, self-approval/disapproval, or approval/disapproval of others (Janis & Mann, 1977; Velicer et al., 1985).

In the Transtheoretical Model, decisional balance predicts progress through the early stages of change (Prochaska et al., 1997; Prochaska & Velicer, 1997; Velicer et al., 1985). The Model also suggests that pros, cons, and decisional balance (pros minus cons)

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(Velicer et al., 1985) can mediate changes in health behaviors (Prochaska et al., 1997; Prochaska & Velicer, 1997; Prochaska et al., 2005). For example, to progress from precontemplation to action stage, the pros of change need to increase by 1 standard deviation (strong principle) and the cons of change need to decrease by a 1/2 standard deviation (weak principle), with positive decisional balance achieved in action stage (Hall & Rossi, 2008; Prochaska, 1994). To test the applicability of these and other Transtheoretical Model hypotheses to fruit and vegetable behaviors, psychometrically sound decisional balance instruments are needed.

Our literature search identified nine adult studies that investigated "decisional balance" to eat fruits and vegetables (De Vet, De Nooijer, De Vries, & Brug, 2005, 2006; Greene et al., 2004; Henry, Reimer, Smith, & Reicks, 2006; Horwath, Nigg, Motl, Wong, & Dishman, 2010; Ling & Horwath, 2001; Ma et al., 2002; Robinson et al., 2008; Steptoe et al., 2003). However, no suitable scale was found to measure decisional balance to eat more fruits and/or vegetables in multi-ethnic adults ages 25–60 years. Just over half of the studies reported all items, thereby allowing independent assessment of face validity (De Vet et al., 2005, 2006; Henry et al., 2006; Ling & Horwath, 2001; Ma et al., 2002), but only Ling and Horwath (2001) clearly operationalized the decisional balance construct by specifying *personalized* outcomes (Velicer et al., 1985). In this case, Singaporean Chinese participants were consulted to generate culturally specific items (some items addressed cultural beliefs and dietary practices that differed significantly from our study population), each item included a personal pronoun written in singular first person, and each item specified a Janis and Mann (1977) outcome category (Ling & Horwath, 2001). In six of nine studies reviewed, researchers stated they adapted or used previously published scales (De Vet et al., 2005, 2006; Greene et al., 2004; Horwath et al., 2010; Robinson et al., 2008; Steptoe et al., 2003), but only one study reported that they confirmed the factor structure in their study population (Horwath et al., 2010). In this case, they used a scale designed for older adults (Greene et al., 2004) among an 18+ years old sample, acknowledging two of eight items were of little relevance to their study population (Horwath et al., 2010).

Despite limitations in some of the decisional balance instruments used, these studies generally support Transtheoretical Model hypotheses for fruit and vegetable consumption. For example, non-experimental, longitudinal studies found an increase of pros predicted forward stage transition from precontemplation for both fruits and vegetables (De Vet et al., 2005, 2006), whereas a decrease of cons predicted progression from contemplation stage for vegetables only (De Vet et al., 2006). Similarly, an increase of cons for vegetables predicted backward stage transitions out of action/maintenance (De Vet et al., 2006). These findings suggest pros and cons might influence people's beliefs about their capabilities (self-efficacy), which also predicted forward and backward stage transitions (De Vet et al., 2005, 2006). Additional research is needed to identify whether decisional balance to eat more fruits and vegetables predicts stage transitions and successful maintenance of behavior change (Blissmer et al., 2010).

Finally, recent systematic reviews investigating determinants of fruit and vegetable intakes did not find any studies testing decisional balance (Guillaumie, Godin, & Vézina-Im, 2010; Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2008). In a cross-sectional study, fruit and vegetable consumption was higher in adults reporting greater pros and fewer cons ($r_s = 0.24$ and -0.10, respectively) (Ling & Horwath, 2001). These relationships require further investigation.

Since no suitable scale was found for our study population, we developed and confirmed a scale to assess decisional balance to eat more fruits and vegetables. To be deemed psychometrically sound, the decisional balance scale needed accurate translation (content and face) validity, repeatable factorial validity discriminating pros and cons, adequate reliability, and convergent validity for the following patterns across the stages of change: the strong and weak principles, and a crossover from negative to positive decisional balance between precontemplation and action stages.

Methods

Design

Two cross-sectional postal surveys were conducted. In each case participants were mailed an introductory letter, a consent form, a self-administered questionnaire (survey 1: 76 items; survey 2: 83 items), and a postage-paid return envelope. Non-respondents were sent up to three reminders (Dillman, 2000). The second survey was designed to screen adults for a large postal intervention. The University of Otago Human Ethics Committee (Dunedin, New Zealand) approved both surveys prior to recruitment.

Sample

For each survey, participants ages 25–60 years were randomly selected, with equal probability, from the New Zealand electoral rolls, which represent 93.5% of the eligible national population (Mainvil, Lawson, Horwath, McKenzie, & Reeder, 2009). The sample size for the development survey was 350 (Mainvil et al., 2009), based on needing at least 200–240 participants to conduct the factor analysis (DeVellis, 1991) and a 70% response rate (Dillman, 2000). Eight percent of questionnaires were undelivered, leaving 322 eligible participants (Mainvil et al., 2009). The sample size for the confirmation survey ($n = 3800$) was based on intervention screening criteria. Seventeen percent of questionnaires were returned as undelivered, leaving 3167 eligible participants.

Measures

Demographics

Demographic variables included sex, age, ethnicity, education level, occupation, employment situation, and household living situation. Response categories have been reported previously (Mainvil et al., 2009). The New Zealand Socio-economic Index 1996 was used to convert occupation data to socio-economic grouping (Galbraith, Jenkin, Davis, & Coope, 2003).

Decisional balance

A 27-item self-administered measure was designed to assess decisional balance to eat more fruits and vegetables, using the following format: "How important is each statement to you in your decision to eat, or not to eat, fruit and vegetables? It is important to me that…" (item list). Participants responded to each item using a five-point Likert-style scale ranging from "not at all important (1)" to "extremely important (5)."

A three-staged, audience-centered approach was used to formulate the questionnaire. First, nine focus groups (Krueger & Casey, 2000) were conducted with 64 adults representing indigenous Maori (two groups), low-income (two female and two male groups, including unemployed beneficiaries), and middle-income (two female groups and one male group) New Zealand populations (Mainvil et al., 2009) to identify positive and negative outcomes of eating more fruit and eating more vegetables. Pros and cons themes emerged from a manual, transcript-based analysis (Krueger & Casey, 2000). These themes were translated into 37 personalized items: 21 pros specified "gain to self" or "self-