Appetite 82 (2014) 103–110

Contents lists available at ScienceDirect

Appetite

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

Research report

A brief intervention increases fruit and vegetable intake. A comparison of two intervention sequences☆

Pempa Lhakhang [a,*], Cristina Godinho [b], Nina Knoll [a], Ralf Schwarzer [d,c,a]

[a] Health Psychology Department, Freie Universität Berlin, Habelschwerdter Allee 45, 14195 Berlin, Germany
[b] Instituto Universitário de Lisboa (ISCTE-IUL), Cis-IUL, Lisboa, Portugal
[c] Department of Psychology, University of Social Sciences and Humanities, ul. Ostrowskiego 30b, 53-238 Wroclaw, Poland
[d] Institute for Positive Psychology and Education, Australian Catholic University, Sydney, 25A Barker Road, Strathfield, NSW 2135, Australia

ARTICLE INFO

Article history:
Received 21 January 2014
Received in revised form 8 May 2014
Accepted 14 July 2014
Available online 15 July 2014

Keywords:
Fruit
Vegetables
Motivation
Self-regulation
Self-efficacy
Planning

ABSTRACT

Background and Purpose: To evaluate the effectiveness of two subsequent intervention components (motivational and self-regulatory components), placed in different order, to promote fruit and vegetable (FV) intake. *Methods:* After baseline assessment, university students ($N = 205$, aged 18–26 years) were allocated to two groups. One group received a motivational intervention (outcome expectancies, risk perception, and task self-efficacy) followed by a self-regulatory intervention (planning and dietary self-efficacy) after 17 days. The second group received the same intervention conditions in the opposite order. Follow-up assessments were done after another 17 days. *Results:* Both intervention sequences yielded gains in terms of FV intake and self-efficacy. However, this gain was only due to the self-regulatory component whereas the motivational component did not contribute to the changes. Moreover, changes in intention and self-efficacy mediated between intervention sequence and follow-up behavior, suggesting that improving these proximal predictors of FV intake was responsible for the behavioral gains. *Conclusions:* Findings highlight the superiority of a self-regulatory intervention over a motivational intervention when it comes to dietary changes in this sample of young adults. Moreover, changes in dietary self-efficacy may drive nutritional changes.

Introduction

Underscoring the benefits of consuming a sufficient amount of fruit and vegetables (FV), a World Health Organization (WHO) review on the effectiveness of interventions and programs promoting FV intake showed that consumption of FV reduces cardiovascular diseases, cancers, diabetes, obesity and prevents several micronutrient deficiencies, especially in less developed countries (Pomerleau, Lock, Knai, & McKee, 2005). However, most people do not attain the recommendation of a minimum of 400 g of FV per day (i.e., approximately five portions). Moreover, this review highlights the need for data collection on FV intervention effectiveness in the majority of countries. India is a vast subcontinent covering 2.4% of the global landmass, it is inhabited by more than one-sixth of the world's population. Currently, the country is undergoing a rapid socio-economic, demographic, and health transition. For instance, over the last two decades, preventive nutrition has emerged as a public health concern; there have been increases in the prevalence of obesity, diabetes, and cardiovascular diseases, especially in urban areas (Ramachandran, 2006).

Thus, evidence-based interventions are needed for the promotion of FV intake, as well as an understanding of the underlying working mechanisms of intervention effectiveness. In addition to basic nutritional knowledge, both motivation and self-regulation are required for people to change their habitual dietary patterns (Adriaanse, Vinkers, De Ridder, Hox, & De Wit, 2011; Verhoeven, Adriaanse, Evers, & De Ridder, 2012).

Motivational and self-regulational mechanisms of health behavior change

Health behavior change is a complex process that involves a multitude of causal factors. From a psychological standpoint, both an initial motivation to change, followed by self-regulatory efforts are needed to change health behaviors, including FV intake. The health action process approach (HAPA; Schwarzer, 2008), a model of the adoption and maintenance of health behaviors, suggests two phases of change, namely (a) a motivational phase (where the most relevant variables are risk perception, outcome expectancies, and task self-efficacy) and (b) a self-regulatory phase (where the most

☆ *Acknowledgements:* Special thanks to the Administrator of the New Delhi SOS Tibetan Youth Hostel (Mrs. Tsering Dolma), Mr Tsering Norbu and the student council board members (2012–13), who assisted in data collection and making this study possible. Pempa Lhakhang is grateful for DAAD (German Academic Exchange Service) grant which made it possible to conduct this research.

* Corresponding author.
E-mail address: pempa.lhakhang@fu-berlin.de (P. Lhakhang).

http://dx.doi.org/10.1016/j.appet.2014.07.014
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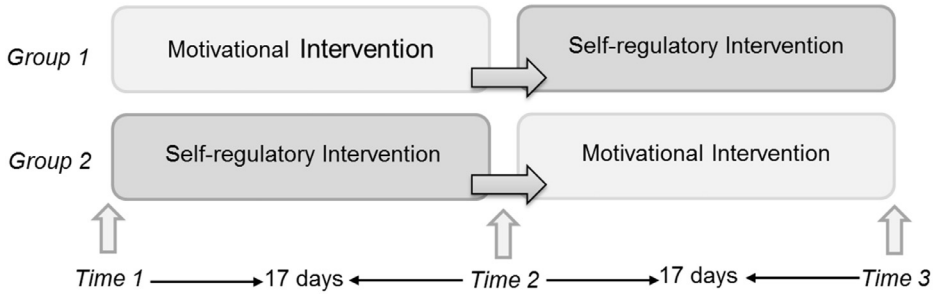

Fig. 1. Illustration of the sequential, crossover research design with two groups that receive both interventions in different order (Group 1 = Motivation → Self-regulation Sequence, Group 2 = Self-regulation → Motivation Sequence).

relevant variables are maintenance self-efficacy, planning, and action control). The first phase leads to a behavioral intention, whereas the second phase reflects the translation of the intention into actual behaviors.

Risk perception can be a starting point for contemplating health behavior change in some cases, but it is considered negligible in the context of FV consumption (Schwarzer et al., 2007). *Outcome expectancies* are the pros and cons expected by adopting (or not adopting) the health behavior, but they lose their predictive power after a personal decision has been made – an intention formed. To form a behavioral intention, one also needs to believe in one's capability of performing a desired action (i.e., task self-efficacy). Perceived self-efficacy is the confidence in one's ability to execute a difficult or resource-demanding behavior (Bandura, 1997). Self-efficacy plays a critical role in health behavior initiation and maintenance by directly influencing health behavior and by affecting several other determinants (Bandura, 2004). Various experimental studies have shown that self-efficacy interventions help to increase FV intake which attests that self-efficacy is an operative construct that facilitates self-regulational processes such as effort and persistence (Luszczynska, Tryburcy, & Schwarzer, 2007). Self-efficacy plays an important role in the long-term adherence to healthy dietary practices (Mosher, Lipkus, Sloane, Snyder, Lobach, & Demark-Wahnefried, 2013).

To translate the intention into action requires self-regulatory beliefs and strategies, in particular self-efficacy and planning (Hagger & Luszczynska, 2014). Action *planning* refers to the when, where, and how of an intended behavior, whereas *coping planning* pertains to the anticipation of barriers and ways to overcome them (Kwasnicka, Presseau, White, & Sniehotta, 2013). A great deal of research has documented the pivotal role of planning as a self-regulatory strategy in health behavior change (for a review, see Hagger, & Luszczynska, 2014), and planning as a mediator between intention and action as well (e.g., Gholami, Lange, Luszczynska, Knoll, & Schwarzer, 2013; Godinho, Alvarez, Lima, & Schwarzer, 2013).

Intervention working mechanisms

Research not only needs to identify factors that promote health behavior change, but also the way in which they operate. According to the HAPA, a motivational intervention should precede a self-regulatory intervention. Participants should first be made aware of the risks of poor nutrition as well as the benefits of consuming the recommended amount of FV and be encouraged to adopt better nutritional habits. Afterwards when they have formed a behavioral intention they should be guided to increase their dietary self-efficacy level and generate dietary plans. A study on adherence to dental flossing among young adults highlighted the advantage of a self-regulatory intervention following a motivational dental flossing intervention (Lakhang, Gholami, Knoll & Schwarzer, 2014, under review). However, research has not addressed the validity of such a sequence on FV intake. Based on the assumption that motivational processes precede self-regulatory ones (Schwarzer, 2008), we hypothesize that the order by which intervention components are delivered is relevant for its effectiveness in the promotion of FV intake. More specifically, we hypothesize that an intervention comprising a motivational component followed by a self-regulation one will be more effective than an intervention comprising the same components, but in the opposite order. Therefore, in the present study both types of intervention components will be provided to all participants, either in the hypothesized correct order or in the reversed order (AB versus BA, see Fig. 1).

Moreover, very few intervention studies have tested whether self-efficacy mediates the relation between intention and behavior and, furthermore, whether intention and self-efficacy work jointly as sequential mediators between intervention and behavior. On the basis of prior research (e.g., Luszczynska et al., 2007; Mosher et al., 2013), we hypothesize that changes in intention and self-efficacy for increasing FV intake would mediate the intervention's effect on participants' daily servings of FV.

Aims

The aim of the present study is to compare one intervention sequence (i.e., first motivation and then self-regulation) with the opposite sequence (i.e., first self-regulation and then motivation) in the context of FV consumption (see Fig. 1). Besides, we aim to unveil the mechanisms that might explain why one sequence operates differently than the other, inspecting the psychological processes by which the intervention sequence impacts behavior change.

A longitudinal intervention design with three assessment points over a 34-day period was used to test a series of predictions derived from the HAPA for FV intake.

Hypothesis 1: On average, participants will attain higher levels of FV intake along with an increase in their dietary self-efficacy, (pre-post comparison), independent of group assignment.

Hypothesis 2: At follow-up (Time 3), participants in Sequence 1 (first motivation, then self-regulation) will show a superior pattern of gains over time in terms of FV intake, intention, self-efficacy, and planning, as compared to participants in Sequence 2 (first self-regulation, then motivation).

Hypothesis 3: The increases in intention and in self-efficacy reflect the psychological mechanisms that explain higher FV intake at follow-up, i.e., they mediate the relationship between the intervention groups and FV intake.

Hypothesis 4: Changes in dietary intention and self-efficacy sequentially mediate the relation between the intervention groups and FV intake at Time 3.