

Chapter 9

SIGN OR DISCOUNT? THE EFFECTS OF VARIOUS PRICE AND PROMOTION STRATEGIES ON FOOD PURCHASES IN A RANDOMIZED CONTROLLED WEB-BASED SUPERMARKET TRIAL

Wilma E Waterlander
Ingrid HM Steenhuis
Michiel R de Boer
Albertine J Schuit
Jacob C Seidell

Appetite, 2012: under review

Abstract

Objective: To examine the effectiveness of pricing strategies and promotion signs to stimulate healthier food purchases.

Methods: A randomized controlled factorial design with three levels of price reduction (10%; 25%; and 50%) and three types of signs ('special offer', 'healthy choice' and 'special offer & healthy choice') on healthy foods was used. N=109 participants completed the experiment by conducting a typical shop for their household for one week at a web-based supermarket. Data were collected in the Netherlands in 2010 and analyzed using analysis of covariance.

Results: Participants receiving a 50% price discount purchased more healthy foods for their household for one week than the 10% discount (+8.7 items; 95%CI=3.8-13.6) and the 25% discount group (+7.7 items; 95%CI=2.74-12.6). However, the proportion of healthy foods was not significantly higher; participants purchased the healthy foods in addition to other items. There were no significant differences in food purchases between conditions with the different promotion signs and there was no significant interaction between the effects of the signs and the discounts.

Conclusion: Price discounts were effective in stimulating the number of healthy food items purchased. This effect was not influenced by displaying signs promoting the healthiness or special offer of the products or a combination of both. The effects of promotion strategies need however more careful examination in different settings.

Introduction

In the quest for improving dietary behaviours, there is increasing recognition that alongside interventions focused on individual behaviour change, interventions in the food environment may be required ^{1,2}. In many parts of the world supermarkets are a dominant element of the food environment and are therefore an appropriate intervention setting ^{3,4}.

Insights from consumer psychology have revealed that consumer choices are mostly not rational, but unconscious and heavily influenced by environmental factors such as supermarket cues ⁵. These unconscious decision processes can however be influenced by changing these cues ^{5,6}. Components known from the marketing mix (product, place, price or promotion) could serve as such primers ⁷. This study will examine to what extent two of these components (price and promotion) could be used to stimulate healthier food purchases.

Manipulations of consumer food prices are frequently cited as a potentially effective tool in changing peoples' dietary behaviour ^{8,9}. One rationale for this idea is that monetary interventions have previously been successful in decreasing purchases of alcohol and tobacco ¹⁰. Furthermore, price manipulations are used widely as an incentive to buy certain products ¹¹⁻¹³. Within the literature, different types of monetary incentives are considered. An example is increasing taxes of unhealthier foods such as sugar sweetened beverages ¹⁴, snack foods ¹⁵ or fatty or high-caloric foods ¹⁶⁻¹⁸. In fact, the Danish government recently introduced a tax on saturated fats to halt the obesity epidemic. Another example is making healthier foods more attractive by lowering their prices ¹⁹⁻²¹. While there is a growing body of evidence on the effects of food pricing strategies, a recent review revealed that only four randomized controlled trials conducted in the supermarket have been published so far ²². One of these trials is the large New Zealand SHOP study which found significant effects on healthy food purchases when these were 12.5% discounted, however the authors emphasized that further research is needed to determine how the effects of price changes could be enlarged ²³. Also, in two experimental studies in a web-based supermarket ^{24,25} it was found that discounts are effective in stimulating the purchase of healthier products. Nevertheless, it was also found that higher discounts were related to an increase in calorie purchases ^{25,26}.

Besides pricing, it is also interesting to study price promotion effects. Normally, when products are discounted, retailers draw peoples' attention to this by using signs or

advertisements. This extra effort seems important since it was found that people tend to remember prices badly and are dependent on cues to update their expectations about relative prices and future product availability²⁷. Also, people have the tendency to buy products because they are on sale²⁸. Furthermore, price changes alone might not improve dietary habits because consumers have difficulty in understanding the health effects of food²⁹ and do not recognize their diet as being unfavourable³⁰. Also, it was found that consumers are interested in information telling them about the healthiness as well as the special offer of a product³¹. Nevertheless, there are also indications that that health messages may be counteractive because people link health with a bad taste³².

In conclusion, there is relatively little evidence on the effects of pricing and promotion strategies to stimulate healthier food choices. Also it is unclear whether highlighting that a product is on sale, is healthy or is both will lead to different effects. Therefore, this study was designed to examine the combined effects of both strategies on food and calorie purchases in a web-based supermarket. The promotion entails both

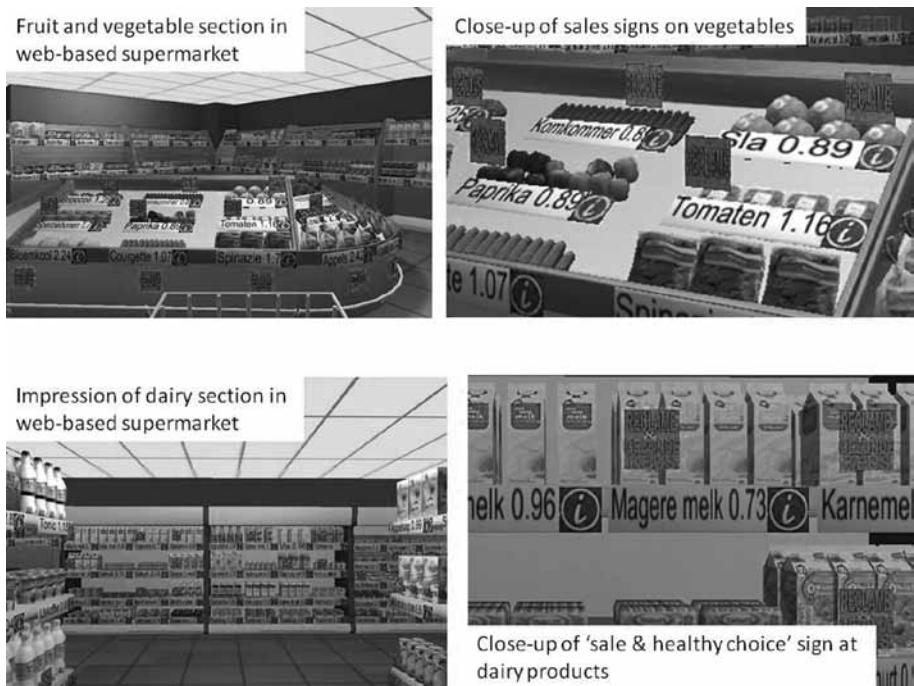


Figure 9.1 Impression of the web-based supermarket and the used promotion signs

health as well as sales. This study focused on consumers with a relatively low socio-economic status (SES) since the burden of diet-related disease is largest in this group and financial barriers in adopting a healthy diet are most prevalent there^{31, 33, 34}. It is hypothesized that the most favourable nutrient purchases will be found when combining the greatest discount on healthier foods with a sign explaining that the item is healthy plus on discount³⁵.

Methods

The 3-D web-based supermarket

A unique three-dimensional (3-D) web-based supermarket (Figure 9.1) was used to study the pricing and promotion strategies. The main features of the application are described below; further information can be found elsewhere³⁶.

A key feature of the web-based supermarket is that it is designed to mimic a real-life supermarket. This was done by using a branch of the Dutch market leader chain as a model and creating a computerized version to its example. The web-based supermarket contains actual shelves and photographs of genuine products were used to compose product images. Prices were made available through shelf labelling and were based on the prices of the two Dutch market leaders. The assortment in the web-based supermarket was chosen to be representative for a regular supermarket assortment. For the product selection we used data provided by one of the key Dutch supermarket specialist journals (Distrifood) and information from the market leader's website. This website used 38 categories to segregate their product assortment³⁷. Within each product category, a sample representing around 10% of the regular assortment was selected by choosing popular and frequently consumed products. No specific brands were included. In total, the web-based supermarket contained 512 different food products (Table 9.1). Compared to prior studies²⁶ our supermarket model can be considered good representative for a regular supermarket setting.

Study design

A randomized controlled trial with a three levels of price reduction on healthy foods x three types of signs placed on healthy foods factorial design was conducted. Participants were randomly assigned to one of nine conditions by using the Random Number Generator in Excel by three research assistants who were blinded with regard to the contents of each condition. The discount levels were chosen in line with previous

Table 9.1 Number of healthy food products within the 38 food categories in the web-based supermarket ^a

	Food Category	Total products (n)	Healthy products (n)
1	Potatoes and potato products	10	7
2	Fruits	10	10
3	Vegetables	41	41
4	Ready to eat meals	19	4
5	Meat/ Fish/ Poultry*	29	13
6	Meat products*	18	4
7	Salads (e.g., crab salad, egg salad, etc.)	8	3
8	Appetizers/ snacks	6	1
9	Cheese	19	3
10	Dairy drinks (e.g., milk, yoghurt drink, etc.)*	15	8
11	Desserts*	21	4
12	(Whipped) cream	5	-
13	Butter	6	2
14	Eggs	2	-
15	Bread*	15	6
16	Pastry	14	4
17	Snacks/ refreshments	12	3
18	Frozen snacks	10	-
19	Ice (cream)	8	1
20	Frozen pastry	2	-
21	Coffee	7	-
22	Evaporated milk/ sugar/ sweeteners	9	2
23	Baking products	13	4
24	Sweet sandwich fillings*	10	3
25	Breakfast products	13	6
26	Pasta/ Rice/ Noodles*	12	4
27	Mixes for sauces	12	1
28	Seasonings	9	1
29	Herbs and spices	10	-
30	Oils/ Sauces and pickles	26	9
31	Soups	12	2
32	Canned foods (excluding fruits and vegetables)	10	3
33	Beverages (excluding soda)	6	3
34	Soda*	24	14
35	Alcoholic beverages	19	-
36	Candy	14	3
37	Chocolate	20	-
38	Crisps/ nuts/ toast	16	3
	Total	512	172 (33.6%)

^a Healthy products are defined following the Choices front-of-pack nutrition label criteria which are based on the international WHO recommendations regarding saturated fat, trans fat, sodium, and added sugar 38

* These products were selected for within category analysis

studies^{9,24,26} and were set at 10%; 25%; and 50% discount respectively. The promotion signs were: 'special offer', 'healthy choice' and 'special offer & healthy choice' (Figure 9.1). The types of signs were chosen to segregate the effects of pointing out that a product was either on sale, healthy, or both. The signs were placed noticeably next to the healthier products in the web-based supermarket (Figure 9.1). Unfortunately, it was unfeasible to include a condition without a sign or without any discounts. Healthy products were defined following the Choices front-of-pack nutrition label criteria which are based on the international WHO recommendations regarding saturated fat, trans fat, sodium, and added sugar³⁸.

Participants and recruitment

A sample size was determined using delta-values as effect size. Delta values are denoted by the difference between the smallest and the largest mean, in units of the within-cell standard deviation. Values of delta = .25, .75 and ≥ 1.25 correspond to small, medium and large effect sizes correspondingly³⁹. For our study it was determined that a sample size of $n = 108$ would be adequate to demonstrate an effect size of .50 (level of significance .05, power $>.90$, fixed effects, equal sizes in all treatment cells assumed).

The study was conducted in the Netherlands. Participants were recruited through newspapers and people could sign up for a broader range of web-based supermarket studies. In total, $n=658$ people signed up by email or telephone (Figure 9.2). After signing up, participants were sent a short electronic questionnaire for checking their eligibility. Because Dutch people are generally hesitant in providing their income, low SES consumers were selected based on education level (maximum completed medium secondary vocational education) and employment status (being unemployed). Additionally, inclusion criteria were: age eighteen years or older, speaking the Dutch language, and running an own household. By these criteria, $n=222$ participants were excluded and $n=9$ declined to participate. From the remaining participants, $n=154$ were randomized into this study; the others were randomized into other experiments. Participants were not aware of the research aims and were blinded with regard to assignment of the research conditions. The study procedures were in accordance with the standards of the responsible institutional medical ethical committee.

Procedure

Participants were sent the web-based supermarket software on a USB-device, written instructions and a personal log-in code by post. In the web-based supermarket,

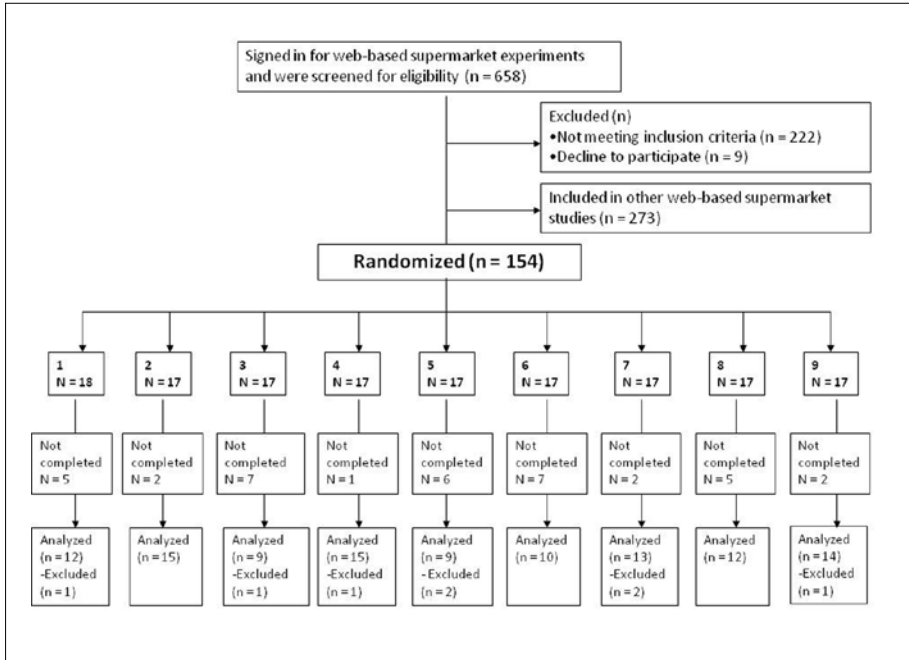


Figure 9.2 CONSORT flow diagram

participants were asked to complete a typical shop for their household for one week. The shopping procedure was virtual and participants did not receive their groceries for real. Participants received a specific budget for shopping. This budget was based on data of the Dutch National Institute of Budget Education and was limited in order to force price sensitive choices. After their log in, participants were able to move with a shopping cart between the shelves in the web-based supermarket and purchase products by using their mouse. All groceries were collected in the participants' grocery cart and appeared on a list. This list also showed the total amount of money spent and could be used to remove products. Also, participants could obtain nutritional information about each product. When finished shopping, participants moved to the cash desk and, if the budget was not exceeded, they were directed to concluding questionnaires. All data were stored and sent to our server automatically.

Measures

Main outcome measures were: healthy and unhealthy food items (number and proportion); fruit and vegetables (gram); and calories (kcal). All outcomes were measured per household per week. As secondary outcome measure we calculated the

proportion of healthier products purchases within specific product categories (Table 9.1). In addition, some background variables were measured (Table 9.2). Finally, participants were asked to complete several questionnaires after shopping. The first questionnaire included questions from the seven “price perception construct scale items”⁴⁰, which was included because consumers have very heterogeneous attention and reaction to prices. The second questionnaire included the twelve item self-report index of habit strength⁴¹. The third included eleven questions concerning the quality of the web-based supermarket software. The final questionnaire measured participant’s notice of prices in the web-based supermarket using four questions. Moreover, participants were asked about their notice of the promotion signs and were requested to identify the sign they had seen during shopping. Except for the questions on the signs, answers were all measured on a 7-point Likert Scale, and total scores were calculated from summing up the individual items. A final measure was the budget participants could spend in the web-based supermarket. This number was dichotomized (below mean vs. above mean) for further analysis.

Statistical analyses

All outcome measures were tested for an adequately normal distribution. Second, it was analyzed whether participants understood the web-based supermarket program and were able to recall the promotion signs. Following, differences in mean values of the main outcome measures were analysed using a crude ANOVA model. Next, differences between conditions were tested using two-way factorial ANCOVA, where factor 1 indicated the level of discount and level 2 the promotion sign. Analysis were conducted by including standard factors (e.g., sex, education level, income, working status, purchasing budget in the Virtual Supermarket (low/high) and grocery responsibility) and theoretically expected strong predictors of the outcomes (e.g., score on price perception, habit strength, appreciation of the web-based supermarket and notice of prices) in the model. These covariates were included because they explained a major part of the error variance and increased the power of the model. For each outcome measure it was then tested whether the interaction between the level of discount and promotion sign was significant, whereby the level of significance was set at .10. Non-significant interaction terms were then removed from the model. For significant interaction terms we planned to present the results separately for every discount and promotion sign combination. Analyses were conducted using SPSS statistical software (version 17.00, SPSS Inc, Chicago, IL).

Results

Participant characteristics

N=117 participants completed the experiment (76%). Non-responders were compared with the final sample on household size, education level, working status and age; no significant differences were found. Following, participants who stated being barely responsible for groceries (n=3) and/or with a low appreciation score of the web-based supermarket (n=5) were excluded. A low appreciation score was set on the fifth percentile, which included participants with a score of 42 or lower (score range = 32-77; mean=59, SD=8.6). The final study sample included n=109 participants (Figure 9.2 and 9.3). There were no significant differences in participant characteristics between the nine conditions (Table 9.2). Sensitivity analysis on all 117 participants resulted in similar outcomes as the results outlined below.

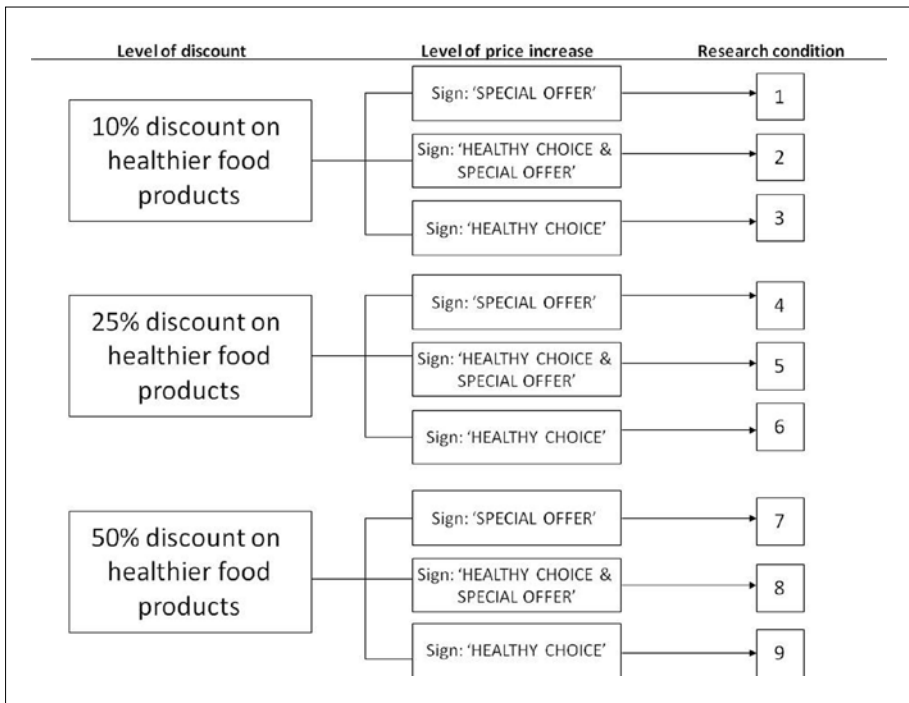


Figure 9.3 Outline of the experimental design

Table 9.2 Participant Characteristics

		Total n = 109 n (%)	p ^a
Sex	Female	93 (85.3)	.69
Age	18 – 31	18 (16.5)	.15
	32 – 46	56 (51.4)	
	47 – 61	27 (24.8)	
	62 +	8 (7.3)	
Grocery Responsibility	Totally responsible	68 (62.4)	.18
	Largely responsible	24 (22.0)	
	Partly responsible	17 (15.6)	
Education level	Low (primary/ lower secondary)	38 (34.9)	.30
	Medium (higher secondary/ intermediate vocational)	58 (53.2)	
	High (higher vocational/ university)	13 (11.9)	
Employment status	Employed	38 (34.9)	.38
	Other	71 (65.1)	
Household income (€ gross monthly) ^b	Low (0 – 2000)	32 (29.4)	.09
	Medium (2000 – 3000)	38 (34.9)	
	High (3000+)	39 (35.8)	
		Mean (SD)	
Household size		2.92 (1.43)	.14
Price perception ^c		67.93 (9.43)	.73
Habit score ^d		49.50 (8.3)	.74
Appreciation score web-based supermarket ^e		60.23 (7.37)	.13
Attention to prices in web-based supermarket ^f		18.3 (5.3)	.82
Budget in web-based supermarket		70.63 (23.19)	.09

Data were measured in 2010 in the Netherlands. Participants included a community sample (n=109)

^a Indicates the p-value for chi² tests and ANOVA analysis comparing the nine research conditions

^b The standard gross monthly income in the Netherlands (2010) was € 2,508⁵⁶

^c Measured by fifteen items (7-point Likert scale) from the seven “price perception construct scale items” (Lichtenstein et al., 1993)

^d Measured by twelve items (7-point Likert scale) self-report index of habit strength (Verplanken et al., 2003)

^e Measured by eleven items (7-point Likert scale) on the web-based supermarket software

^f Measured by four items concerning attention to prices in the web-based supermarket (7-point Likert scale)

Understanding of the web-based supermarket and attention to placed signs

94% Of the participants scored ≥ 5 (scale 1–7) on comprehension of the software. Furthermore, 93% indicated that their experimental purchases aligned with their regular groceries (score ≥ 5). Next, 95% reported to have noticed the signs in the web-based supermarket. When testing this further, it was found that in the ‘special offer’ condition 83%; in the ‘healthy choice’ condition 85%; and in the ‘special offer & healthy choice’ condition 58% identified the sign correctly.

Differences in food purchases

Crude analyses

Table 9.3 describes the major outcomes for each research condition. Participants who received higher discounts purchased more healthy foods: 22.8 in the 10% discount condition; 23.0 in the 25% discount condition; and 32.1 in the 50% discount condition ($p = .000$ for trend). Nevertheless, participants receiving higher discounts also purchased a higher total number of items ($p = .006$) and more calories ($p = .06$). No significant effects of the signs were found.

Table 9.3 Purchased amounts of (un)healthier food items and calories within the nine research conditions – results of crude ANOVA analyses

Item	Type of sign	<i>Special offer</i>		<i>Healthy choice</i>		<i>Special offer & healthy choice</i>		Total per discount		p
		mean	SD	mean	SD	mean	SD	mean	SD	
Healthy Food items (n)	10%	21.9	5.6	27.1	7.3	20.9	7.9	22.8	7.3	.00***
	25%	23.8	8.7	22.1	9.7	22.7	9.8	23.0	9.0	
	50%	32.5	9.1	34.9	16.6	28.3	13.2	32.1	13.4	
Total per sign(p=.28)		26.1	9.0	29.3	13.7	23.8	10.6	-	-	
Unhealthy food items (n)	10%	21.3	9.8	27.3	9.0	26.5	10.9	25.0	10.1	.48
	25%	27.0	9.7	30.4	14.6	23.1	6.0	26.9	10.5	
	50%	25.8	13.5	28.8	13.4	30.2	11.3	28.2	12.7	
Total per sign(p=.31)		24.9	11.1	28.8	12.4	26.9	10.2	-	-	
Total products (n)	10%	43.3	11.3	54.4	10.9	47.3	14.3	47.8	12.9	<.01**
	25%	50.8	12.9	52.6	13.5	45.8	11.5	49.9	12.6	
	50%	58.2	18.9	63.7	26.2	58.4	20.1	60.4	21.9	
Total per sign(p=.22)		51.0	15.5	58.2	20.1	50.6	16.4	-	-	

Total	10%	34,404	8,809	41,000	9,840	39,229	13,337	38,064	11,183	.06[‡]
Calories	25%	42,126	12,946	44,174	15,063	37,028	12,838	41,295	13,380	
(kcal)	50%	46,879	19,845	47,275	22,751	47,114	20,202	47,098	20,202	
Total per sign(p=.76)		41,354	15,116	44,718	17,732	41,307	15,479			
Healthy	10%	13.4	2.9	18.9	6.7	13.7	5.5	14.9	5.5	.00^{***}
food items	25%	14.8	5.0	15.4	7.5	14.6	7.0	14.9	6.1	
exl. (n) ^a	50%	22.1	8.5	22.1	12.2	18.8	9.5	21.1	10.1	
Total per sign(p=.27)		16.8	6.9	19.4	9.9	15.6	7.5	-	-	
% Healthy	10%	52.7	13.3	50.0	10.3	44.5	13.2	48.6	12.8	.13
food items	25%	47.4	14.0	43.7	17.6	48.5	12.3	46.7	14.3	
	50%	58.0	12.2	54.3	13.4	47.0	15.9	53.3	14.2	
Total per sign(p=.17)	Total	52.4	13.6	50.2	14.2	46.3	13.7	-	-	
% unhealthy	10%	47.3	13.3	50.0	10.3	55.5	13.2	51.4	12.8	.13
food items	25%	52.6	14.0	56.3	17.6	51.5	13.3	53.3	14.3	
	50%	42.0	12.2	45.7	13.4	53.0	13.7	46.7	14.2	
Total per sign(p=.17)		47.6	13.6	49.8	14.2	53.7	13.7	-	-	
% healthy	10%	32.1	6.8	34.8	11.1	29.0	8.3	31.5	8.7	.21
food items	25%	29.4	7.4	30.7	14.1	30.6	9.2	30.1	9.8	
exl. ^a	50%	38.4	8.9	33.3	10.6	31.2	10.4	34.3	10.2	
Total per sign(p=.36)		33.1	8.5	33.0	11.5	30.1	9.0	-	-	
Vegetables	10%	3,611	1,684	3,026	1,162	3,060	1,523	3,235	1,483	.00^{***}
(gram)	25%	3,593	2,317	2,601	1,516	3,253	1,239	3,230	1,866	
	50%	4,172	1,264	5,093	1,579	3,755	1,773	4,392	1,613	
Total per sign(p=.52)		3,786	1,814	3,850	1,832	3,340	1,537	-	-	
Fruit (gram)	10%	1,667	1,213	2,275	787	1,698	982	1,832	1,028	.33
	25%	2,640	1,735	1,722	1,417	2,472	1,593	2,344	1,615	
	50%	2,077	1,266	2,798	2,456	2,396	1,710	2,443	1,926	
Total per sign(p=.94)		2,165	1,457	2,362	1,924	2,124	1,421	-	-	
% of budget	10%	92.8	11.3	86.5	17.3	90.1	14.2	90.1	14.0	.29
spent	25%	93.3	8.4	90.9	15.1	81.1	13.7	89.3	12.7	
	50%	92.3	7.2	80.2	27.0	80.2	15.3	84.2	19.4	
Total per sign(p=.04)		92.8	8.8	84.8	21.7	84.5	14.8	-	-	

Data were measured in 2010 in the Netherlands. Participants included a community sample (n=109)

^a Healthy excl. means number of healthy products excluding fruits and vegetables

[‡] Borderline significant at p = .06

^{*} Significant at p<.05

^{**} Significant at p<.01

^{***} Significant at p<.001

Interaction effects of discount x sign

Next, differences between the nine conditions were analyzed using two-way factorial ANCOVA. First, the interaction between level of discount and type of sign was tested. Results showed that there were no significant interactions for all outcome measures. This means that the effects of the discounts were irrespective of the type of sign and vice versa. Interaction terms were therefore removed from the model, and results of the ANCOVA will be presented at level of discount and type of sign separately and not for the interaction between those two.

Two-way ANCOVA: Effects of the discounts

Also in the corrected model it was found that participants in 50% discount condition purchased significantly more healthy food items compared to the 10% and 25% discount condition (Table 9.4a). Differences were 8.7 ($p=.001$) and 7.7 ($p=.003$) items respectively. Furthermore, participants in the 50% discount condition purchased significantly more vegetables. Nevertheless, the proportion of healthy foods was not higher in these conditions. Also, the highest discount condition purchased 8,451 kcal more than the 10% discount condition ($p=.014$). Looking within the eight major food categories, the proportion of healthier products purchased due to higher discounts was only significantly higher in the meat products and dairy drinks category (Table Appendix 9.1a).

Table 9.4a. Effects of varying price *discount* levels on food purchases in the web-based supermarket – Results of two-way ANCOVA analyses ^a

<i>Discount</i>	Ref. level	<i>Level 1 = 10%</i>			<i>Level 2 = 25%</i>			<i>Level 3 = 50%</i>		
		B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI
N	1	-	-	-	.83	-3.87	5.54	2.62	-1.80	7.03
Unhealthy	3	-2.62	-7.03	1.80	-1.78	-6.24	2.67	-	-	-
N Healthy	1	-	-	-	1.01	-4.22	6.23	8.70*	3.79	13.60
	3	-8.70**	-13.60	-3.79	-7.69**	-12.64	-2.74	-	-	-
Total items	1	-	-	-	1.84	-5.47	9.15	11.32**	4.45	18.18
	3	-11.32**	-1.18	-4.45	-9.47**	-16.40	-2.55	-	-	-
Total Calories	1	-	-	-	2,975	-4,133	10,082	8,451*	1,778	15,123
	3	-8,451*	-15,123	-1,778	-5,476	-12,209	1,256			
N healthy excl. ^b	1	-	-	-	.86	-2.91	4.64	6.04**	2.50	9.58
	3	-6.04**	-9.58	-2.50	-5.18**	-8.75	-1.60	-	-	-
% Healthy	1	-	-	-	-.03	-6.63	6.57	4.79	-1.41	10.99
	3	-4.79	-10.99	1.41	-4.82	-11.07	1.44	-	-	-
% Healthy excl. ^b	1	-	-	-	.18	-4.64	5.00	3.28	-1.24	7.80
	3	-3.28	-7.80	1.24	-3.10	-7.67	1.46	-	-	-
Vegetables (gram)	1	-	-	-	7.4	-871	886	1,063*	238	1,887
	3	-1,063*	-1,887	-238	-1,055*	-1,887	-223	-	-	-
Fruit (gram)	1	-	-	-	418	-393	1,228	422	-338	1,183
	3	-422	-1,183	338	-4.6	-772	763	-	-	-
% budget spent	1	-	-	-	-2.38	-10.16	5.40	-7.99*	-15.29	-.68
	3	7.99*	.68	15.29	5.61	-1.76	12.98	-	-	-

Data were measured in 2010 in the Netherlands. Participants included a community sample (n=109)

^a Results of two-way ANCOVA adjusted for sex, education, income, working status, purchasing budget in web-based supermarket (low/high), grocery responsibility, price perception, habit strength, appreciation of web-based supermarket and notice of prices

^b Healthy excl. means number of healthy products excluding fruits and vegetables

* significant at $p < .05$

** significant at $p < .01$

Two-way ANCOVA: Effects of the signs

There were no statistically significant differences in healthy or unhealthy food purchases between the promotion sign conditions (Table 9.4b). Also, no differences were observed within the eight major food categories (Table Appendix 9.1b).

Table 9.4b. Effects of different promotion signs in the web-based supermarket – Results of two-way ANCOVA analyses^a.

Type of Sign	Ref. level	Special offer			Healthy choice			Special offer & Healthy choice		
		B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI
N Unhealthy	1	-	-	-	-.84	-5.38	3.71	-1.61	-6.08	2.86
	3	1.61	-2.86	6.08	.78	-3.80	5.35	-	-	-
N Healthy	1	-	-	-	.98	-4.07	6.03	-3.70	-8.67	1.26
	3	3.70	-1.26	8.67	4.68	-.40	9.76	-	-	-
Total items	1	-	-	-	.14	-6.92	7.21	-5.31	-12.26	1.63
	3	5.31	-1.63	12.26	5.46	-1.65	12.57	-	-	-
Total Calories	1	-	-	-	-2,755	-9,625	4,116	-4,748	-11,502	2,007
	3	4,748	-2,007	11,502	1,993	-4,921	8,906	-	-	-
N healthy excl. ^b	1	-	-	-	.87	-2.77	4.52	-2.28	-5.87	1.30
	3	2.28	-1.30	5.87	3.15	-.52	6.82	-	-	-
% Healthy	1	-	-	-	1.20	-5.18	7.58	-2.89	-9.16	3.39
	3	2.89	-3.39	9.16	4.09	-2.34	10.51	-	-	-
% Healthy excl. ^b	1	-	-	-	1.40	-3.26	6.05	-1.75	-6.33	2.83
	3	1.75	-2.83	6.33	3.15	-1.54	7.83	-	-	-
Vegetables (gram)	1	-	-	-	-108	-957	741	-556	-1,391	279
	3	556	-279	1,391	448	-407	1,302	-	-	-
Fruit (gram)	1	-	-	-	238	-546	1,021	-6.5	-778	764
	3	6.5	-764	778	244	-544	1,033	-	-	-
% budget spent	1	-	-	-	-5.81	-13.33	1.71	-5.60	-12.99	1.79
	3	5.60	-1.79	12.99	-.22	-7.78	7.35	-	-	-

Data were measured in 2010 in the Netherlands. Participants included a community sample (n=109)

^a. Results of two-way ANCOVA adjusted for sex, education, income, working status, purchasing budget in web-based supermarket (low/high), grocery responsibility, price perception, habit strength, appreciation of web-based supermarket and notice of prices

^b. Healthy excl. means number of healthy products excluding fruits and vegetables

Discussion

This study examined the effects on food purchases of two strategies from the marketing mix: pricing and promotion. Results indicate that price discounts on healthier products are effective in stimulating the purchase of these products, where higher price discounts (50%) are most effective. However, participants receiving the highest discount also purchased more items in total, meaning that the proportion of healthier foods did not change significantly. Moreover, higher discounts were associated with higher calorie purchases. Remarkably, there were no significant differences in the effects of the promotion signs; participants purchased similar products when a 'special offer', 'healthy choice' or 'special offer & healthy choice' promotion sign was displayed alongside healthier foods. Moreover, the effects of the price discounts were irrespective of the type of promotion sign that was displayed.

To our knowledge, this is the first study examining the effects of price discounts in combination with different promotion signs highlighting sales as well as health in a retail environment. Giessen *et al* recently published a study into the effects of calorie information and taxes on high-calorie foods on lunch decisions among university students. They found that a 25% tax increase was effective to reduce calorie purchases, but that this effect was lowered in the presence of calorie information¹⁶. The authors therefore argue that it may be more important to communicate calorie information than to tax products. A limitation of this study, however, was that it only included a limited amount of food options to choose from. Moreover, promoting the healthiness of a product may not work the same way as labeling products as being unhealthy. A study by Horgen and Brownell on the effects of price promotions and health messages in a restaurant found that health messages may counteract the discount effect because people link health with a bad taste³². Finally, there are also indications that education does not interact with the effects of pricing strategies. Ni Mhurchu *et al* found in their large supermarket trial about the effects of pricing strategies and tailored nutrition education that the price discounts were effective to stimulate healthier food purchases, but that there were no effects of the education²³. Besides health messages, it could also be important to tell people that a product is discounted. Previous research showed that people have the tendency to buy a product simply because it is on sale or cheaper now^{28, 42}. In fact, Anderson and Simester found that using the word 'sale' beside a price (without actually varying the price) can increase demand by more than 50%⁴³.

Our study did not observe differences in (healthy) food purchases between the conditions with the different promotion signs and revealed that higher discount levels significantly influenced healthy food purchases irrespective of the type of sign that was displayed. For example, in condition one, participants were provided with a 10% price discount and a 'special offer' sign; and they purchased on average 21.9 healthy food items. In the 50% price discount and the same 'special offer' sign condition, this number was 32.5. Seen the large difference in the number of healthy food purchases between the 10% and 50% price discount condition in all three promotion sign conditions, we suggest that alongside promotions, price changes make the true difference. Another indication of the effects of pricing strategies comes from previous pricing experiments in the Virtual Supermarket where the price changes were silent (e.g., not communicated). A study on the effects of a 25% price discounts on fruits and vegetables revealed that this lead to nearly one kilo gram extra fruit and vegetable purchases per household per week ²⁴. Furthermore, a study on the effects of different levels of taxes on unhealthy foods combined with different levels of subsidies on healthy foods found that higher discount levels were associated with more fruit and vegetable purchases and higher levels of healthy products overall ²⁵. This study did, however, not contain a condition with discounts in absence of a sign, meaning that we cannot segregate the effects of both interventions. While the differences in healthy food purchases between the three discount levels were large in all sign conditions, we cannot compare this to a control group with no sign. Moreover, we did not have a condition with a sign in the absence of a discount, meaning that we were unable to test the effects of a sales sign alone. This is an important limitation; but the results still bring relevant new insights by showing that it does not matter which type of promotion sign is displayed and that highlighting that a product is both healthy *and* on sale does not have additional effects compared to stating that is on sale or healthy only. Also, we did not observe counteractive effects of the healthy choice sign (as was observed by Horgen and Brownell³²), meaning that it combining pricing strategies and health messages is still worth considering.

While our study did not find differences in the number of healthy food purchases between conditions with a 'special offer', 'healthy choice' or 'special offer & healthy choice' promotion sign and also no interactions between the price and promotion interventions, we cannot conclude that these signs have no effects. First, the absence of a significant interaction between the effects of the price discounts and the promotion signs could be due to a power problem; our sample size was not specifically powered

for these interaction effects. Moreover, our power calculations were based on quite large effect sizes, meaning that our sample size may have been too small to detect effects of the promotion signs in general. It is interesting to study this further among larger samples. Another issue that may have lowered the effects of the promotion signs in this study is that participants might not have felt the necessity to react upon these because they only shopped once in our web-based supermarket. When reacting on a price promotion, people also consider future prices and react upon the need of not missing out on a good deal. This effect, known as *transaction utility* from economic literature, may not have been apparent in our experimental set up ^{11, 43}. Another explanation for the non-significant effects of the signs may be that too many products were displayed with a promotion sign. All healthier items received a sign, implicating that the fruit and vegetable section was loaded with displays. There is evidence that sales signs are less effective when more products have them ⁴⁴. Finally, there is evidence that the effects of promotions may be larger in real supermarkets than online, meaning that our effects may be an underestimation ⁴⁵. Based on the issues listed above, we recommend that future studies examine the effects of pricing and promotion strategies combined as well as separately using a no-intervention control group. Future studies could also incorporate the framing of promotion signs, such as the use of \$9/€9 endings or everyday low pricing ⁴⁶. Also it would be interesting to test which quantity of information works best. Our results revealed that 83–85% of the participants identified the ‘special offer’ and ‘healthy choice’ signs correctly, but that this number dropped to 58% in the condition with the ‘special offer and healthy choice’ sign. More information about a promotion might therefore be an inferior strategy.

Besides the issues listed above, there are some other limitations that should be mentioned. First, was made use of a web-based supermarket which assortment was limited to food products and was not as extensive as a real supermarket. This means that this study does not give insight into how people may shift to non-food items as a consequence of the interventions. Nevertheless, a large merit of our web-based tool is that it is a build in a 3-D fashion, closely imaging a real shopping experience. Moreover, the virtual supermarket enabled us to test the pricing and promotion strategies in a highly controlled environment, providing a high level of internal validity. Compared to previous studies where a supermarket environment was modeled by using 60 products ²⁶ or using online drop-down lists ⁴⁷, this application seems a good quality research instrument. Still, it is important to validate our results in a real shopping environment

and beyond the Dutch setting. Another concern is that people may act differently when they shop in a real supermarket compared to an experimental setting. However, a greater part of the participants stated that their web-based purchases resembled their regular food purchases accurately. Furthermore, there is evidence that people's virtual behavior fairly predicts their behavior in real life ⁴⁸. Another limitation is that participants were self-selected and our findings may thus not be generalizable to the overall population. Nevertheless, participants were not aware of the research aims and were blinded with regard to assignment of the research conditions. A final limitation is that the study sample had a fairly high income level. Since price and promotion strategies are expected to be mainly effective among people with limited financial resources ³⁴, it is interesting to extend our results to a low income population.

Altogether, this study gives a relevant first insight into the combined effects of pricing and promotion on food choices, but also reveals the complexity that lies within. Effects of both price and promotions are highly dependent on the specific situation and the way in which they are framed. More studies are required to get hold of the true effects and especially to find out how these strategies should be best designed to stimulate health. The subsidizing pricing strategies in particular seem to have ambiguous effects. They do encourage the purchase of healthy products, but we also found that the discounts lead to higher food purchases in total and also to more purchased calories. These findings are in line with a number of previous results coming both from experimental ^{25,26} and simulation modelling studies ^{49,50}. It was not found, however, that people purchased significantly more unhealthy food items due to the discounts; instead participants purchased a higher number of healthier items in addition to their regular purchases. While the purchase (and consumption) of more healthy foods such as fruits and vegetables contributes to the prevention of non-communicable diseases ⁵¹, extra calorie intake is not desirable in light of obesity prevention. Earlier work however revealed that such higher calorie purchases were not present when only fruits and vegetables were discounted²⁴. In addition, a recently published paper found that an expert panel was uniformly in favor of stimulating healthy food purchases by a fruit and vegetable subsidy ⁸. Acknowledging that people may not spend their total relative grown income on fruits and vegetables ⁵², the experts agreed that the link between lower obesity risk and greater fruits and vegetable consumption is strong enough to support a subsidizing strategy ⁵³. Other arguments may be that currently fruits and vegetables are relatively expensive compared to high-energy-dense, fat and sugar rich foods ^{54,55}.

Conclusion

Pricing and promotion form important components of the marketing mix but are relatively little explored in relation to dietary interventions. This study brings new findings in this area by a unique experiment in a 3-D web-based supermarket. Results demonstrate that price discounts are effective in stimulating healthier food purchases. Nevertheless, the price promotions also lead to more food and calorie purchases overall. This study did not find significant effects of signing healthier products as ‘sale’ ‘healthy choice’; or ‘sale & healthy choice’. More research is needed to examine how to amplify the effects of promotion signs and pricing strategies on healthy food purchases. This research should be specifically aimed at finding ways to direct consumers towards interchanging unhealthier options for healthier alternatives and thereby lowering overall calorie purchases.

References

1. Faith MS, Fontaine KR, Baskin ML, Allison DB. Toward the reduction of population obesity: macrolevel environmental approaches to the problems of food, eating, and obesity. *Psychol Bull* Mar 2007;133(2):205-226.
2. Swinburn B, Egger G, Raza F. Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity. *Prev Med* 1999;29(6):563-570.
3. Hawkes C. Dietary implications of supermarket development: a global perspective. *Development Policy Review* 2008;26(6):657-692.
4. Vorley B. *Food, Inc.: Corporate Concentration from Farm to Consumer*. London: International Institute for Environment and Development; 2003.
5. Dijksterhuis A, Smith PK, van Baaren RB, Wigboldus DHJ. The unconscious consumer: Effects of environment on consumer behavior. *Journal of Consumer Psychology* 2005;15(3):193-202.
6. North AC, Hargreaves DJ, McKendrick J. In-store music affects product choice. *Nature* 1997;390(6656):132-132.
7. McCarthy J. *Basic Marketing: A managerial approach*. 13 ed. Homewood Illinois: Irwin; 2001.
8. Faulkner G, Grootendorst P, Nguyen VH, et al. Economic instruments for Obesity Prevention: Results of a Scoping Review and Modified Delphi Survey. *Int J Beh Nutr Phys Act* 2011;8(109):doi:10.1186/1479-5868-1188-1109.
9. French SA. Pricing effects on food choices. *J Nut*. Mar 2003;133(3):841S-843S.
10. Chopra M, Darnton-Hill I. Tobacco and obesity epidemics: not so different after all? *Bmj* 2004;328(7455):1558-1560.
11. Darke PR, Chung CMY. Effects of pricing and promotion on consumer perceptions: it depends on how you frame it. *Journal of Retailing* 2005;81(1):35-47.
12. Han S, Gupta S, Lechmann DR. Consumer price sensitivity and price thresholds. *Journal of Retailing* 2001;77:435-456.
13. Hawkes C. Sales promotions and food consumption. *Nutr Rev* Jun 2009;67(6):333-342.
14. Brownell KD, Farley T, Willett WC, et al. The public health and economic benefits of taxing sugar-sweetened beverages. *N Engl J Med* 2009;361(16):1599-1605.
15. Kuchler F, Tegene A, Harris M. Taxing snack foods: what to expect for diet and tax revenues. *Agricultural Information Bulletin* 2004;08(747).
16. Giesen JC, Payne CR, Havermans RC, Jansen A. Exploring how calorie information and taxes on high-calorie foods influence lunch decisions. *Am J Clin Nutr* 2011;doi: 10.3945/ajcn.110.008193.
17. Cash SB, Sunding, DL, Zilberman D. Fat taxes and thin subsidies: prices, diet, and health outcomes. *Acta Agriculturae Scand Section C*. 2005;2:167-174.
18. Kuchler F, Tegene A, Harris M. Taxing snack foods: manipulating diet quality or financing

- information programs. *Review of Agricultural Economics* 2005;27(1):4-20.
19. Powell LM, Chaloupka FJ. Food prices and obesity: evidence and policy implications for taxes and subsidies. *The Milbank Quarterly* 2009;87(1):229-257.
 20. Wall J, Ni Mhurchu C, Blakely T, Rodgers A, Wilton J. Effectiveness of monetary incentives in modifying dietary behavior: a review of randomized, controlled trials. *Nutr Rev* Dec 2006;64(12):518-531.
 21. Waterlander WE, Steenhuis IH, de Vet E, Schuit AJ, Seidell JC. Expert views on most suitable monetary incentives on food to stimulate healthy eating. *Eur J Public Health* 2010;20(3):325-331.
 22. Epstein LH, Jankowiak N, Nederkoorn C, Raynor HA, French SA, Finkelstein E. Experimental research on the relation between food price changes and food-purchasing patterns: a targeted review. *Am J Clin Nutr* 2012 doi:10.3945/ajcn.111.024380.
 23. Ni Mhurchu C, Blakely T, Jiang Y, Eyles HC, Rodgers A. Effects of price discounts and tailored nutrition education on supermarket purchases: a randomized controlled trial. *Am J Clin Nutr* Mar 2010;91(3):736-747.
 24. Waterlander WE, Steenhuis IH, de Boer MR, Schuit AJ, Seidell JC. The effects of a 25% discount on fruits and vegetables: results of a randomized trial in a three-dimensional web-based supermarket. *Int J Beh Nutr Phys Act* 2012;9(1):11: doi:10.1186/1479-5868-9-11
 25. Waterlander WE, Steenhuis IH, de Boer MR, Schuit AJ, Seidell JC. Introducing taxes, subsidies or both: The effects of various food pricing strategies in a web-based supermarket randomized trial. *Prev Med* 2012: doi:10.1016/j.ypmed.2012.02.009.
 26. Epstein LH, Dearing KK, Roba LG, Finkelstein E. The Influence of Taxes and Subsidies on Energy Purchased in an Experimental Purchasing Study. *Psychological Science* 2010;21:406-414.
 27. Vanhuelle M, Laurent G, Dreze X. Consumers' immediate memory for prices. *Journal of Consumer Research* 2006;33:163-171.
 28. Anderson ET, Simester DI. The role of sale signs. *Marketing Science* 1998;17(2):139-155.
 29. Cowburn G, Stockley L. Consumer understanding and use of nutrition labelling: A systematic review. *Publ Health Nutr* 2005;8:21-28.
 30. Dibsall LA, Lambert N, Bobbin RF, Frewer LJ. Low-income consumers' attitudes and behaviour towards access, availability and motivation to eat fruit and vegetables. *Publ Health Nutr* 2003;6(2):159-168.
 31. Waterlander WE, de Mul A, Schuit AJ, Seidell JC, Steenhuis IHM. Perceptions on the use of Pricing Strategies to stimulate Healthy Eating among Residents of deprived Neighbourhoods: a Focus Group Study *Int J Behav Nutr Phys Act* 2010;7(44):doi:10.1186/1479-5868-1187-1144.
 32. Horgen KB, Brownell KD. Comparison of price change and health message interventions in promoting healthy food choices. *Health Psychol* 2002;21(5):505-512.
 33. Darmon N, Drewnowski, A. Does social class predict diet quality? *Am J Clin Nutr* 2008;87(5):1107-1117.

34. Steenhuis IH, Waterlander WE, de Mul A. Consumer food choices: the role of price and pricing strategies. *Publ Health Nutr* 2011;14(12):2220-2226.
35. Chetty R, Looney A, Kroft K. Salience and Taxation: Theory and Evidence. *Am Econ Rev* 2009;99(4):1145-1177.
36. Waterlander WE, Scarpa M, Lentz D, Steenhuis IH. The Virtual Supermarket: An Innovative Research Tool to Study Consumer Food Purchasing Behaviour. *Bmc Public Health* 2011;11(1):589.
37. Albert Heijn Online Shop (AH Webwinkel). Groceries (boodschappen). URL:<http://webwinkel.ah.nl/> 2010; <http://webwinkel.ah.nl/>. Accessed 12 November 2010.
38. Roodenburg AJC, Popkin BM, Seidell JC. Development of international criteria for a front of package food labelling system: the international Choices Programme. *Eur J Clin Nutr* 2011;65:1190-1200.
39. Cohen J. *Statistical Power Analysis for the Behavioral Sciences, 2nd Edition*. 2nd Edition ed. Hillsdale, New Jersey: Lawrence Erlbaum Associates 1988.
40. Lichtenstein DR, Ridgway NM, Netemeyer RG. Price perceptions and consumer shopping behavior: a field study. *Journal of Marketing Research* 1993;30:234-245.
41. Verplanken B, Orbell S. Reflections on past behavior: A self-report index of habit strength. *Journal of Applied Social Psychology* 2003;33(6):1313-1330.
42. Blattberg RC, Briesch R, Fox EJ. How promotions work. *Marketing Science* 1995;14(3):G122-G132.
43. Anderson ET, Simester DI. Mind your pricing cues. *Harvard Business Review* 2003;81(9):97-103.
44. Anderson ET, Simester DI. Are sale signs less effective when more products have them? *Marketing Science* 2001;20(2):121-142.
45. Degeratu A, Rangaswamy A, Wu J. Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes. *Int J Res Mark* 2000;17:55-78.
46. Anderson ET, Simester DI. Effects of \$9 price endings on retail sales: evidence from field experiments. *Quantitative Marketing and Economics* 2003;1(1):93-110.
47. Nederkoorn C, Havermans RC, Giesen JC, Jansen A. High tax on high energy dense foods and its effects on the purchase of calories in a supermarket: An experiment. *Appetite* 2011;56(3):760-765.
48. Sharpe KM, Staelin R, Huber J. Using extremeness aversion to fight obesity: Policy implications of context dependent demand. *Journal of Consumer Research* 2008;35:406-422.
49. Nordstrom J, Thunstrom L. The impact of tax reforms designed to encourage healthier grain consumption. *J Health Econ* 2009;28(3):622-634.
50. Mytton O, Gray A, Rayner M, Rutter H. Could targeted food taxes improve health? *J Epidemiol Community Health* 2007;61(8):689-694.
51. Scarborough P, Nnoaham KE, Clarke D, Capewell S, Rayner M. Modelling the impact of a healthy diet on cardiovascular disease and cancer mortality. *J Epidemiol Community Health* 2010;doi:10.1136/jech.2010.114520.
52. Blisard N, Stewart H, Jolliffe D. Low-income households' expenditures on fruits and vegetables: U.S.

Department of Agriculture;2004. *Agricultural Economic Report* 833.

53. He K, Hu FB, Colditz GA, Manson JE, Willett WC, Liu S. Changes in intake of fruits and vegetables in relation to risk of obesity and weight gain among middle-aged women. *Int J Obes Relat Metab Disord* Dec 2004;28(12):1569-1574.
54. Waterlander WE, de Haas WE, van Amstel I, et al. Energy density, energy costs and income - how are they related? *Publ Health Nutr* 2010;13(10):1599-1608.
55. Drewnowski A. The cost of US foods as related to their nutritive value. *Am J Clin Nutr* 2010;92(5):1181-1188.
56. Central Planning Office (Centraal Planbureau (CPB)). Standard Income (Modaal inkomen). 2010. Available at: <http://www.cpb.nl/nl/prognoses/nlinfo.html>

Table Appendix 9.1a Effects of varying price discount levels on the percentage of healthy food products purchased within eight different product categories, the Netherlands (2010) ^a

Discount	Ref. level	Level 1 = 10%			Level 2 = 25%			Level 3 = 50%		
		B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI
Meat/Fish/ Poultry	1	-	-	-	1.13	-13.2	15.4	4.84	-8.67	-18.4
	3	-4.84	-18.3	-8.67	-3.71	-17.5	10.1	-	-	-
Meat products	1	-	-	-	19.2	-3.40	41.8	29.0*	8.85	49.1
	3	-29.0*	-49.1	-8.85	-9.77	-31.1	11.6	-	-	-
Dairy drinks	1	-	-	-	19.5*	2.00	37.1	19.6*	3.57	35.7
	3	-19.6*	-35.7	-3.57	-0.8	-16.4	6.3	-	-	-
Desserts	1	-	-	-	2.57	-19.7	24.8	16.1	-4.61	36.9
	3	-16.1	-36.9	4.61	-13.6	-35.1	7.98	-	-	-
Bread	1	-	-	-	-4.36	-20.3	11.6	-11.6	-26.6	3.53
	3	11.6	-3.53	29.6	7.19	-8.01	22.4	-	-	-
Sweet sandwich fillings	1	-	-	-	-2.68	-21.5	16.1	-3.52	-21.2	14.1
	3	3.52	-14.1	21.15	.84	-17.2	18.9	-	-	-
Pasta/ rice/ noodles	1	-	-	-	12.4	-7.91	32.7	5.67	-13.4	24.7
	3	-5.67	-24.7	13.4	6.75	-13.0	26.5	-	-	-
Soda	1	-	-	-	1.19	-22.5	24.9	9.16	-11.9	30.3
	3	-9.16	-30.3	12.0	-7.97	-30.3	14.3	-	-	-

Data were measured in 2010 in the Netherlands. Participants included a community sample (n=109)

^a Adjusted effects for two-way factorial ANCOVA analyses. Adjusted for: sex, education level, income, employment status, spending budget (low/high), grocery responsibility, price perception, habit strength, appreciation of the web-based supermarket and notice of prices

* Significant at p<.05

** Significant at p<.01

Table Appendix 9.1b Effects of different promotion signs on the percentage of healthy food products purchased within eight different product categories, the Netherlands (2010) ^a

<i>Type of sign</i>	Ref. level	<i>Special offer</i>			<i>Healthy choice</i>			<i>Special offer & Healthy choice</i>		
		B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI	B	Lower 95% CI	Upper 95% CI
Meat/Fish/ Poultry	1	-	-	-	-6.68	-21.0	7.65	-5.44	-19.1	8.24
	3	5.44	-8.24	19.1	-1.24	-15.4	12.9	-	-	-
Meat products	1	-	-	-	4.40	-16.4	25.2	7.79	-12.5	28.1
	3	-7.79	-28.1	12.5	-3.39	-24.0	17.2	-	-	-
Dairy drinks	1	-	-	-	-12.1	-28.4	4.26	-4.42	-21.9	13.0
	3	4.42	-13.0	21.9	-7.65	-25.1	9.86	-	-	-
Desserts	1	-	-	-	-10.15	-32.1	11.7	-7.15	-28.1	13.8
	3	7.15	-13.8	28.1	-3.01	-24.5	18.5	-	-	-
Bread	1	-	-	-	4.28	-11.7	20.3	-6.88	-22.0	8.20
	3	6.88	-8.20	22.0	11.2	-4.69	27.0	-	-	-
Sweet sandwich fillings	1	-	-	-	2.86	-15.6	21.3	11.9	-5.70	29.5
	3	-11.9	-29.5	5.70	-9.05	-27.2	9.11	-	-	-
Pasta/ rice/ noodles	1	-	-	-	10.9	-8.88	30.7	2.86	-16.6	22.3
	3	-2.86	-22.3	16.6	8.07	-11.7	27.9	-	-	-
Soda	1	-	-	-	5.86	-16.4	28.0	-.75	-21.7	20.5
	3	-.75	-20.5	21.7	6.57	-15.7	28.9	-	-	-

Data were measured in 2010 in the Netherlands. Participants included a community sample (n=109)

^a Adjusted effects for two-way factorial ANCOVA analyses. Adjusted for: sex, education level, income, employment status, spending budget (low/high), grocery responsibility, price perception, habit strength, appreciation of the web-based supermarket and notice of prices