



EAT SLEEP WORK

A behavioural modification intervention to reduce snack food consumption focusing on external situational cues:
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CASE STUDY

ORIGINAL RESEARCH ARTICLE

A behavioural modification intervention to reduce snack food consumption focusing on external situational cues: The case study you can't read between meals without ruining your appetite!

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ABSTRACT

Currently, obesity is a leading threat to optimal health and wellbeing in Australia. Offsetting risks of acute and chronic disease and disability, a balanced diet offers a sound investment against premature morbidity and mortality commonly associated with obesity. Demonstrated empirically to lead to weight gain, consumption of snack foods lacking in nutritional value (“indulgences”) threatens a healthy lifestyle and is as prevalent as 90% in some populations. Thus, finding strategies to counteract habitual snacking on “indulgences” is imperative. External stimuli (objects, events or people) can influence food consumption. Changing exposure to external cues may be used to reduce snacking. This case study (n=1) investigated effects of a behavioural modification intervention using classical and operant conditioning techniques to reduce snack food ingestion over one week. Specifically, modifications to situational cues including meal versus snack schema activation and a fixed-interval sweet reward provided a holistic ‘internal-external’ environmental strategic approach. One hypothesis was proposed; the intervention would be associated with a reduction in snack food consumption during the seven-day intervention period. Results indicated the number of snacks consumed was significantly reduced during the intervention. While methodological limitations precluded causal claims and strength and direction of relationships, evidence supported a behavioural modification approach to reduce snacking. Moreover, results demonstrate the complexity of human eating behaviours, Rather than attributing overeating to individual “choice,” findings highlight a number of situational factors that may be altered to reduce snacking on indulgent foods.

KEYWORDS: case study, behaviour modification, snacking, diet, single systems design

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1 INTRODUCTION

Obesity is emerging as a global pandemic of the new millennium (1). Recognising the health benefits of improved diet, this study aims to investigate the effectiveness of a behavioural modification to reduce snacking. Broadly defined, behavioural modification exploits classical (learned associations) and operant (reinforced behaviour is likely to recur) principles to alter behaviour. Modifications to the individual's environment, in contrast to the individual per se, underpin therapeutic objectives to restructure environmental stimuli (objects, events or people) triggering and reinforcing behaviours (2). Applied to overeating in particular, the aim is to isolate and extinguish these antecedents, recognising that a diverse array of cues may coalesce or interact to trigger food ingestion (3). While hunger remains a robust predictor of food consumption (4, 5), research manipulating negative affect (6), environmental stressors (7), and memory (8) suggests that these factors interact with biological mechanisms to potentiate snack food consumption.

A number of other situational and social factors have been identified. For example, Wansink and colleagues (9) investigated situational cues that distinguished meals from snacks. Sitting with family, using ceramic plates, cutlery and napkins, and large-portioned high-quality food provided durable meal-schemas (mental definitions of what constitutes a meal). In contrast, standing, eating alone, using paper plates, and small-portioned low-quality food signified snacking. This suggests that meal versus snack-schemas could influence subsequent eating patterns. Pliner and Zec (10) tested this proposition experimentally. Given equal portions in either meal- (sitting at a table with utensils) or snack- (standing with finger-food) schemas, lone participants were offered pasta 20 minutes later. Results revealed 'meal' participants consumed significantly less than 'snack' participants.

Hetherington, Anderson, and Newson (11) explored whether social interaction or television watching, compared to eating alone, influenced energy consumption. In a repeated-measures, within-subject design, energy intake (kJ) was higher when with friends or watching television, than when alone. The authors argued that distraction in the friends and television conditions resulted in reduced self-monitoring and increased consumption. Bellisle, Dalix and Slama (12) examined energy intake in participants exposed to control, television, and audiobook conditions. Consistent with Hetherington,

Anderson, and Newson (11), results indicated that energy intake in the television and audiobook conditions were significantly higher than in the control condition. Vartanian and colleagues (13) had participants (n = 122) eat pizza in pairs while watching television. While consumption within pairs was positively correlated, only 2.5% of participants identified a companion influence; most nominated internal cues (e.g. hunger) for intake.

Collectively, these studies reveal situational conditions, which can undermine intentions to change snacking behaviour. In the current study, an undergraduate student maintained health-behaviour diaries for two weeks, nominating a behaviour for intervention. Using a Single-Systems Design, week one baseline data was compared to week two following implementation of a behavioural modification. It was hypothesised that the behavioural intervention would be associated with reduced snack-food consumption.

2 MATERIALS AND METHODS

2.1 PARTICIPANTS

The participant, a 43-year-old married female, full-time student, with primary-school aged dependants and part-time work commitment had a self-reported weight problem. Her undisclosed body mass index exceeded healthy weight-range, categorising her as overweight.

2.2 DESIGN

Using the most basic Single-Systems Design, with a baseline phase followed by an intervention phase (14, 15), snacking behaviours were recorded in week one as baseline/control and compared to week two following behavioural intervention. The dependent variable was number of snacks consumed, as defined below.

2.3 MATERIALS

Data were collected using a pre-prepared self-report diary pro-forma. Diaries incorporated sleep, exercise and food behaviours. Noting date and time, food diaries recorded food and beverage intake (in serves), indicating type, quantity and circumstances of consumption including: location, activity, mood and with/without companionship. The participant was instructed to document events as they transpired; a time-burden accounting for approximately 5-10 minutes daily. The completed diary data were entered into an Excel file. The 12345+ Food and Nutrition Plan (16, 17) was used to classify foods in 'indulgence units.' These are commonly consumed foods with little nutritional value. For example, two sweet

biscuits, 30g of chocolate, two scoops of ice cream or 30g of lollies would equate to one “indulgence.”

2.4 PROCEDURE

Following completion of week one baseline, student dyads conducted guided interviews nominating behaviour for intervention. Using an ABC model (2), a review of antecedents, behaviour and consequences provided rationale for behavioural modifications based on classical and operant conditioning principles. The participant identified snacking for behavioural intervention. From baseline data, cues or stimuli (events, locations or people) preceding snacking were identified. Stimuli-control strategies to reduce/remove antecedents were suggested. Incompatible behaviours were proposed to disrupt stimuli-response relationships. A reward schedule was recommended to positively reinforce reduced snacking.

Specifically, situational cues were manipulated via activation of meal versus snack-schema (18). Food was consumed seated in the dining room with plates and cutlery, avoiding kitchen or study areas, and secondary activities were prohibited during ingestion. Using a fixed-interval reinforcement schedule to reduce motivation for snack foods (19, 20), a fixed-portion sweet snack reward was taken daily following lunch to offset impulses to snack (18, 21). Strategies were implemented for one week following baseline/control.

2.5 ANALYSIS

Number of ‘indulgences’ consumed each day during baseline and intervention were compared using Proportion-Frequency Analysis (14), which may be used in repeated measures studies of an individual or a group (14, 22). Analysis involves defining typical behaviour, in order to determine whether an intervention is associated with a significant departure from typical, in the desired direction. The definition of typical is based on the standard normal curve, the mean plus or minus one standard deviation, or the middle two thirds of the dataset. Using this definition, the data are divided into zones: a ‘typical zone’ (the middle two thirds of the baseline data), an ‘undesired zone’ (in this case, higher than typical consumption) and a ‘desired zone’ (in this case, lower than typical consumption). The number of observations in the desired zone in the baseline and intervention phases can then be compared using tables to give a basic indicator of statistical significance (14).

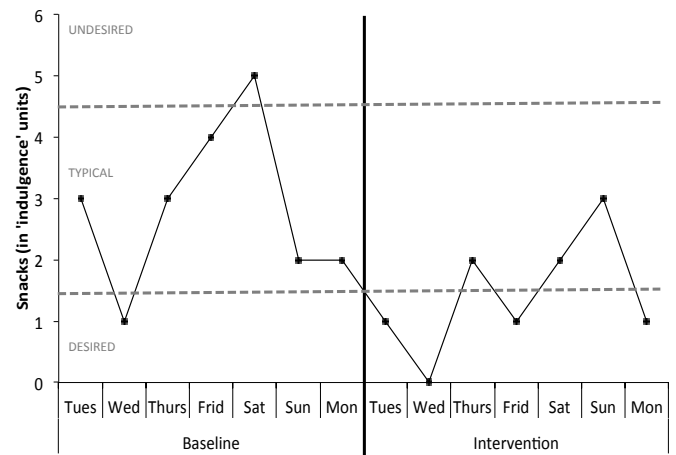


Figure 1. Snacks consumed daily during baseline and post-intervention. Snack food units are defined according to CSIRO 12345+ ‘indulgences’ classification (16, 17). Broken lines divide desired, typical and undesired zones as per the Proportion-Frequency Analysis approach (14).

3 RESULTS

Results indicated that the number of snacks consumed was reduced during post-intervention (Figure 1). The participant consumed an average of 1.4 (SD ± 1.0) snacks daily during the intervention week compared to 2.9 (SD ± 1.3) snacks daily during baseline. Proportion-Frequency Analysis indicated this reduction was significant ($p < 0.05$).

4 DISCUSSION

Results supported the prediction that behaviour modification would be associated with a reduction in total consumption of “indulgence” snack foods during the intervention week. This finding is analogous to previous research. Interventions activating meal versus snack schemas (9, 10), minimising environmental distractions (11, 12), and fixed-portion daily rewards (18-20) were collectively associated with reduction in snack-food consumption in the current study.

Current results are also consistent with Foster’s behavioural modification of obesity (6). He argues that internal adjustments are optimised by changes to external environments, reinforcing new stimuli-response relationships as they emerge. Thus combining small modifications in situational cues and divided attention with daily fixed-interval rewards may reveal potential advantages for future behavioural interventions addressing snack food consumption. It would be interesting to investigate the efficacy of other rewards (than the fixed-portion sweet reward used in the current study), which may provide a healthier alternative.

More broadly, challenges to dogma, which holds individuals solely responsible for their eating behaviours, emerge. While personal accountability and cognitive reallocation of external to internal loci of control is central to change (2), antecedents and contingency relationships embed individuals into unique contexts, which trigger and sustain behaviours. Therefore, real-world implications for findings suggest community education must endeavour to increase personal insight and public awareness into not only dietary behaviours, but also situational risk factors contributing to obesity.

However, the current study is not without limitations. The sample of one provides evidence specific to the participant. The self-report diary format, although commonly used in behavioural studies (23), by definition draws participants' attention to purposes of the study. Thus reporting accuracy may be jeopardised by social-desirability, mood, saliency and recency bias (5). While single-week baseline and intervention recording periods minimise fatigue or burden effects, observations may equally be artefacts of study novelty. Longer observation periods may reveal different patterns or reversion to baseline snacking behaviour. Increased numbers of observations over a longer time period would increase statistical power and sensitivity of Proportion-Frequency Analysis (14). Additionally, potential confounding variables including acute/chronic illness or significant stressors were not acknowledged. With these considerations in mind, employing a more robust Single Systems Design would be of benefit, for example, a withdrawal design could be used (baseline-intervention-baseline-intervention), or a design with longer recording periods for the baseline and intervention plus a follow up period to examine whether any changes are sustained (15).

The CSIRO (16) recommended no more than two indulgences daily, suggesting that the clinical significance of halving daily snack consumption from approximately 3 to 1.4 in the current study is potentially of benefit. However, reductions in snacking without commensurate changes to other habitual behaviours may not diminish overall chronic health risks. Yet on balance, this assertion neglects subtle but important advantages of this study. Exposing frequently imperceptible situational cues, which can potentiate indulgence (13), individuals are invested with novel perspectives for informed action. An opportunity to revise fatalistic notions that individuals are servants of biological drives in contrast to potential masters of their environment can rescript otherwise paralysing personal narratives.

In conclusion, results of the current study complement conclusions in the literature, which indicate modifications to situational cues and internal triggers can diminish snack consumption. While experimental studies may provide causal conclusions regarding behaviour, they reveal little of real-world snacking decisions. Although limited by the inability to manipulate cues independently, naturalistic studies such as the current one offer unique opportunities to observe effects when triggers coalesce. This is particularly advantageous because snacking, like all behaviour, occurs in environments where multiple cues are simultaneously present; generating multi-layered stimuli-response relationships.

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