Appetite 58 (2012) 997–1004

Contents lists available at SciVerse ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Research report

Promoting fruit and vegetable consumption. Testing an intervention based on the theory of planned behaviour

E.J. Kothe *, B.A. Mullan, P. Butow

School of Psychology, The University of Sydney, Griffith Taylor (A19), NSW 2006, Australia

ARTICLE INFO

Article history:
Received 21 November 2011
Received in revised form 1 February 2012
Accepted 10 February 2012
Available online 17 February 2012

Keywords:
Theory of planned behaviour
Fruit and vegetable consumption
Behaviour change

ABSTRACT

This study evaluated the efficacy of a theory of planned behaviour (TPB) based intervention to increase fruit and vegetable consumption. The extent to which fruit and vegetable consumption and change in intake could be explained by the TPB was also examined. Participants were randomly assigned to two levels of intervention frequency matched for intervention content (low frequency $n = 92$, high frequency $n = 102$). Participants received TPB-based email messages designed to increase fruit and vegetable consumption, messages targeted attitude, subjective norm and perceived behavioural control (PBC). Baseline and post-intervention measures of TPB variables and behaviour were collected. Across the entire study cohort, fruit and vegetable consumption increased by 0.83 servings/day between baseline and follow-up. Intention, attitude, subjective norm and PBC also increased ($p < .05$). The TPB successfully modelled fruit and vegetable consumption at both time points but not behaviour change. The increase of fruit and vegetable consumption is a promising preliminary finding for those primarily interested in increasing fruit and vegetable consumption. However, those interested in theory development may have concerns about the use of this model to explain behaviour change in this context. More high quality experimental tests of the theory are needed to confirm this result.

Introduction

Fruit and vegetable consumption has wide ranging implications, including decreased risk of cancer, heart attack, and stroke (Dauchet, Amouyel, & Dallongeville, 2009; Dauchet, Amouyel, Hercberg, & Dallongeville, 2006; FAO/WHO, 2003; He, Nowson, & MacGregor, 2006). The Australian Government recommends that Australians consume 2 pieces of fruit and 5 servings of vegetables each day (National Health & Medical Research Council, 2003). However, few adults meet recommended daily intakes of fruit and vegetables, with young adults the least likely of any age group to consume fruit and vegetables (Australian Bureau of Statistics, 1995; Joint Health Surveys Unit, 2008). Low consumption rates amongst young adults suggest the need for programs designed specifically for this population.

Major reviews of behaviour change and methods of intervention design recognise the importance of theory in the development and evaluation of interventions (e.g. Bartholomew, Parcel, Kok, & Gottlieb, 2001; House of Lords: Science and Technology Committee, 2011). A recent meta-analytic review of the use of theory in intervention design concluded that more extensive use of theory was associated with larger intervention effects (Webb, Joseph, Yardley, & Michie, 2010). However, despite this widespread recognition of the importance of theory, many studies within health behaviour research are still atheoretical (Painter, Borba, Hynes, Mays, & Glanz, 2008). The challenge for researchers working in the area of fruit and vegetable consumption is to develop effective theory-driven interventions which target variables likely to influence consumption. The present study adopts the theory of planned behaviour (TPB; Ajzen, 1991) as a framework for addressing this issue since it proposes determinants of behaviour which are potentially amenable to change through psychosocial interventions.

TPB

The TPB posits that intention and perceived behavioural control (PBC) are the most proximal determinants of behaviour; intention in turn is determined by attitude towards the behaviour, subjective norm and PBC (Ajzen, 1991). Attitude refers to the individual's evaluation of a given behaviour as favourable or unfavourable and formed on the basis of the individual's beliefs about the outcomes of behaviour and their evaluations of those outcomes (Ajzen, 1991; Fishbein & Ajzen, 2010). Subjective norm refers to perceived social pressure to perform (or not perform) of the behaviour. Subjective norm is formed as a result of the individual's beliefs about the extent to which important others would approve or disapprove of their performance of the behaviour mediated by

* Corresponding author.
E-mail address: emily.kothe@sydney.edu.au (E.J. Kothe).

0195-6663/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
doi:10.1016/j.appet.2012.02.012

the individual's motivation to comply with others' views (Ajzen, 1991; Fishbein & Ajzen, 2010). The final predictor of intention measured in this study, PBC, reflects the extent to which an individual believes the performance of the behaviour is within their control (Ajzen, 1991; Fishbein & Ajzen, 2010). Like attitude and subjective norm, PBC is thought to influence behaviour through its influence on intention. It is also thought to have a direct influence on behaviour over and above its influence on intention. The extent to which PBC has a direct influence on behaviour is often thought to reflect an individual's actual behavioural control over the target behaviour (Fishbein & Ajzen, 2010). Given the difficulty in directly assessing actual behaviour control for most health related behaviours, PBC is used as a proxy for actual behaviour control the majority of TPB based studies (Armitage & Conner, 2001; Fishbein & Ajzen, 2010; Godin & Kok, 1996).

A large number of studies provide support for the utility of the model in the prediction of behaviour (Armitage & Conner, 2001; Godin & Kok, 1996). In the context of fruit and vegetable intake, the model has been reported to account for an average of 41% of the variance in intention and 45% of the variance in behaviour (Guillaumie, Godin, & Vézina-Im, 2010). In their meta-analytic review of psychosocial predictors of fruit and vegetable intake, Guillaumie, Godin, and Vézina-Im argued that the TPB is the most strongly supported model of intention and behaviour (Guillaumie et al., 2010), and therefore there is sound justification for the use of the model in interventions designed to increase intake of fruit and vegetables (Guillaumie et al., 2010).

TPB and behaviour change

Although the predictive utility of the TPB model has been well established, there are relatively few studies which manipulate the cognitions specified in the model in order to assess whether changes in the supposed predictors of behaviour do in fact lead to behaviour change (Elliott & Armitage, 2009; Hardeman et al., 2002). While a number of studies have successfully changed behaviour using interventions modelled on the TPB (for a review see: Hardeman et al., 2002) – few studies have investigated the extent to which change in behaviour occurs through theorised pathways (Elliott & Armitage, 2009; Hardeman et al., 2002). Researchers have specifically called for studies which explore the mediation of behaviour change outcomes by theory specific cognition changes (Michie & Abraham, 2004). While a small number of studies have explored this in recent years (e.g. Elliott & Armitage, 2009; Kelley & Abraham, 2004; Kothe, Mullan, & Amaratunga, 2011) results have been inconsistent and none have looked at fruit and vegetable intake.

Aims and hypotheses

The TPB was used in this study to develop and test an intervention to promote fruit and vegetable consumption amongst young adults. The aims of the study were to evaluate the impact of the intervention on TPB variables and behaviour; to investigate the extent to which intervention effects could be explained using pathways implied by the TPB; and to examine the efficacy of the Fresh Facts 30 day program, described below, at different levels of email frequency.

It was hypothesised that exposure to the intervention would result in changes in attitude, subjective norm, PBC, intention and behaviour. It is expected that the TPB would provide a good model of intention and behaviour at both baseline and follow-up. With regards to the modelling of behaviour change, it was hypothesised that change in behaviour could be explained by change in intention and PBC and that change in intention could be explained by change in attitude, subjective norm, and PBC.

In light of work linking intervention intensity to efficacy (Kroeze, Werkman, & Brug, 2006), it was expected that higher frequency emails would result in greater change in behaviour.

Method

Participants

Data were collected from undergraduate students from a wide range of disciplines who were undertaking a 1st year psychology course at an Australian University in May 2011. All aspects of the experiment, including recruitment, occurred online and could be completed from any computer with internet access. Participants received course credit for their participation. Details of the final sample are given in the results section.

The Fresh Facts 2011 intervention

The intervention ('Fresh Facts 2011') was designed to increase fruit and vegetable intake of young adults. The intervention was developed using the theory of planned behaviour (Ajzen, 1991), and consisted of a 30 day program designed to target attitude, subjective norm and PBC. The intervention materials consisted of a series of automated emails sent to participants over the course of the intervention period. Participants were randomised to two levels of email frequency – participants in the high frequency group received 27 intervention emails (each containing one intervention message) over the study period, while participants in the low frequency group received 9 longer emails (each containing three intervention messages) over the same time period. The email content was matched across the two groups so that all participants received identical intervention content regardless of group.

The content of the automated emails was designed using the taxonomy of behaviour change techniques (Abraham & Michie, 2008). All techniques used in the present study have previously been identified as potentially being linked to attitude, subjective norm, and/or PBC (Abraham, Kok, Schaalma, & Luszczynska, 2010). For a summary of the intervention techniques used in the present study see Table 1.

Procedure

This study was approved by the University Human Research Ethics Committee and carried out in accordance with universal ethical principles. After completing a consent form online, participants completed a baseline questionnaire at Time 1, which included demographic measures, a measure of behaviour, and a TPB questionnaire. Once they had completed the baseline survey, participants were randomised and then added to the study mailing list and began receiving intervention messages via email. All participants received an invitation to complete the follow-up questionnaire on Day 30. The Time 2 questionnaire included a second administration of the behaviour measure and TPB items.

Measures

TPB questionnaire

A purpose designed questionnaire was used to assess intention, attitude, subjective norm and PBC. The questionnaire was designed using guidelines for TPB questionnaire construction (Francis et al., 2004). Intention, attitude, subjective norm and PBC were all assessed using a 100 point visual analogue scale at both baseline and post-intervention follow-up.

Intention to eat 2 servings of fruit and 5 servings of vegetables was measured by three items, each relating to an individual's plans