Appetite 130 (2018) 184–189

Contents lists available at ScienceDirect

Appetite

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

Results of a randomized controlled trial evaluating the effect of increasing package size on usage volume of peanut butter in older adults

Michelle Eykelenboom, Elizabeth Velema, Berend P.D. Eberson, Gillian C. Scholten, Valerié K. Lushpa, Ingrid H.M. Steenhuis*

Department of Health Sciences and Amsterdam Public Health Research Institute, VU Amsterdam, Amsterdam, the Netherlands

ARTICLE INFO

Keywords:
Portion size effect
Package
Overweight
Obesity
Older adults

ABSTRACT

Background: Portion and package sizes of foods generally influence energy intake in children and adults. However, little is known about this effect in older adults. This study aimed to determine the effect of increasing package size on usage volume of peanut butter in older adults. Furthermore, it is investigated whether older women and men, different age groups (< 65, 65–80, and 80+), and non-overweight (BMI < 25), overweight (BMI ≥ 25) and obese (BMI > 30) older adults had different responses to variation in package size.

Methods: A randomized controlled trial among 205 older adults was conducted wherein participants were randomized to either the small (350 g) (n = 103) or the large (1000 g) (n = 102) package size condition. Linear regression analyses were used to determine the association between package size condition and usage volume of peanut butter on a slice of bread. Interactions of sex, age groups and BMI categories with package size were tested to investigate differences in responses to variation in package size.

Results: Older adults spread on average 12.4 g (SD = 4.3) of peanut butter on a slice of bread when exposed to a small jar of peanut butter and 12.6 g (SD = 4.4) when exposed to a large jar of peanut butter (B = 0.15; 95%CI = −1.04 to 1.35). Interactions between sex, age groups or BMI categories with package size condition were not statistically significant.

Conclusions: Increased package size has no effect on usage volume of peanut butter among older adults. Older women and men, different age groups within older adults, and normal-weight, overweight and obese older adults do not respond differently to variation in package size of spreads.

1. Introduction

Over the past decades, the prevalence of obesity has increased in all age groups, including older adults (Inelmen et al., 2003). Across ten European countries, the prevalence of obesity ranges from 12.3% to 25.6% for adults over the age of 50 years (Andreyeva, Michaud, & van Soest, 2007). Consequently, older adults are prone to disability, morbidity and mortality (Inelmen et al., 2003). Because of both an global increase in the older population and in the percentage of older adults that is obese, this condition represents a serious health problem (Inelmen et al., 2003).

The current eating environment contributes to overweight and obesity by promoting inexpensive, large portions of highly palatable foods (Ledikwe, Ello-Martin, & Rolls, 2005; Steenhuis & Poelman, 2017; Vermeer, Alting, Steenhuis, & Seidell, 2010; Vermeer, Steenhuis, & Poelman, 2014; Young & Nestle, 2002). Research has shown that people increase their energy intake when offered larger portions, which is known as the 'portion size effect' (Hollands et al., 2015; Zlatevska, Dubelaar, & Holden, 2014). In their meta-analysis, Zlatevska et al. reported an average increase in energy intake of 35% for a doubling of portion size (Zlatevska et al., 2014). Moreover, it has been demonstrated that people consume more out of large packages than out of small packages, independent of perceived taste or food quality (Hollands et al., 2015; Rolls, Roe, Kral, Meengs, & Wall, 2004). Large portions and packages of food may increase energy intake partly because they increase the experience of 'portion distortion' (Schwartz & Byrd-Bredbenner, 2006). That is, they suggest larger portions to be an appropriate amount to consume on a single occasion (Schwartz & Byrd-Bredbenner, 2006).

The portion size effect has been demonstrated for a variety of foods. While studies focused on foods that are eaten directly from the plate or out of the package (e.g. entrée of macaroni and cheese) (Rolls, Morris, & Roe, 2002), the portion size effect is also demonstrated for foods that require preparation (i.e. cooking) before consumption (e.g. spaghetti)

* Corresponding author. Department of Health Sciences, Faculty of Sciences, VU Amsterdam, De Boelelaan 1085, 1081 HV, Amsterdam, the Netherlands.
E-mail address: ingrid.steenhuis@vu.nl (I.H.M. Steenhuis).

https://doi.org/10.1016/j.appet.2018.08.008
Received 20 February 2018; Received in revised form 5 July 2018; Accepted 7 August 2018
Available online 08 August 2018
0195-6663/

(Benton, 2015).

It is possible that some groups of individuals are particularly susceptible to the portion size effect (Rolls et al., 2002). However, results are inconsistent in meta-analyses that examined whether some groups of individuals are more responsive to portion sizes than others. Zlatevska et al. (2014) indicated that, although the effect is robust across a range of individuals, the portion size effect is weaker in children compared to adults, in women compared to men, and in overweight individuals compared to non-overweight individuals. In contrast, Hollands et al. (2015) found in their meta-analysis that sex and body mass index (BMI) did not influence the strength of the portion size effect.

Although previous studies indicated that increasing portion or package sizes of foods generally cause an increase in consumption for children and adults (Hollands et al., 2015; Zlatevska et al., 2014), little is known about this effect in older adults. Understanding of the portion size effect in older adults is important, because it represents a possible target for future intervention strategies in order to prevent or treat obesity among older adults (Marteau, Hollands, Shemilt, & Jebb, 2015). If it can be shown that older adults are susceptible to variations in food package size this would provide an opportunity to decrease consumption when reducing those sizes (Freedman & Brochado, 2010; Steenhuis & Poelman, 2017).

Therefore, the aim of the current randomized controlled trial (RCT) was to determine the effect of increasing package size on usage volume of peanut butter in older adults. Peanut butter is a very commonly eaten spread in the Netherlands. It used to be available in two jar sizes: 350 g and 600 g. Following the trend of increasing package sizes, the 600 g jar was enlarged to 650 g in 2014; in the same year a 1000 g jar was introduced on the market. This study aims to investigate the effects of these market developments on the volume used. It is hypothesized that older adults spread on average more peanut butter on a slice of bread out of a large jar (1000 g) compared to a small jar (350 g). We also investigated whether older women and men, different age groups within older adults, and non-overweight, overweight and obese older adults have different responses to variation in package size.

2. Materials and methods

2.1. Participants

The study was conducted according to ethical standards declared in the Helsinki Declaration. In accordance with the Dutch Medical Research Involving Human Subjects Act, approval of the study by the Medical Ethics Committee of the VU Medical Center was not required. In May 2017, participants were recruited from bridge clubs and a community center in North Holland, a province in the Netherlands. Bridge clubs and a community center were contacted by telephone and email. Several bridge clubs (5 of the contacted 40) and one community center (the only one contacted) were willing to participate in the study and agreed with a visit by the researchers in order to recruit potential participants and conduct the experiment during their meetings. The bridge clubs that refused to participate indicated that their members were not interested in other activities than playing bridge during their meetings.

Participants were included in the study if they met the following criteria: (1) aged over 50 years, (2) physically capable of spreading a slice of bread with peanut butter, (3) no peanut allergy. Participants were excluded from the analyses when they reported to be younger than 50 years old (n = 1), when they had a missing value on age (n = 2) or when they had a conjecture about the purpose of the experiment as reported in an open question on the questionnaire (n = 1) (Fig. 1).

2.2. Study design

A RCT was conducted wherein 209 participants were randomized to either the condition of the small (350 g) or the large (1000 g) package of peanut butter (Fig. 1). Randomization was based on consecutive participant numbers given to the older adults, in the order of participation. The researcher who recruited the participants was not aware of the number given to the participant, as this was done by a second researcher. Participants with uneven numbers were allocated to the small peanut butter jar group and participants with even numbers were allocated to the large peanut butter jar group. Participants were blinded for their allocation condition. However, the researcher who performed the outcome measurements was not blinded.

2.3. Procedures

On seven separate days, the researchers (G.S., B.E., V.L.) visited the locations. Most measurements (n = 94, 45.9%) were conducted in the evening. Participants were not informed of the actual purpose of the study, but were told that the purpose was to examine the spreadability of peanut butter. Older adults willing to participate were led by the researcher (B.E.) to a separate room in which there was one preweighted slice of bread, one knife and one of the two package size conditions of peanut butter (350 g or 1000 g). Prior to the experiment, the researcher (G.S.) asked the participant to sign an informed consent form and encouraged the participant to read and follow the instructions. Participants were instructed to spread as much as peanut butter as desired, as long as it approximated the same amount of spread as they usually consume on bread. In addition, participants were instructed to not consume the prepared slice of bread with peanut butter directly after spreading. During the experiment, the researcher (G.S.) was present in the same room. After the experiment, the participant was guided to a second room where the participant completed a questionnaire regarding demographics, height and weight, hunger sensations, habitual consumption of peanut butter and conjecture about the purpose of the experiment under guidance of a researcher (V.L.). Meanwhile, the researcher in the first room (G.S.) weighted the slice of bread spread with peanut butter. If desired, participants could consume their slice of bread with peanut butter after weighing. The procedure was repeated for all participants. The volume of the peanut butter jar was held constant by refilling the peanut butter jar to 90 percent of the total weight after each experiment with a single participant.

2.4. Intervention: large package size condition

The intervention group had to spread one slice of bread with peanut butter out of a 90 percent filled large (1000 g) jar of peanut butter.

2.5. Control: small package size condition

The control group had to spread one slice of bread with peanut butter out of a 90 percent filled small (350 g) jar of peanut butter.

2.6. Sample size

Based on numbers in an unpublished pilot study among a younger sample, an a priori sample size estimation indicated that 200 participants (100 per group) would be sufficient to detect a difference of 2 g with a two-sided 5% significance level and a power level of 80%.

2.7. Measures

Demographics. Age, sex, educational level, height and weight were assessed by self-report. Education was based on the highest qualification attained and classified in three groups: low (less than secondary school or A-level certificate), middle (A-levels or Dutch A-level