Psychology, Health & Medicine

ISSN: 1354-8506 (Print) 1465-3966 (Online) Journal homepage: https://www.tandfonline.com/loi/cphm20

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To cite this article: Maryam Gholami, Amelie Wiedemann, Nina Knoll & Ralf Schwarzer (2015) Mothers improve their daughters' vegetable intake: A randomized controlled trial, Psychology, Health & Medicine, 20:1, 1-7, DOI: 10.1080/13548506.2014.902485

To link to this article: https://doi.org/10.1080/13548506.2014.902485

Psychology, Health & Medicine, 2015
Vol. 20, No. 1, 1–7, http://dx.doi.org/10.1080/13548506.2014.902485

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Mothers improve their daughters' vegetable intake: A randomized controlled trial

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(*Received 13 November 2013; accepted 4 March 2014*)

The increasing prevalence of childhood overweight makes children an important target for health promotion programmes. An intervention was designed for mothers to provide more vegetables to their daughters' diet. A randomized controlled trial compared a self-regulation condition with a control condition in 155 mothers aged 25–50 years. Dependent variable was children's (aged 6–11 years) vegetable consumption which was reported by their mothers at three points in time. After baseline (Time 1), the intervention group received theory-based instructional leaflets to promote self-regulatory skills for providing a healthy nutrition for children. Changes were assessed after two weeks (Time 2) and at three-month follow-up (Time 3). The self-regulation intervention in mothers led to an increase in vegetable intake among their daughters at Time 2 but not at Time 3. However, maintenance of vegetable consumption at Time 3 was mediated by the amount of vegetable intake at Time 2. Engaging mothers in self-regulatory health promotion programmes may be a feasible strategy to facilitate more vegetable intake among their daughters.

Keywords: school-aged children; vegetable intake; self-regulation intervention; planning

Introduction

Early dietary interventions within the family environment are an effective strategy for childhood obesity prevention (Haire-Joshu et al., 2008) and for the development of favourable food attitudes and eating behaviours of children and adolescents (Campbell et al., 2007). Golan, Kaufman, and Shahar (2006) suggested that interventions focusing on the parent as an agent of dietary change may be effective for influencing child dietary behaviour. Mothers in comparison to fathers seem to be more concerned about their children's diet and have a stronger influence on their children's eating behaviours (Johannsen, Johannsen, & Specker, 2006). Even if parents have enough information about health-behaviour recommendations and are motivated to follow a healthy lifestyle, they still need self-regulatory strategies such as planning and self-efficacy to translate their intention into action (Luszczynska, Tryburcy, & Schwarzer, 2007; Schwarzer, 2008; Wiedemann, Lippke, & Schwarzer, 2012).

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Aim and hypotheses

We investigated the effect of a self-regulation intervention for mothers on the vegetable consumption of their primary school daughters. It was hypothesized that mothers in the intervention group would report higher vegetable intake in their daughters, compared with the control group. Moreover, it was expected that the intervention affects planning and self-efficacy in the experimental group.

Methods

Participants and procedure

Mothers were invited to a health-promotion programme and attending was voluntary and without compensation. Exclusion criteria were any medical contraindications with health recommendations for vegetable consumption. Of 305 recruited mothers, 155 participants remained in the analysed sample after attrition over time or due to missing

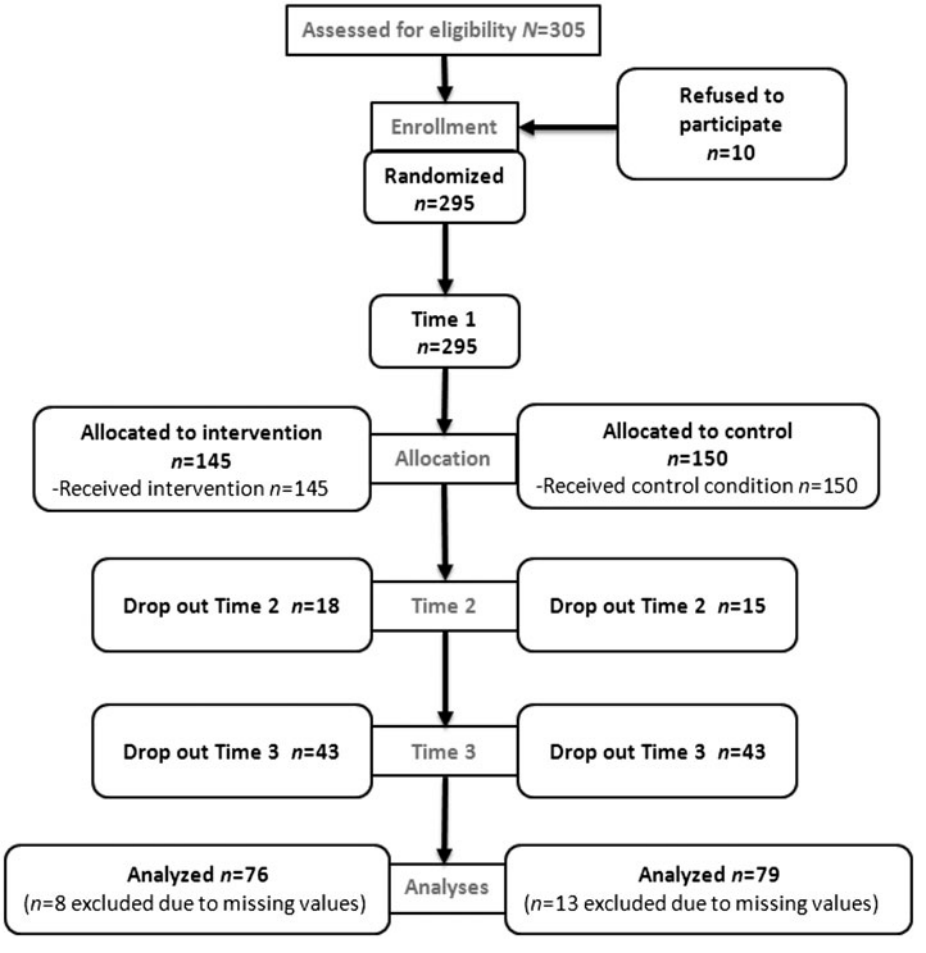

Figure 1. Flowchart with numbers of participants who attended the intervention and control conditions.

values (Figure 1). The baseline (Time 1) questionnaires were mailed to participants assessing socio-demographic factors (e.g. mothers' age, education, number of children) and daughters' vegetable intake. Following the baseline assessment, we randomized the sample into intervention and control groups, then the intervention group received the treatment package. Follow-up questionnaires were sent to all participants after two weeks (Time 2) and three months (Time 3).

The mothers in the longitudinal sample were 25–50-years old ($M = 34.13$ years; SD = 5.87 years), the majority were educated (33.5% have finished high school and 41.5% have a bachelor's degree) and married (88.1%). The number of children mostly ranged from 1 to 3 (13% had 1, 41% had 2 and 23% had 3 children), the age of their daughters ranged from 6 to 11 years.

Measures

At all three measurement points in time, *vegetable intake* was assessed with an open answer format: "How many portions of vegetable did your daughter eat on a usual day during last week?" One portion was defined as equivalent to one handful of vegetables.

Planning was measured by two items, Cronbach's α for three points in time were .74, .77 and .84, respectively.

Self-efficacy was measured with two items, Cronbach's α were .89, .94 and .94.

For both planning and self-efficacy, responses were rated on a scale ranging from (1) not at all true to (4) exactly true, using averages as scale scores (adapted from Schwarzer (2008)).

Intervention and control conditions

In the experimental condition, mothers received a theory-guided leaflet at the end of their baseline questionnaire. According to the behaviour change technique definitions by Michie et al. (2011), the intervention consisted of technique 1 (i.e. provide information on consequences of behaviour in general), with WHO recommendations on healthy nutrition (WHO, 2002) and technique 21 (provide instruction in how to perform the behaviour). Moreover the intervention included dietary action planning and coping planning exercises (Schwarzer, 2008; Stadler, Oettingen, & Gollwitzer, 2010; Wiedemann et al., 2012) in line with techniques 7 (action planning), and 8 (barrier identification/problem solving) (Michie et al., 2011).

Results

Intervention effects

Means, standard deviations (SD) and group comparison statistics for vegetable intake for all measurement points in time are summarized in Table 1.

To examine the intervention effects at Time 2 and Time 3, repeated measures ANOVAs were computed. For the dependent variable vegetable intake, a main effect of time emerged, $F(1153) = 4.75$, $p = .03$, $\eta^2 = .03$, but no treatment effect, $F(1153) = .18$, $p = .67$. An interaction between treatment and time emerged, $F(1153) = 5.48$, $p = .02$, $\eta^2 = .03$, (see Figure 2). As indicated in Table 1, the groups differed significantly at Time 2 ($M_{\text{Intervention}} = 3.09$, $\text{SD}_{\text{Intervention}} = 1.86$; $M_{\text{Control}} = 2.53$, $\text{SD}_{\text{Control}} = 1.63$; t (166) $= -2.07$; $p = .04$), but at Time 3, the difference was no longer significant ($p > .05$).

Table 1. Means and SD of vegetable intake in both groups, and comparison between groups.

	Time 1					Time 2					Time 3				
Variable/group	*M*	SD	*t*	*p*	*d*	*M*	SD	*t*	*p*	*d*	*M*	SD	*t*	*p*	*d*
Vegetable intake			1.54	.12	−.24			−2.07	.04	.32			−.80	.42	.12
Intervention	2.42	1.44				3.09	1.86				3.05	1.48			
Control	2.80	1.71				2.53	1.63				2.87	1.45			

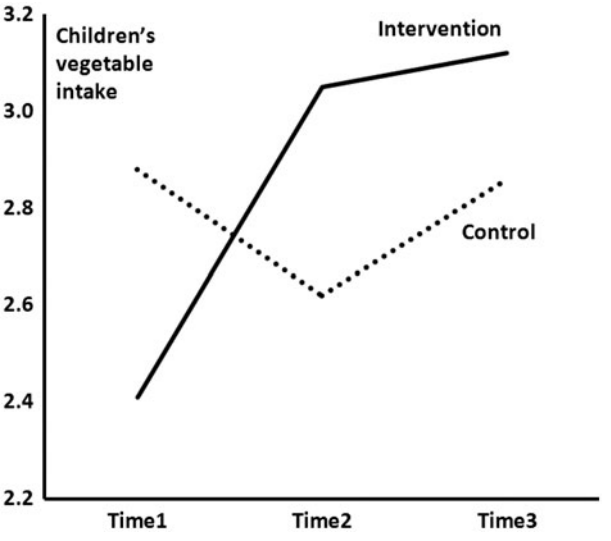

Figure 2. Adjusted means of vegetable intake in the two experimental conditions at three points in time (Time 1: baseline, Time 2: two weeks later, Time 3: three months later). Children's vegetable intake was reported by their mothers.

For mothers' planning to feed vegetable to daughters, a main effect of time emerged, $F(1156) = 6.52$, $p = .01$, $\eta^2 = .03$, but no treatment effect, $F(1156) = 1.06$, $p = .30$, and no interaction between treatment and time emerged, $F(1156) = 2.09$, $p = .15$.

For mothers' self-efficacy, neither an effect of time nor a treatment effect nor an interaction between treatment and time emerged.

Mediation analyses

As the intervention effect was only short-term, as seen by increased Time 2 levels vegetable intake, the question arises whether there might be an indirect effect of the intervention at Time 3. To address this question, Time 2 vegetable intake was considered a putative mediator between the intervention conditions and vegetable consumption at Time 3.

Figure 3 illustrates the mediation model with unstandardized parameters (B values). The intervention had a significant effect on Time 2 vegetable intake ($B = .58$, $p = .03$). Furthermore, Time 1 vegetable intake predicted Time 2 vegetable consumption ($B = .30$, $p = .002$). There was no direct effect of the intervention on Time 3 vegetable intake ($B = .23$, $p = .36$), controlling for baseline behaviour but a significant indirect effect of the intervention on Time 3 vegetable consumption through post-intervention vegetable intake ($B = .19$, $p = .02$), indicating a full mediation chain.

Although there was a significant change in planning between mothers in the experimental and control groups, this difference is very small and did not contribute to the mediation.

Discussion

This study examined whether a self-regulation intervention on mothers to feed more vegetable to their daughters would make a difference on vegetable consumption in their children. Results yielded a significant time by treatment interaction for children's

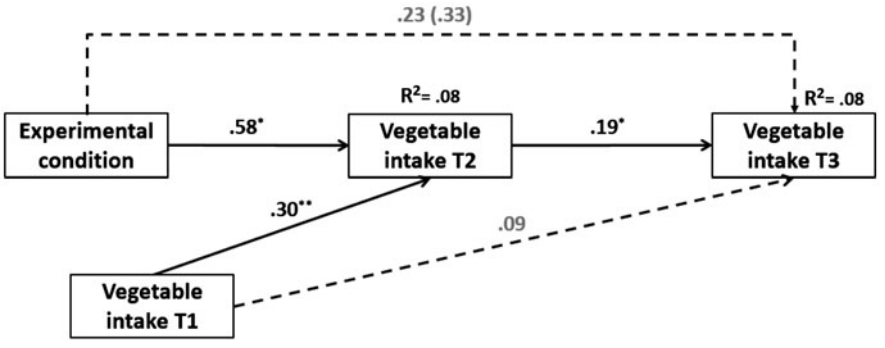

Figure 3. Effects of experimental conditions (1 = treatment, 0 = control) on vegetable intake Time 3 via vegetable intake Time 2, controlling for baseline vegetable consumption (T1: baseline, T2: two weeks later, T3: three months later). Children's vegetable intake was reported by their mothers. Note: Grand-mean-centred solution with unstandardized coefficients; bootstrapped with 5000 resamples. In parenthesis: total effect. $^{*}p < .05$; $^{**}p < .01$.

vegetable consumption. It was found that mothers receiving the intervention reported more vegetable intake by their daughters, and the difference was substantial at Time 2.

This finding is consistent with other studies that have shown improvements in dietary behaviours in children by targeting the parents (Tabak, Tate, Stevens, Siega-Riz, & Ward, 2012). For example, when interventions targeted parents of preschoolers as the agents of dietary change, this approach has been effective in influencing child dietary behaviours. These findings could be supported by Savage, Fisher, and Birch (2007), who drew on the observation that parents decide on many aspects of the home environment and found effects of parental behaviour on health habits of their children. Several studies confirm that making modifications to the home environment is effective in increasing children's vegetable intake (Brug, Tak, te Velde, Bere, & de Bourdeaudhuij, 2008; Haire-Joshu et al., 2008; Williams, Veitch, & Ball, 2011).

A further question was whether behaviour change at Time 2 would predict future behaviour change. To examine this chain mechanism, we specified a model where Time 2 behaviour served as a mediator between experimental conditions and Time 3 vegetable consumption. This chain model has shown that there is a proximal effect that may trigger subsequent maintenance.

There are some limitations. Assessments were self-reported as no objective measures were available. Thus, one needs to rely on mothers' reports on vegetable intake of their daughters. Future studies should validate such reports against the reports of the children and against objective data as well.

Nevertheless, this kind of self-regulatory intervention targeting mothers may serve as a useful template to design dietary change processes in children; and thus, make a contribution to the cumulative knowledge about self-regulatory components in health behaviour change. Future research should examine under which circumstances other mediators or moderators may operate.

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