Use of SEM analysis to relate consumer's attitudes and consumption of chocolate

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INTRODUCTION

Chocolate is the most frequently craved food having a uniquely attractive taste. Chocolate popularity appears related to its ability to induce sensory pleasure and positive emotions; however, it can also report negative emotions, in particular guilt. Structural equation modelling (SEM) is a technique useful to test causal relationships among personal values, attitudes and behaviours. In the present work the attitude and the emotions related to chocolate consumption for Catalonian consumers were evaluated and related with their interest in eating healthy and their chocolate consumption.

METHODS

SURVEYS

Data used in this study was a survey carried out in Vic, Spain during 2011. Consumers completed the following questionnaires:

- The Attitudes to Chocolate Questionnaire (1) using a 10 cm line with "very much like me" at one end and "not at all like me"on the other end.
- Part of the Dutch Eating Behavior Questionnaire (2) adapted to chocolate emotional eating. The response format was : never (1), seldom (2), sometimes (3), often (4)and very often (5).
- The Health Attitudes Questionnaire (3) using a Likert scale with 5-point from "totally disagree" to "totally agree".
- Chocolate consumption habits, the amount of chocolate eaten per week and the frequency of chocolate cravings.

DATA ANALYSIS

Exploratory factor analysis (PCA with varimax rotation procedure) was used to assess construct validity. SPSS software was used.

Reliability was assessed for each sub-scale or construct. by internal consistency. Cronbach's alpha coefficient values were calculated using SPSS software.

SEM analysis was performed to obtain and validate the model of causal relations among the factors extracted. This analysis was performed with AMOS software.

Attitudes to Chocolate

Craving
C1 My desire for chocolate often seems overpowering.
C2 I often go into a shop for something else and end up buying chocolate.
C3 I usually find myself wanting chocolate during the afternoon.
C4 I often eat chocolate when I am bored.
C5 I eat chocolate to cheer me up when I am down.
C6 I like to indulge in chocolate.
C7 Chocolate often preys on my mind.
C8 Nothmg else but chocolate satisfy my chocolate cravings.
C9 Even when I do not really want any more chocolate I will often carry on eating it.
C10 The thought of chocolate often distracts me from what I am doing (e.g. watching TV).

Guilty
G1 I feel guilty after eating chocolate.
G2 After eating chocolate 1 often wish I hadn't.
G3 I feel unattractive after I have eaten chocolate.
G4 I feel depressed and dlssat&ied with life after eating chocolate.
G5 I feel unhealthy after I have eaten chocolate.
G6 I am often on one kind of diet or another.
G7 If I resist the temptation to eat chocolate I feel more in control of my life.
G8 I always look at the calorific value of a chocolate snack before 1 eat it.
G9 I often feel sick after eatmg chocolate.
G10 I consider chocolate to be high in fat and to be of poor nutritional value.

Health Attitudes

General Health Interest
H1 The healthiness of food has a little impact on my food choices.
H2 I am very particular about the healthiness of food I eat
H3 I eat what I like and I do not worry much about the healthiness of food.
H4 It is important for me that mydiet is low in fat.
H5 I always follow a healthy andbalanced diet.
H6 It is important for me that my daily diet contains a lot of vitamins and minerals.
H7 The healthiness of snacks makes no difference to me.
H8 I do not avoid foods, even if they may raise my cholesterol.

Light- Products Interest
L1 I do not think that light products are healthier than conventional products.
L2 In my opinion, the use of light products does not improve one's health.
L3 In my opinion light products don't help to drop cholesterol levels.
L4 I believe that eating light products keeps one's cholesterol level under control.
L5 I believe that eating light products keeps one's body in good shape.
L6 In my opinion by eating light products one can eat more without getting too many calo...

Emotional eating for Chocolate
E1 Do you have the desire to eat chocolate when you are irritated?
E2 Do you have a desire to eat chocolate when you have nothing to do?
E3 Do you have a desire to eat chocolate when you are depressed or discouraged?
E4 Do you have a desire to eat chocolate when you are feeling lonely?
E5 Do you have a desire to eat chocolate when somebody lets you down?
E6 Do you have a desire to eat chocolate when you are cross?
E7 Do you have a desire to eat chocolate when you are approaching something unpleasant to happen?
E8 Do you get the desire to eat chocolate when you are anxious, worried or tense?
E9 Do you have a desire to eat chocolate when things are going against you or when things have gone wn
E10. Do you have a desire to eat chocolate when you are frightened?
E11 Do you have a desire to eat chocolate when you are disappointed?
E12 Do you have a desire to eat chocolate when you are emotionally upset?
E13 Do you have a desire to eat chocolate when you are bored or retless?

Figure 1. Items included in the questionnaires completed by participants. Only the factors extracted are shown.

RESULTS

First Principal Component analysis was used to determine the factor structure of the items. Factors obtained were: Interest for healthy diet (8 items), importance of light products (6 items), Guilty (10 items), Craving for chocolate (10 items) and Chocolate emotional eating (13 items).

The internal consistency of each factor was estimated with the Cronbach's coefficient that in all cases was higher than the recommended level (0.7). Table 1 shows the values of the coefficient obtained for each factor considering all the items and only the items resulted in the model.

SEM analysis was used to test the causal relations among the factors . Acceptable model fits are indicated by Comparative Fit Index (CFI) values exceeding 0.90, and Root Mean Square Error of Approximation (RMSEA) values below 0.06. Figure 2 shows the parameters of the final model that fitted well to the sample ($\chi2=532$-d.f.=313; CFI = 0.920; RMSEA= 0.042). The model confirmed the hypothesis that chocolate consumption is related with craving and guiltiness and with the interest on eating healthy and light products. Emotional eating was not found to be related with these factors so the hypothesis that attitude to chocolate factors (Guilty and Craving) explains chocolate emotional eating should be rejected.

Table 1. Cronbach's coefficient values obtained for the studied factors.

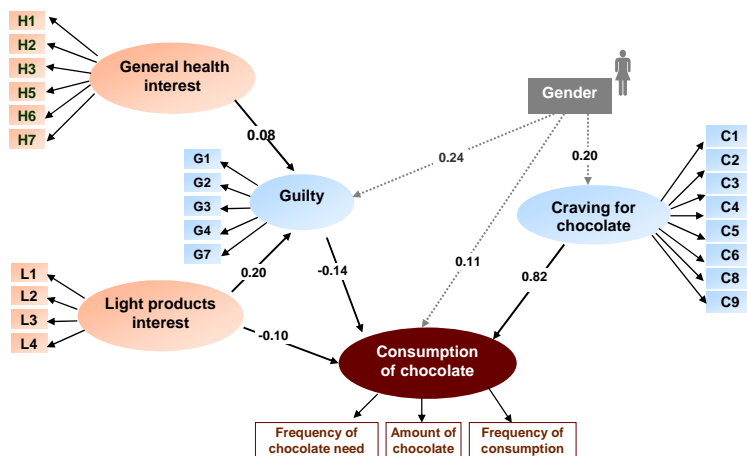| FACTOR	N. of items	Cronbach's coefficient
CRAVING	10	0.868
GUILTY	10	0.878
GENERAL HEALTH INTEREST	8	0.850
LIGHT-PRODUCTS INTEREST	6	0.799
EMOTIONAL EATING	13	0.940
CRAVING	8	0.852
GUILTY	5	0.880
GENERAL HEALTH INTEREST	6	0.836
LIGHT-PRODUCTS INTEREST	4	0.799

Figure 2. Final Confirmatory Analysis of the model of Chocolate Consumption for Catalonian consumers (n=250)

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