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Explaining fruit and vegetable consumption: the theory of planned behaviour and misconception of personal intake levels

R.P. Bogers[a,*], J. Brug[b,c], P. van Assema[c], P.C. Dagnelie[a]

[a]*Department of Epidemiology, Maastricht University, P.O. Box 616, 6200 MD, Maastricht, The Netherlands*
[b]*Department of Public Health, Erasmus Medical Centre, Rotterdam, The Netherlands*
[c]*Department of Health Education and Promotion, Maastricht University, Maastricht, The Netherlands*

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Abstract

The influence of individuals' misconceptions in assessing fruit and vegetable consumption on the ability of the theory of planned behaviour to explain variance in the consumption of these foods was studied. Dutch women (mean age 41, $n = 159$) completed a questionnaire assessing the theory's constructs with regard to the daily consumption of at least two pieces of fruit and 200 gram of vegetables. Consumption was assessed using a self-rated measure and more objectively with a food-frequency questionnaire. Both measures were combined to classify participants according to the accuracy of their self-assessed intake levels ('realists' vs. 'overestimators'). The model explained variation in objective fruit and vegetable intake much better among realists ($R^2 = 45\%$ for fruits and 39% for vegetables) than among overestimators ($R^2 = 18$ and 5%, respectively). Perceived behavioural control was the strongest predictor of intentions and behaviour. When plasma vitamin C and carotenoid concentrations were used as objective indicators for fruit and vegetable intake, the explanatory value of the model was lower, but again more variance was explained among realists than among overestimators. We conclude that awareness of personal behaviour should be taken into account when applying the theory of planned behaviour to explain dietary behaviours as well as to design health education interventions.

Introduction

Although fruits and vegetables (FV) are a major dietary source of vitamins and fibre, and results of many observational studies in humans suggest that ample consumption of FV may prevent cardiovascular disease (Ness & Powles, 1997) and cancer (Steinmetz & Potter, 1996), mean consumption of these foods is still below the intake levels recommended by public health authorities (200 g of vegetables and two pieces of fruit according to Dutch guidelines) (Hulshof, 1998). Many people seem not to be aware that their FV consumption is below the recommended level (Lechner, Brug, & De Vries, 1997). The present article deals with the influence of an optimistic bias in self-rated FV intake on the strength of the relations between FV consumption and its determinants.

A model that has proved useful in explaining or predicting a variety of behaviours is the Theory of Planned Behaviour (TPB) (Ajzen, 1991). The TPB originated from the earlier theory of reasoned action (TRA), which states that the likelihood of someone engaging in a particular behaviour can be predicted by their intention to perform that behaviour, which in turn is predicted by attitudes and subjective norms. Attitude refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question. Subjective norm refers to the perceived social pressure to perform or not perform a behaviour. In order to extend the scope of the TRA to behaviours that may not be under complete volitional control, the perceived behavioural control construct was introduced as a third predictor of behavioural intention. Perceived behavioural control reflects the perceived ease or difficulty of performing a particular behaviour, and is thought also to have a direct effect on behaviour, which is not mediated by intentions (Ajzen, 1991). In a meta-analysis including 185 independent studies on the predictive potential of the TPB for a variety of health-related behaviours, the TPB explained 27 and 39% of the variance in behaviour and intention, respectively (Armitage & Conner, 2001). For

* Corresponding author.
E-mail address: rik.bogers@epid.unimaas.nl (R.P. Bogers).

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complex health-related behaviour such as diet and physical activity, the predictive value of the TPB or the related Attitude-Social influence-Efficacy (ASE) model (De Vries, Dijkstra, & Kuhlman, 1988) may be more limited (Brug, Lechner, & De Vries, 1995).

Besides the fact that such behaviours could be partly habitual, this may be caused by the fact that what is studied as one behaviour (e.g. fruit consumption) in reality consists of many separate behaviours (e.g. buying, preparing and eating apples, pears, oranges) each of which may have its own determinants. The complexity of dietary behaviour probably also contributes to the fact that people tend to have an unrealistically optimistic view of their own intake levels. For example, a study by Lechner et al. (1997) showed that of those people who do not eat the recommended amounts of vegetables and fruits, 88 and 65%, respectively, think they actually do meet the recommendations. This misconception of their own consumption would be expected to reduce the explained variance in behaviour when an objective measure of behaviour is used instead of a self-rated measure. The above meta-analysis supports this hypothesis: studies using self-reported behavioural measures found an explained variance of 31% compared to 21% in studies using objective or observed behavioural measures (Armitage & Conner, 2001). Work by Brug et al. showed that psychosocial determinants (outcome beliefs, attitude, social pressure, self-efficacy, modelling) of fat intake were stronger correlates of self-rated fat intake than of fat intake as assessed by a food-frequency questionnaire (FFQ) (Brug, 1994; Brug & Van Assema, 2001). Similar findings have also been reported concerning physical activity (Ronda, Van Assema, & Brug, 2001). Therefore, we hypothesized that in the TPB model a higher percentage of variance should be explained in participants having a realistic view of their FV consumption (in other words, individuals whose self-rated consumption approaches objective consumption) than in participants misjudging their FV intake. Due to the discrepancy between subjective and objective measures of FV intake, we cannot rely on self-rated measures if we want to know whether someone eats the recommended amounts of FV. A FFQ is a more objective instrument widely used for estimating habitual intake of foods (Willett, 1994). Nevertheless, because a FFQ is a self-administered assessment instrument, there remains a possibility of bias with respect to the recall of past diet, socially desirable answering, or the (conscious or subconscious) desire to match answers given in a FFQ to answers given in a questionnaire for measuring psychosocial determinants of consumption. Truly objective measures of dietary intake are biochemical markers of consumption (van 't Veer, Kardinaal, Bausch Goldbohm, & Kok, 1993), frequently used biomarkers for FV consumption being plasma carotenoids and vitamin C. Concentrations of these vitamins were found to correlate with the intake of FV as assessed by dietary questionnaires (Campbell et al., 1994; Drewnowski et al., 1997), although correlations are moderate due to biological variation between persons in, for example, absorption or metabolism of vitamins. Plasma carotenoid and vitamin C concentrations respond to changes in dietary FV intake and were reported to stabilise within approximately two weeks of changing FV consumption to a new stable level (Yeum et al., 1996; Zino, Skeaff, Williams, & Mann, 1997). To our knowledge, biomarkers have not been used previously as an outcome measure in studies of psychosocial determinants of FV consumption.

The objectives of the present study were to determine the effect of misconception of FV consumption on the explanatory value of the TPB, and to identify which TPB constructs predict intentions and FV consumption. Additionally, we tested the use of biomarkers as a measure of FV consumption in the TPB.

Methods

Study design

The study was part of a larger project aimed at testing various methods to assess FV intake in children aged 7–10 years and their mothers. Approval for the study at large was obtained from the medical ethical committee of the University Hospital in Maastricht. In March 2001, a questionnaire comprising a FFQ about FV consumption, immediately followed by questions assessing TPB constructs and a question about self-rated consumption was sent to the mothers 1–2 weeks before blood sampling. Participants were requested to complete the questionnaire the day or evening before blood sampling. A venous blood sample was taken from the mothers for the analysis of biomarkers.

Participants

In the present study only data regarding the mothers were used. The women had to be apparently healthy non-smokers who agreed not to use vitamin supplements from 1 month before the first blood collection to the end of the study period. Various ways of approaching potential study participants were used such as distribution of invitation letters via mail to households where children aged 7–10 lived, and recruitment via schools. Recruitment was stopped when >200 women were enrolled. The study started with 207 women, of whom 163 women (79%) completed it. Respondents were excluded from further analysis because of having FFQs with >20% missing values ($n = 2$), or having >20% missing values in the questions assessing TPB constructs ($n = 2$), leaving a total number of 159 respondents (77% of the initial number of participants). In the analyses on vegetable consumption and determinants, one more participant was excluded because of a high number of missing values in the questions assessing the TPB constructs regarding vegetable consumption. One participant did not complete the question on self-rated vegetable consumption,