Delivering healthy food choice: A dual-process model enquiry

Julia E. Carins^{1,2}, Sharyn R. Rundle-Thiele¹ & Joy E. Parkinson¹

¹ Social Marketing @ Griffith

Department of Marketing

Griffith University

Kessels Rd, Nathan, QLD, 4111

² Land Division

Defence Science and Technology Group

George Street, Scottsdale, TAS, 7260

Corresponding Author:

Julia E. Carins

Social Marketing @ Griffith

Department of Marketing

Griffith University

Kessels Rd, Nathan, QLD, 4111

j.carins@griffith.edu.au

Ph: +61 7 37358446

Fax: +61 7 37357126

Delivering healthy food choice: A dual-process model enquiry

Abstract

Introduction: Military personnel need to eat healthfully to enable peak performance and sustain health. Poor dietary habits and a rising rate of obesity amongst military personnel indicate a need for programs to improve food choices. This study evaluated two programs conceived under a dual-process model (consumer-focussed communications only; and a broader social marketing program including communications and environmental changes).

Methods: Programs were implemented and evaluated over a six week period in two military dining halls in Australia. Food selections were measured before and after program implementation using plate photography (n=673 meals). Outcome variables included a Healthy Plate Index (HPI), number of selections for food types, number of selections from three healthfulness categories (most healthful, moderately healthful and least healthful), and a measure of how diner selections differed from the proportions of each healthfulness category available on the menu. Independent t-tests were used to assess the difference between diner selections before and after program implementation.

Results: Significant differences ($p < 0.05$) in diner selections were observed after implementation of both programs, all in a healthful direction. When communications were used in isolation, the HPI was higher, with more selections made, and more moderately healthful selections chosen. When communications and environmental changes were combined, the number of choices remained stable but the HPI increased, and more of the most healthful foods were chosen.

Conclusions: The eating behaviour of military personnel can be improved using consumer focussed communications. However, by altering the environment as well, a greater change in behaviour can be realised.

Introduction

Military forces around the globe are appointed the responsibility of defending borders, protecting national interests, and assisting in times of emergency. To do this, they must train and retain personnel who are capable, adaptive, responsive and professional—people who are performing at their best physically and cognitively. However, many military personnel consume a diet that would be considered neither healthful nor beneficial to performance—one that is low in recommended foods like fruit and vegetables, and high in fat and/or sugar-rich foods (Barlas, Higgins et al., 2013; Skiller, Booth et al., 2005). Concern has been expressed about the level of obesity in military forces in many nations (Cawley & Maclean, 2012; Peake, Gargett et al., 2012), with approximately 62% of Australian personnel, 64% of US personnel, and 57% of UK personnel considered overweight or obese (Australian Institute of Health and Welfare, 2010; Barlas, Higgins et al., 2013; Sanderson, Clemes et al., 2014).

To improve eating behaviour in this population, an extensive formative research project was conducted to understand both individual and environmental influences on eating behaviour within a military base setting (Carins, Rundle-Thiele et al., 2016). Formative research insights informed development of two programs—a motivational communication campaign; and a broader social marketing campaign involving communications and changes to the military dining environment to facilitate healthier choices. **Both** formative research and the interventions were based on a dual-process model of behaviour (Evans, 2008), which recognises some behaviours are consciously made, whereas other behaviours occur automatically (or subconsciously) often heavily influenced by the environment or context surrounding individuals (Bargh, 2002).

This article describes and compares the impact of the programs on food choice by military diners. The results are discussed in light of the dual-process model of behaviour, as well as the practical and theoretical implications for social marketing that arise as a result.

Background and Literature

Social marketing is underpinned by a consumer oriented approach (Andreasen, 2002; French & Blair-Stevens, 2006). Researchers and practitioners strive to establish a deep understanding of the people they are working with, allowing them to develop programs that better suit the situation, and communication that resonates with the target group(s). Somewhat unsurprisingly, the theories of behaviour most commonly used in social marketing are individually based ‘cognitive decision models’ and have the underlying assumption that humans are rational, and make decisions that serve their best interests after assessing available information and prevailing circumstances (Luca & Suggs, 2013; Truong, 2014). As a consequence, programs often seek to change individual factors like knowledge, self-efficacy, skills, attitude, perceptions (e.g. social norms) and intentions—based on theoretical underpinnings implying these influence individual behaviour, despite some research indicating that individual factors such as intentions do not always translate into the desired behaviour (Holdershaw, Gendall et al., 2011). The social marketing evidence base is dominated by this downstream approach (Truong, 2014), and resounding support exists for social marketing to intervene further upstream (Gordon, 2013; Hoek & Jones, 2011; Wymer, 2011). The need to move upstream is also expressed as a need to adopt a wider systems view to achieve behavioural change, extending focus beyond the individual to the social and built settings surrounding the individual (Duane, Domegan et al., 2016) which may require alternate theoretical perspectives.

Recognition of dual-process models of behaviour (both conscious and automatic decision making processes) is widespread in the behavioural sciences (Evans, 2008). The concept of 'dual-process' comprises a broad group of theories used to describe a number of phenomena including information processing, cognitive processing, social judgement and decision making which are all individually based, cognitive mechanisms (Chaiken & Trope, 1999; Evans, 2008). However, 'dual-process' is also used to explain the environment-behaviour relationship (c.f. Kremers, De Bruijn et al., 2006) to acknowledge the existence of effortful and reasoned behaviour alongside impulsive, automatic or stimulus-driven behaviour that does not have a cognitive precursor (Strack & Deutsch, 2004). This latter conceptualisation recognises that while some behaviours are deliberate, much human behaviour occurs automatically in response to the environment or context surrounding individuals (Bargh, 2002), much of which cannot be explained with questioning in self-report research methodologies. Social marketing and other behavioural change programs that require individuals to use rational decision-making processes that involve weighing up the costs and benefits of particular actions, (e.g. healthy food choices), may fall short when behaviours are automated to 'free up' mental capacity for more demanding tasks (Bargh & Chartrand, 1999; Cohen & Farley, 2008). The ability to rationally process information and weigh up options can be constrained when other mental demands are present (March, 1978), such as time pressures and other pressing tasks. Non-rational, or automatic behavioural pathways have received less attention in social marketing (Anghelcev, Chung et al., 2015) when compared to their rational counterpart, and scholars have called for more consideration of dual-process models (Carvalho & Mazzon, 2013). Inclusion of strategies that trigger automatic responses, either alone or in combination with other strategies, may improve social marketing practice extending avenues of influence.

Consideration of dual-process models is particularly pertinent in the nutrition domain, where as much as 90% of eating behaviour is thought to be automatic (Cohen & Farley, 2008). Eating can be both uncontrollable and unconscious (Moldovan & David, 2012), and heavily influenced by the physical features of the eating environment (Wansink, 2004), and/or social and ambient cues (Stroebele & De Castro, 2004). Researchers have advocated for increased recognition of the automaticity of human behaviour, and stressed the importance of structuring the eating environment to automatically trigger healthful behaviour, rather than urging the individual to control or restrain behaviour (Marteau, Hollands et al., 2012; Rozin, Scott et al., 2011). Environmental changes can have an effect without consumers being aware of their behaviour or, if aware of the behaviour, with no awareness of what caused the behaviour (Marteau, Hollands et al., 2012). People tend to minimise the effort needed to obtain food (Rozin, Scott et al., 2011), so changing the layout so that the fastest path has the healthy options (Hanks, Just et al., 2012) or making healthy options easier to reach or simpler to serve (Rozin, Scott et al., 2011) increases the likelihood of healthier options being selected. Items that are more obvious or prominent are more likely to be chosen, since consumers choose items that are more visually prominent (Milosavljevic, Navalpakkam et al., 2012) or items that are placed in prominent positions (Cohen & Babey, 2012). When attentional resources are low, consumers rely almost exclusively on the most obvious visual cues (Mann & Ward, 2007). To increase the effectiveness of social marketing programs, calls have been made to alter the environment in which the behaviour occurs, to make it easier for motivated individuals to make healthier choices and also to affect those who are not motivated (Hoek & Jones, 2011; Wymer, 2011). Similar calls have been made in the wider health fields, indicating a strong interest in changing environments to better support healthy behaviours (Lake & Townshend, 2006; Larson & Story, 2009) all of which is consistent with the need to move social marketing upstream and/or adopt a systems view.

Given military personnel spend much of their time on a military base, following a tight military schedule (often allowing only 20 minutes to eat, see: Fiedler, Cortner et al., 1999), it is reasonable to expect that eating could be highly automated, and the setting likely to be a significant influence on eating behaviour. Few studies have tested programs to improve military eating behaviour—with mixed results. Point-of-selection nutrition labelling that focussed on calorie content or healthfulness of the food in a military setting was not found to be effective (Reid, 2012; Sproul, Canter et al., 2003). Improvements in individual dietary intake were observed after working with catering staff to change the food offered (Bingham, Lahti-Koski et al., 2012; Crombie, Funderburk et al., 2013), in effect forcing healthy choice rather than stimulating it through conscious or automatic means.

The aim of this study was to assess and compare the effects of two programs designed to improve the healthfulness of food selections in military dining facilities. Both programs were designed following a rigorous formative research process, investigating both conscious and automatic influences on eating behaviour (Carins, Rundle-Thiele et al., 2016). Briefly, formative research included examination of the literature to discover successful strategies used previously with other populations that may translate to a military population; in-depth interviews with military personnel to find out motivators for (and facilitators and barriers to) healthy eating; a food audit of military dining facilities and nearby commercial outlets to determine how well the environment supports healthy eating; and an observational study of food choice behaviour within a military dining hall. Insights from the formative research indicated a desire to eat well to support performance, rather than solely for health; and that diners were time-poor and frustrated by the opportunities presented to them. The dining environment was not optimised for healthy eating, and diner behaviour in this environment

exhibited a predictable traffic flow through the dining room layout, and a collective fast paced choice process with little apparent deliberation. Stemming from this formative research, the first program, in line with dominant prevailing social marketing practice, contained communications tailored to military personnel which focused on linking military personnel motivations (e.g. improved performance) to the foods available, rather than advising them of the nutritional content of the food. The second program used the same communications, but also included changes to the dining environment to facilitate selection of healthier choices. According to the dual-process model, changes were designed to make it easier for those diners who were motivated to eat well (the conscious decision maker)—but equally to influence those who were not consciously thinking about or were ambivalent towards making healthy choices (the automatic decision maker), by making healthier food alternatives readily available, convenient and prominent.

Methods

The GO FOOD programs

Communications-only program: The ‘GO FOOD’ theme leveraged on the desire of military personnel to eat well in order to perform well in their roles. The communications aimed to remind them of their healthful eating intentions, connect with and intensify existing motivation, and draw attention towards items that help them to eat well. Communications included GO LEAN: Stay lean and keen with protein, GO FRESH: Gain an edge with crisp fruit and salads, and GO ENERGY: Complex carbs for slow burn energy. Communications were designed to be positive. A combination of posters, placards, floor stickers and food labels, in highly visible places in the dining room, were used to execute this program. A sample of the communications is shown in Figure 1.

Figure 1: Communications used in the GO FOOD programs

Broader social marketing program: The second program used the same “GO FOOD” communications, but coupled them with environmental changes known to influence food choice. Modifications were made to the dining room layout to take advantage of the predictable traffic flow. To increase prominence, counters containing healthy choices were moved to ensure diners arrived at these counters first. For example, the salad counter was moved to be the most prominent, and an Express Bar (lunchtime only) which housed pre-made wraps, sandwiches, juice and fruit was created to deliver healthy and fast alternatives based on formative research insights. These changes were designed to trigger automatic food choices, by increasing convenience and prominence. A diagram of the layout changes are shown in Figure 2.

Figure 2: Layout changes for the GO FOOD broader social marketing program

Study design

The study was part of a collaborative research project between the University and a Government research organisation; ethical approval for the study was obtained through the Ethics Committees of both organisations. Programs were tested concurrently in two separate, but similarly sized, military dining halls in Australia. The dining halls served the same type of fare—main dishes included roast/grilled meats, stir-fries, curries, pies, pizza and spring rolls. Sides included baked, steamed or mashed vegetables, vegetable bakes, and salads. Other dishes included cold processed meats, bread and cut vegetables (e.g. sandwich ingredients), condiments and fruit. Catering staff indicated to diners they could make one main choice, but were free to choose any number of selections from the hot vegetable, salad or sandwich/fruit bars. Overall, both sites presented an array of dishes, on average 20 dishes per meal, which changed daily, and experienced regular diner attendances in the order of 200 per meal.

A quasi experimental pre-post design was used to test the programs over a six week period. During weeks 1 and 2 measures were taken at each site to quantify food choice behaviour prior to program implementation. In weeks 3 and 4, program materials were installed and layout changes made. In weeks 5 and 6, food choice behaviour was again measured following full implementation of the programs. Data collection days and meals were chosen to coincide with the most consistent diner attendance patterns at each site (to avoid times of high variability in diner numbers, e.g. leave days and weekends). Lunch and dinner meals were observed on each data collection day, producing a data set containing four meals in the pre-implementation observation period at each site, and four meals in the post-implementation period for each site.

Study measures

Observational methods were used to measure food selection behaviour. Observational methods were particularly suited to this study as self-reporting of food consumption is prone to socially desirable responding—especially when participants are aware of the importance of eating healthfully or the consequences (Barros, Oliveira et al., 2003; Hebert, Hurley et al., 2008). Secondly, eating behaviour is known to be highly automated (Cohen & Farley, 2008), with individuals unaware of the influence the environment has on behaviour (Bargh, 2002); therefore there is a risk that self-report methods may be asking participants to report on behaviours that do not reach the level of full consciousness (Boote & Mathews, 1999).

Prior to any diners entering the dining room, researchers carefully noted all choices available for that meal, clarifying with catering staff where needed to ensure each dish (or side dish) was captured and adequately described. Up to eight observers were stationed in the dining room, and after noting all of the dishes present within their area of viewing responsibility, observers recorded each time a diner made a selection from any of those dishes. This method produced counts of selections from each dish, and provided a means of capturing all food selections for the entire dining room, during any given meal (aggregate food choice). A second method was used—a photographer asked diners if they would mind if a photograph was taken of their plate after they had finished making their selections. Diners were approached using a convenience sampling method as they emerged from the exiting end of the food counters. The photographer took 3-4 minutes to ask permission, focus and take the photo, ensure the photo had saved; before recomposing themselves and commencing the next approach. Examination of each photograph was performed, and choices seen on the plate were matched to the list of choices available for that meal. This method produced counts of

selections from each dish for each individual, and provided a means of examining individual food selections (individual food choice) for a sample of the meal population observed. Examples of plate photographs are shown in Figure 3.

Figure 3: Examples of plate photographs taken to enumerate food selections

Analytical approach

Verification of food choice patterns

Correlation analyses were used to examine the relationship between the observer data and the photographic data. The number of individual selections for each dish was totalled from the individual food choice data, and compared to the number of selections recorded by the observers for each dish (the aggregate food choice data). This analysis was performed across all categories (mains, side dishes, sandwich ingredients, condiments, fruit and desserts), in order to determine how well the subset of diner plate photographs represented diner selection patterns observed for the entire dining room.

Examination of food choice patterns across food categories

Using the individual data, food choice patterns before and after each program were examined. Standard catering practice was to provide a varied menu meal to meal, but within a structured

menu pattern. This means each of the menu options could be grouped under the following categories: mains (lean meat cuts, other meat cuts, other main dishes), hot sides (pasta/rice, orange/yellow vegetables, green vegetables, potato), salads (pasta salad, green salad, coleslaw, potato salad, Caesar salad, other salads). Descriptive statistics were used to examine food selections and calculate means and standard deviations for each of these food choice categories, followed by independent samples t-tests to determine differences before and after program.

Examination of food choice patterns across healthfulness categories

A classification scheme [*citation to be added post review*] founded on the Australian Dietary Guidelines was used to classify each of the dishes as red (least healthful) orange (moderately healthful) or green (most healthful). Using the individual food choice data, the number of red, orange and green selections for each diner was then calculated. A Healthy Plate Index was computed for each plate according to the following formula:

$$\text{HPI} = [\text{Num of Red selections} \times 0] + [\text{Num of Orange selections} \times 0.5] + [\text{Num of Green selections} \times 1]$$

Researchers were not able to modify or control the availability of choices, only monitor what was provided. On average, both sites presented about 20 dishes per meal that was fairly balanced in terms of the three categories of healthfulness (on average, close to 33% red, 33% orange, 33% green dishes at each site). At the dish type level, there was an imbalance of classifications presented—main choices were predominately red (60% red, 20% orange, 20% green), and side dishes were predominately green or orange (20% red, 40% orange, 40% green). To determine if availability was closely related to food choice, the degree to which an

individual's selections matched the proportions served during a meal was calculated using the following formula:

$$\text{Net Selection Score} = \text{proportion chosen}_{(\text{red, orange, green})} - \text{proportion presented}_{(\text{red, orange, green})}$$

Using the formula, a positive value represents individual selection in excess of the proportion presented and a negative value represents individual selections below the proportion presented. For example, a plate with half orange (0.5) selections, and half green (0.5) selections during a meal with an equal number of red (0.33), orange (0.33) and green (0.34) dishes presented would result in a positive Net Selection Score for the orange and green categories (food selections higher than the proportions offered) and a negative Net Selection Score for the red category (selections not reaching the proportion offered).

Descriptive statistics were used to examine food selections and calculate means and standard deviations for each of these food healthfulness categories, including HPI and Net Selection Score, followed by independent samples t-tests to determine differences before and after program. All descriptive and inferential statistical analyses were conducted using Statistical software (IBM SPSS Statistics for Windows, Version 22.0).

Results

Diner numbers varied meal by meal, with a total of 4,400 diners (average 280 diners per meal) observed over the course of the experiment. Of these, 673 had their plate photographed, representing a 15% capture rate. Refusal rate was low; 10 diners declined to have their plate photographed, representing 1% of those approached.

Congruence of food choice patterns

Variables used in the correlation analysis were not normally distributed (assessed by Shapiro-Wilk's test, $p < 0.05$), so Spearman's rank-order correlation was used. Preliminary analysis showed the relationship to be monotonic, as assessed by visual inspection of a scatterplot. A strong positive correlation was found between the data collected by the observers, and the data collected by the photographer, across almost all categories, indicating that the plates photographed were representative of diner food selections in the dining hall during any given meal (see Table 1).

Table 1: Correlations between observer data and photographic data by dish type

Dish type	Correlation co-efficient (r^s)
All dishes (N=657)	0.75**
Mains (n=98)	0.77**
Sides (n=211)	0.83**
Sandwich ingredients (n=167)	0.32**
Condiments/extras (n=29)	0.76**
Fruit (n=140)	0.38**
Dessert (n=12)	0.38

** significant at $p < 0.01$ level.

Food choice patterns across food categories

Of the 671 plate photographs included in the final dataset, most included one main, and one to seven side dishes. Twelve diners elected not to take a main dish, three diners chose two main dishes, and two diners chose no side dishes. On average, diners made four selections—one main dish and three side dishes. Food selections before and after each program, in each food category, are shown in Table 2.

Table 2. Means and standard deviations for individual food choices across food categories

	Site 1: Communications-only				Site 2: The broader social marketing program			
	Before (n=207)	After (n=114)			Before (n=134)	After (n=216)		
	Mean ($\pm$ SD)	Mean ($\pm$ SD)	t statistic (df)	p value	Mean ($\pm$ SD)	Mean ($\pm$ SD)	t statistic (df)	p value
Total Selections	3.70 ($\pm$ 1.06)*	4.46 ($\pm$ 1.30)*	5.396 (195)	<0.001	4.48 ($\pm$ 1.17)	4.66 ($\pm$ 1.20)	1.378 (348)	0.169
Mains	1.00 ($\pm$ 0.12)	0.98 ($\pm$ 0.19)	0.738 (319)	0.461	1.01 ($\pm$ 0.09)	0.97 ($\pm$ 0.16)	2.617 (340)	0.009
- Lean Meat Cuts	0.15 ($\pm$ 0.36)	0.18 ($\pm$ 0.39)	0.800 (319)	0.424	0.11 ($\pm$ 0.32)	0.23 ($\pm$ 0.42)	3.012 (336)	0.003
- Other Meat Cuts	0.29 ($\pm$ 0.46)	0.28 ($\pm$ 0.45)	0.264 (319)	0.792	0.19 ($\pm$ 0.40)	0.10 ($\pm$ 0.30)	2.304 (228)	0.022
- Other Main dishes	0.55 ($\pm$ 0.51)	0.52 ($\pm$ 0.50)	0.562 (319)	0.574	0.70 ($\pm$ 0.48)	0.64 ($\pm$ 0.48)	1.188 (348)	0.236
Veg	1.66 ($\pm$ 1.01)	1.85 ($\pm$ 1.07)	1.612 (319)	0.108	2.69 ($\pm$ 1.25)	3.04 ($\pm$ 1.22)	2.623 (348)	0.009
- Pasta/Rice	0.29 ($\pm$ 0.45)	0.54 ($\pm$ 0.52)	4.479 (208)	<0.001	0.86 ($\pm$ 0.68)	0.80 ($\pm$ 0.65)	0.786 (348)	0.432
- O/Y Veg	0.30 ($\pm$ 0.46)	0.40 ($\pm$ 0.49)	1.765 (220)	0.079	0.66 ($\pm$ 0.69)	0.68 ($\pm$ 0.61)	0.263 (257)	0.793
- Gr Veg	0.47 ($\pm$ 0.50)	0.43 ($\pm$ 0.51)	0.739 (319)	0.460	0.73 ($\pm$ 0.63)	1.10 ($\pm$ 0.68)	5.046 (348)	<0.001
- Potato	0.59 ($\pm$ 0.50)	0.47 ($\pm$ 0.50)	2.059 (319)	0.040	0.44 ($\pm$ 0.50)	0.47 ($\pm$ 0.50)	0.497 (348)	0.620
Salad	1.04 ($\pm$ 0.97)	1.63 ($\pm$ 1.01)	5.139 (319)	<0.001	0.78 ($\pm$ 0.92)	0.64 (0.84)	1.462 (348)	0.145
- Pasta	0.12 ($\pm$ 0.32)	0.18 ($\pm$ 0.39)	1.597 (198)	0.112	0.10 ($\pm$ 0.31)	0.08 ($\pm$ 0.27)	0.823 (348)	0.411
- Green	0.31 ($\pm$ 0.47)	0.46 ($\pm$ 0.52)	2.439 (213)	0.016	0.28 ($\pm$ 0.47)	0.25 ($\pm$ 0.43)	0.779 (348)	0.436
- Coleslaw	0.15 ($\pm$ 0.36)	0.24 ($\pm$ 0.43)	1.849 (201)	0.066	0.17 ($\pm$ 0.38)	0.09 ($\pm$ 0.29)	2.069 (229)	0.040
- Potato	0.08 ($\pm$ 0.28)	0.18 ($\pm$ 0.39)	2.479 (176)	0.014	0.06 ($\pm$ 0.24)	0.07 ($\pm$ 0.25)	0.357 (348)	0.722
- Caesar	0.20 ($\pm$ 0.40)	0.32 ($\pm$ 0.47)	2.429 (203)	0.016	0.04 ($\pm$ 0.21)	0.09 ($\pm$ 0.28)	1.638 (339)	0.102
- Other Salad	0.18 ($\pm$ 0.46)	0.25 ($\pm$ 0.57)	0.995 (193)	0.321	0.12 ($\pm$ 0.39)	0.07 ($\pm$ 0.29)	1.284 (224)	0.200

*significant differences ($p < 0.05$) observed between pairs

Site 1: The communications-only program

Changes in individual food selection behaviour were observed at Site 1 after implementation of the communications-only program. Total selections increased, as did the number of salad selections. Main and vegetable side selections remained similar. Within the vegetable (or hot sides) category, pasta selections increased, and potato selections decreased. Within the salads category, green salads, potato salad and Caesar salad selections all increased.

Site 2: The broader social marketing program including triggers for automatic behaviour

Differences were observed in individual food selection behaviour after implementation of the broader social marketing program. The total number of selections did not change, neither did the number of salad selections, but the number of vegetable selections increased and main selections decreased. Within these categories, lean meat main selections increased, and other meat cut mains decreased; green vegetables increased, and coleslaw salad selections decreased.

Food choice patterns across healthfulness categories

Food selections were examined in terms of healthfulness; results are shown below in Table 3.

Table 3. Means and standard deviations for individual food choices across healthfulness categories

	Site 1: Communications-only				Site 2: The broader social marketing program			
	Before (n=207)	After (n=114)			Before (n=134)	After (n=216)		
	Mean ($\pm$ SD)	Mean ($\pm$ SD)	t statistic (df)	p value	Mean ($\pm$ SD)	Mean ($\pm$ SD)	t statistic (df)	p value
Total Selections	3.70 ($\pm$ 1.06)*	4.46 ($\pm$ 1.30)*	5.396 (195)	<0.001	4.48 ($\pm$ 1.17)	4.66 ($\pm$ 1.20)	1.378 (348)	0.169
Healthy Plate Index	2.06 ($\pm$ 1.02)*	2.46 ($\pm$ 0.99)*	3.437 (319)	0.001	2.78 ($\pm$ 1.14)*	3.06 ($\pm$ 1.16)*	2.201 (348)	0.028
No. Red Selections	1.03 ($\pm$ 0.83)	1.06 ($\pm$ 0.83)	0.334 (319)	0.738	1.13 ($\pm$ 0.69)	1.08 ($\pm$ 0.69)	0.574 (348)	0.566
No. Orange Selections	1.21 ($\pm$ 1.02)*	1.88 ($\pm$ 1.11)*	5.433 (319)	<0.001	1.13 ($\pm$ 0.87)	1.02 ($\pm$ 0.84)	1.192 (348)	0.234
No. Green Selections	1.45 ($\pm$ 1.04)	1.53 ($\pm$ 0.96)	0.611 (319)	0.542	2.22 ($\pm$ 1.13)*	2.55 ($\pm$ 1.18)*	2.612 (348)	0.009
No. Red Main Selections	0.51 ($\pm$ 0.51)	0.49 ($\pm$ 0.50)	0.352 (319)	0.725	0.70 ($\pm$ 0.48)	0.64 ($\pm$ 0.48)	1.188 (348)	0.236
No. Orange Main Selections	0.27 ($\pm$ 0.44)	0.31 ($\pm$ 0.46)	0.787 (319)	0.432	0.19 ($\pm$ 0.40)*	0.10 ($\pm$ 0.30)*	2.304 (228)	0.022
No. Green Main Selections	0.22 ($\pm$ 0.41)	0.18 ($\pm$ 0.39)	0.702 (319)	0.483	0.11 ($\pm$ 0.32)*	0.23 ($\pm$ 0.42)*	3.012 (336)	0.003
No. Red Side Selections	0.52 ($\pm$ 0.65)	0.57 ($\pm$ 0.68)	0.690 (319)	0.490	0.43 ($\pm$ 0.54)	0.44 ($\pm$ 0.52)	0.330 (348)	0.742
No. Orange Side Selections	0.95 ($\pm$ 0.88)*	1.57 ($\pm$ 0.99)*	5.632 (211)	<0.001	0.94 ($\pm$ 0.71)	0.92 ($\pm$ 0.81)	0.223 (348)	0.824
No. Green Side Selections	1.16 ($\pm$ 0.98)	1.34 ($\pm$ 0.90)	1.605 (319)	0.110	2.10 ($\pm$ 1.07)	2.32 ($\pm$ 1.08)	1.820 (348)	0.070
Net Selection Score (Red)	-0.06 ($\pm$ 0.22)*#	-0.15 ($\pm$ 0.20)*#	3.422 (319)	0.001	-0.02 ($\pm$ 0.16)	-0.05 ($\pm$ 0.17) #	1.411 (348)	0.159
Net Selection Score (Orange)	0.00 ($\pm$ 0.26)	0.03 ($\pm$ 0.21)	1.194 (278)	0.234	-0.09 ($\pm$ 0.21) #	-0.11 ($\pm$ 0.16) #	0.741 (226)	0.459
Net Selection Score (Green)	0.07 ($\pm$ 0.26)*#	0.12 ($\pm$ 0.21)*#	2.022 (273)	0.044	0.12 ($\pm$ 0.20) #	0.16 ($\pm$ 0.20) #	1.891 (348)	0.059

*significant differences ($p < 0.05$) observed between pairs

significantly different ($p < 0.05$) from zero

Site 1: The communications-only program

An increase in the HPI indicated that the plates contained more healthful selections after the communications program. The number of orange (moderately healthful) selections increased, and although changes in both main and side selections would have contributed to this increase, a significant increase in orange sides alone was observed. Overall, the results indicate a healthier set of food selections on diners' plates, with more of the moderately healthful options chosen.

Diner selections were compared to availability of least healthful (red); moderately healthful (orange) and most healthful (green) choices, using the Net Selection Scores. On average, both sites tended to present red, orange and green options in close to equal measure throughout the programs, although at Site 1, the proportion of green dishes fell slightly, being 9% lower at the end of the program. Diners were observed to select fewer red dishes, and more green dishes than presented at both time points. A significant decrease in the Net Selection Score was observed for the red category after program implementation at Site 1.

Site 2: The broader social marketing program including triggers for automatic behaviour

Differences were also observed after implementation of the broader social marketing program. A significant increase in the HPI indicated that the plates contained more healthful selections after this program. The number of most healthful (green) selections increased. Changes in both main and side selections would have contributed to this increase, however a significant increase in green mains was observed, as well as a significant decrease in orange mains. Overall, the results indicate a healthier set of food selections on diners' plates, with more of the most healthful options chosen.

Availability of least healthful (red); moderately healthful (orange) and most healthful (green) choices remained balanced throughout at Site 2. Diner selections were compared to availability using Net Selection Scores. Before program implementation, diners were selecting fewer orange and more green dishes than presented, whereas after the program they were selecting fewer red and orange dishes than presented, and selecting more green dishes than presented.

Results summary

Taken altogether, results indicate both programs increased the healthfulness of individual food selections. The communications-only program appears to have prompted an extra selection, which appears to have been from the moderately healthful category. A small reduction in availability of the most healthful dishes may have influenced which category the extra selection was chosen from. Food types that were chosen more were pasta/rice sides; and green salad, potato salad and Caesar salad. The broader social marketing program (communications and layout changes), with no change to total number of selections, and no change to availability during the program, appears to have prompted a switching behaviour, from the least and moderately healthful categories to the most healthful category. Increased lean meat selections, as well as vegetable selections (principally an increase in green vegetables) would have driven this increase in most healthful selections. These results are summarised in Figure 4.

Figure 4: Number of selections from each category before and after program implementation, and changes in the availability of each category

*significant differences ($p < 0.05$) observed between pairs

Squares indicate availability by category did not change ($< 2\%$ change) during program

Arrows indicate availability by category did change (direction and magnitude given)

Discussion

Extending beyond dominant individually targeted communication approaches this study, underpinned by a dual-process model, sought to design, implement and assess an intervention that extended beyond conscious processing to target automatic decision processes. Given the need for healthy eating programs in the military domain, the broader social marketing program including triggers for automatic behaviour was compared and contrasted with a communications-only program in line with current dominant social marketing practice.

Both programs contained consumer focussed communications to intensify existing motivation and draw attention to healthy foods—a strategy that operates through conscious pathways and is common to an individually targeted social marketing approach. In line with a dual-process approach, modifications to the dining environment in the second program were intended to trigger automatic behaviour by making healthier options easy to access and more prominent.

Individual food selection behaviour was examined as the primary outcome, and significant differences, observed before and after both programs were all in a positive direction. The Healthy Plate Index indicated that individual plates contained a healthier set of choices after both programs, but also that food selection patterns had changed in different ways during the two programs. At the communications-only site, total number of selections per plate increased, as did moderately healthful selections. Whilst caution must be exercised when interpreting these findings, it appears that communications alone may have prompted diners to make an extra selection—a moderately healthful one. Under the broader social marketing program, total number of selections remained the same, but diners selected significantly more of the most healthful foods. A cautious interpretation suggests that the program stimulated a switching behaviour, from less healthful options to more healthful options. Taken together, the results from the broader program showed no overall increase in the number of choices, concurrent with an increase in the most healthful choices—including lean meats and green vegetables which is –a more desirable outcome. This study indicates that changes in the food environment enhanced change, providing empirical evidence to support calls for systems thinking to be applied (c.f. Duane, Domegan et al., 2016) or re-focus from the individual (downstream) to the mid and upstream (Gordon, 2013; Hoek & Jones, 2011; Wymer, 2011).

Availability of options within the three healthfulness categories was monitored throughout the programs, but researchers were not able to modify or control availability. Increasing availability of healthful options within a given environment increases the likelihood that healthier choices will be selected, for example, by increasing the number of healthful choices within a cafeteria menu (Crombie, Funderburk et al., 2013; French, Hannan et al., 2010), an opportunity for future research.

The communications program employed a positive appeal targeting motivations identified in formative research, which is in contrast to information focussed or guilt inducing appeals which are dominant and may induce inaction (Brennan & Binney, 2010). Positive results found after implementation of the communications program are noteworthy in light of the few nutrition communication campaigns that have been tested in military settings. Point-of-purchase nutrition information—targeting healthful entrée dishes (equivalent to main dishes) with a health based slogan, and containing nutrient data—had no effect on increasing consumption of those key foods in a US military dining setting (Sproul, Canter et al., 2003), which may be expected given emerging research evidence indicating education focussed efforts are failing to combat obesity (Fildes, Charlton et al., 2015; Laska, Pelletier et al., 2012) and positive appeals may be more likely to induce actions (Brennan & Binney, 2010). In a more recent US initiative, the Go for Green labelling system follows a traffic light format, and uses a performance based slogan coupled with nutrition information. When used alone, this communication labelling system had limited success, producing no increase in selections of green labelled entrees (main dishes), vegetables and starches, and mixed findings with other foods (e.g. increased fruit consumption but decreased salad consumption) (Reid, 2012). However, Arsenault and Singleton et al. (2014) found the labelling was

considered useful by personnel—approximately half of the military dining population reported referring to the Go for Green labelling when making food choice decisions—but these users were more likely to be already following a special diet (Arsenault, Singleton et al., 2014).

Communication focused on the health attributes of foods is likely to appeal to those who are concerned with their health (Arsenault, Singleton et al., 2014). Formative research for this present intervention found that motivations went beyond health—they were connected to performance, soldierly identity and job stability. Motivation is essential to purposeful action, and those with higher internal motivation are more likely to engage in actions that satisfy those motivations (Li, Iannotti et al., 2014). The inclusion of nutrient data and the use of traffic light systems are information strategies that rely on a conscious, rational and deliberative decision-making process—weighing up whether the calorie count is too high (given an individual’s nutrition knowledge) and whether consumption of a particular item has been limited (given an individual’s pattern over the past few days). The communication used in this study made the link between the motivations expressed by military personnel and foods available in the dining facility.

The broader social marketing program employed environmental changes as well as communication, resulting in a greater behaviour change than the communications-only program. Eating behaviour has improved in the military dining environment following changes that increased availability of healthful items and reduced availability of items high in fat and sugar (Bingham, Lahti-Koski et al., 2012; Crombie, Funderburk et al., 2013). However, increasing availability of fruit and vegetables in these programs did not increase fruit and vegetable intake, and the authors noted this remained a challenge. Modifying

availability is only one of many strategies that can be employed to make dining environments more supportive of healthful eating. In this study, researchers did not make any changes to the food offerings at either site (catering staff provided foods according to their usual menus and procedures), yet positive changes were effected. There is widespread multi-sectorial support for environmental change to facilitate individual behaviour change (Geaney, Kelly et al., 2013; Glanz, Sallis et al., 2005; Mhurchu, Aston et al., 2010; Wymer, 2011), either alone or in combination with other strategies. The study offers just one example of how this might be achieved.

Strengths and limitations

A key strength of this study is the use of observational measures, which remove biases inherent in other evaluation methods, such as surveys. Photographing plates allowed individual food selection patterns, which cannot be determined from sales data alone, to be examined. Our equivalent to sales data (aggregate food selection data) gave confidence that the patterns seen on individual plates were representative of the larger group.

Food selection was the behaviour measured in this study, and therefore it is assumed that by selecting foods which are more healthful, individuals will be consuming a better diet. However, food selection volumes were not measured, nor food waste, so there is no way to determine if a large serve of a more healthful food could outweigh a small serve of a less healthful one, or vice versa. This could be addressed in future studies. Individuals were not followed in this study, so it is not known if individual dietary behaviour was significantly improved, although it is reasonable to expect that individuals who are part of the aggregate group would benefit if these patterns continue. Repeated cross-sectional analyses are considered appropriate for measuring the effectiveness of programs implemented at a

community level (Atienza & King, 2002), however future studies could be strengthened with the inclusion of cohort analysis. Other limitations include the lack of a control group. However, justifications have been given for the use of alternatives to no-treatment controls, including testing new approaches against standard approaches to determine similar or superior degrees of effectiveness (Streiner, 2007). For this reason, and taking into consideration limited research resources and the demands on the organisation where the data was being collected, the dual-process approach was tested against the standard, and commonly used, communications-only approach. Programs were implemented at two different sites, meaning differences pertinent to each site could not be controlled for. Programs ran over a six week period, and whilst these results are encouraging, it is not known if the positive changes were sustained over the longer term. Finally, the effect of the communication and environment layout changes cannot be separated, and it is unknown whether environmental changes would be effective in isolation. Future research could test the effect of environmental layout changes alone on diner behaviour in this environment, or examine the effect of a range of strategies that prompt behaviour changes with low level conscious engagement. Despite these limitations, this evaluation of a consumer focussed communication program, and a social marketing program based on identified environmental facilitators, shows promising results—extending application beyond dominant attempts that appeal to for individuals to change their behaviour.

Contributions and Implications

This study contributes to the military health promotion area, demonstrating communications focused on the motivations of military personnel can stimulate behaviour change. However, a broader approach can achieve better results. Social marketing programs staged in real-world settings have been dominated by education, communication or promotion strategies. This is

true of the nutrition domain (Carins & Rundle-Thiele, 2014), in reducing alcohol consumption (Kubacki, Rundle-Thiele et al., 2015), and indeed, the wider social marketing field (Luca & Suggs, 2010). Social marketing has been effective in its use of these strategies, however, recent research reveals relying on a single type of strategy (e.g. communications) may be limiting the effectiveness of social marketing programs (Kubacki, Rundle-Thiele et al., 2015). Overall, the results from this direct test of ‘communication’ and ‘communication plus more’ show that while the communication was successful, the broader program was more successful—it achieved a better outcome. The current study contributes to social marketing demonstrating application of the dual-process model to effect change in the environment surrounding the individual.

Further implications for the social marketing field flow from the approach taken to devise the broader program. As noted in the introduction, dual-process theories encompass a broad array of different precursors and mechanisms, which influence a number of cognitive processes and behaviours. Whilst social marketing has embraced this concept through theories such as the elaboration likelihood model of persuasion (Cacioppo & Petty, 1984) when designing communications, there remains scope to explore other dual-process models. Application of a dual-process approach in the current study extended the focus to the environment surrounding the individual that is known to influence food choice, either in tandem with concurrent cognitive processes, or in isolation from it. Further research could explore dual-process models that operate through other mechanisms, or on other processes, thereby responding to calls for more consideration of these models in social marketing (Carvalho & Mazzon, 2013), and opening a potentially rich field of enquiry with flow on benefits for social marketing practice.

Social marketers have recognised the importance of ‘moving upstream’ or operating within a system acknowledging multiple interactions between stakeholders within the system. To date, the majority of calls to move upstream or apply systems thinking call for policy and regulation designed to restrict the supply of products which are detrimental to health (Hoek & Jones, 2011; Wymer, 2011), rather than structuring the environment to trigger automatic behaviour for a positive outcome. Others have articulated a broader set of approaches including environmental ‘nudges’ and ‘shoves’ that do not require a high level of conscious engagement (French, 2011). The modifications to dining room layout in this program did not require diners to consciously engage with the program; rather the environmental changes were designed to make the healthy choice the easy choice. Commercial marketers create environments that make it easy for consumers and which favour their objectives and social marketers should look to incorporate some of these ideas into their work. Changes to the environment have long been recognised as having the potential to affect more of the population, not just those who are motivated to behave in the desired way (Glanz & Mullis, 1988). This study demonstrates that those larger behaviour changes can be realised; and shows growing interest in the use of environmentally-oriented or upstream strategies within social marketing to improve eating behaviour (c.f Escaron, Martinez-Donate et al., 2016; French, 2011; Velema, Vyth et al., 2017).

Conclusions

This study demonstrates that in line with the dual-process model, using programs that incorporate communications and environmental changes can be more successful in delivering behaviour change than communications-only programs. Communications were effective on their own, however, a greater effect was seen when environmental layout strategies that did not rely on conscious engagement by military diners were added. This study provides a solid

starting point for those wishing to intervene in a variety of settings. Future research should aim to demonstrate whether environmental strategies are effective on their own, or test a broader suite of environmental strategies. Effective programs that improve the eating behaviour of military personnel will contribute to their better health and performance, in turn creating a stronger and more resilient force.

References

- Andreasen, A. R. (2002). Marketing social marketing in the social change marketplace. *Journal of Public Policy and Marketing*, 21(1), 3-13.
- Anghelcev, G., Chung, M., Sar, S., et al. (2015). A ZMET-based analysis of perceptions of climate change among young south koreans: Implications for social marketing communication. *Journal of Social Marketing*, 5(1), 56-82.
- Arsenault, J. E., Singleton, M. C., & Funderburk, L. K. (2014). Use of the go-for-green nutrition labeling system in military dining facilities is associated with lower fat intake. *Journal of the Academy of Nutrition and Dietetics*, 114(7), 1067-1071.
- Atienza, A. A., & King, A. C. (2002). Community-based health intervention trials: an overview of methodological issues. *Epidemiologic Reviews*, 24(1), 72-79.
- Australian Institute of Health and Welfare. (2010). *Whose health? How population groups vary*. Canberra, ACT, Australia: AIHW.
- Bargh, J. A. (2002). Losing consciousness: Automatic influences on consumer judgment, behavior, and motivation. *Journal of Consumer Research*, 29(2), 280-285.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist*, 54(7), 462-479.

- Barlas, F. M., Higgins, W. B., Pflieger, J. C., et al. (2013). *Department of Defense 2011 Health Related Behaviors Survey of Active Duty Military Personnel*. Fairfax VA: ICF International Inc.
- Barros, R., Oliveira, B., & Moreira, P. (2003). Social desirability affects nutritional and food intake estimated from a food frequency questionnaire. *International Journal of Consumer Studies*, 27(3), 249-250.
- Bingham, C. M., Lahti-Koski, M., Puukka, P., et al. (2012). Effects of a healthy food supply intervention in a military setting: positive changes in cereal, fat and sugar containing foods. *International Journal of Behavioral Nutrition and Physical Activity*, 9(91), 1-11.
- Boote, J., & Mathews, A. (1999). "Saying is one thing; doing is another": the role of observation in marketing research. *Qualitative Market Research: An International Journal*, 2(1), 15-21.
- Brennan, L., & Binney, W. (2010). Fear, guilt, and shame appeals in social marketing. *Journal of Business Research*, 63(2), 140-146.
- Cacioppo, J. T., & Petty, R. E. (1984). The elaboration likelihood model of persuasion. *Advances in Consumer Research*, 11(1), 673-675.
- Carins, J. E., & Rundle-Thiele, S. R. (2014). Eating for the better: A social marketing review (2000-2012). *Public Health Nutrition*, 17(7), 1628-1639.
- Carins, J. E., Rundle-Thiele, S. R., & Fidock, J. T. T. (2016). Seeing through a Glass Onion: Broadening and deepening formative research in social marketing through a mixed methods approach. *Journal of Marketing Management*, 32(11-12), 1083-1102.
- Carvalho, H. C., & Mazzon, J. A. (2013). Homo economicus and social marketing: questioning traditional models of behavior. *Journal of Social Marketing*, 3(2), 162-175.

- Cawley, J., & Maclean, J. C. (2012). Unfit for service: the implications of rising obesity for US military recruitment. *Health Economics*, 21(11), 1348-1366.
- Chaiken, S., & Trope, Y. (1999). *Dual-process theories in social psychology*. New York: Guilford Press.
- Cohen, D. A., & Babey, S. H. (2012). Contextual influences on eating behaviours: heuristic processing and dietary choices. *Obesity Reviews*, 13(9), 766-779.
- Cohen, D. A., & Farley, T. A. (2008). Eating as an automatic behavior. *Preventing Chronic Disease*, 5(1), A23.
- Crombie, A. P., Funderburk, L. K., Smith, T. J., et al. (2013). Effects of modified foodservice practices in military dining facilities on ad libitum nutritional intake of US Army soldiers. *Journal of the Academy of Nutrition and Dietetics*, 113(7), 920-927.
- Duane, S., Domegan, C., McHugh, P., et al. (2016). From restricted to complex exchange and beyond: social marketing's change agenda. *Journal of Marketing Management*, 32(9–10), 856–876.
- Escaron, A. L., Martinez-Donate, A. P., Riggall, A. J., et al. (2016). Developing and Implementing “Waupaca Eating Smart”. *Health Promotion Practice*, 17(2), 265-277.
- Evans, J. S. B. T. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, 59(1), 255-278.
- Fiedler, E. R., Cortner, D. M., Ktenidis, H., et al. (1999). Healthy eating in practice: The US Air Force demonstration at basic military training. *Applied and Preventive Psychology*, 8(3), 155-163.
- Fildes, A., Charlton, J., Rudisill, C., et al. (2015). Probability of an obese person attaining normal body weight: cohort study using electronic health records. *American Journal of Public Health*, 105(9), e54-e59.
- French, J. (2011). Why nudging is not enough. *Journal of Social Marketing*, 1(2), 154-162.

- French, J., & Blair-Stevens, C. (2006). Social Marketing National Benchmark Criteria. UK National Social Marketing Centre. Retrieved 15 August 2012, from <http://www.snh.org.uk/pdfs/sgp/A328466.pdf>
- French, S. A., Hannan, P. J., Harnack, L. J., et al. (2010). Pricing and availability intervention in vending machines at four bus garages. *Journal of Occupational and Environmental Medicine*, 52(Suppl 1), S29.
- Geaney, F., Kelly, C., Greiner, B. A., et al. (2013). The effectiveness of workplace dietary modification interventions: a systematic review. *Preventive Medicine*, 57(5), 438-447.
- Glanz, K., & Mullis, R. M. (1988). Environmental interventions to promote healthy eating: a review of models, programs, and evidence. *Health Education and Behavior*, 15(4), 395-415.
- Glanz, K., Sallis, J. F., Saelens, B. E., et al. (2005). Healthy nutrition environments: concepts and measures. *American Journal of Health Promotion*, 19(5), 330-333.
- Gordon, R. (2013). Unlocking the potential of upstream social marketing. *European Journal of Marketing*, 47(9), 1525-1547.
- Hanks, A. S., Just, D. R., Smith, L. E., et al. (2012). Healthy convenience: nudging students toward healthier choices in the lunchroom. *Journal of Public Health*, 34(3), 370-376.
- Hebert, J. R., Hurley, T. G., Peterson, K. E., et al. (2008). Social desirability trait influences on self-reported dietary measures among diverse participants in a multicenter multiple risk factor trial. *Journal of Nutrition*, 138(1), 226S-234S.
- Hoek, J., & Jones, S. C. (2011). Regulation, public health and social marketing: a behaviour change trinity. *Journal of Social Marketing*, 1(1), 32-44.
- Holdershaw, J., Gendall, P., & Wright, M. (2011). Predicting blood donation behaviour: further application of the theory of planned behaviour. *Journal of Social Marketing*, 1(2), 120-132.

- Kremers, S. P., De Bruijn, G. J., Visscher, T. L., et al. (2006). Environmental influences on energy balance-related behaviors: a dual-process view. *International Journal of Behavioral Nutrition and Physical Activity*, 3(1), 9.
- Kubacki, K., Rundle-Thiele, S., Pang, B., et al. (2015). Minimizing alcohol harm: A systematic social marketing review (2000–2014). *Journal of Business Research*, 68(10), 2214-2222.
- Lake, A., & Townshend, T. (2006). Obesogenic environments: exploring the built and food environments. *The Journal of the Royal society for the Promotion of Health*, 126(6), 262-267.
- Larson, N., & Story, M. (2009). A review of environmental influences on food choices. *Annals of Behavioral Medicine*, 38(1), 56-73.
- Laska, M. N., Pelletier, J. E., Larson, N. I., et al. (2012). Interventions for weight gain prevention during the transition to young adulthood: a review of the literature. *Journal of Adolescent Health*, 50(4), 324-333.
- Li, K., Iannotti, R. J., Haynie, D. L., et al. (2014). Motivation and planning as mediators of the relation between social support and physical activity among US adolescents: a nationally representative study. *International Journal of Behavioral Nutrition and Physical Activity*, 11, 42.
- Luca, N. R., & Suggs, L. S. (2010). Strategies for the social marketing mix: a systematic review. *Social Marketing Quarterly*, 16(4), 122-149.
- Luca, N. R., & Suggs, L. S. (2013). Theory and model use in social marketing health interventions. *Journal of Health Communication*, 18(1), 20-40.
- Mann, T., & Ward, A. (2007). Attention, self-control, and health behaviors. *Current Directions in Psychological Science*, 16(5), 280-283.

- March, J. G. (1978). Bounded rationality, ambiguity, and the engineering of choice. *The Bell Journal of Economics*, 9(2), 587-608.
- Marteau, T. M., Hollands, G. J., & Fletcher, P. C. (2012). Changing human behavior to prevent disease: the importance of targeting automatic processes. *Science*, 337(6101), 1492-1495.
- Mhurchu, C. N., Aston, L. M., & Jebb, S. A. (2010). Effects of worksite health promotion interventions on employee diets: A systematic review. *Bmc Public Health*, 10(1), 62-69.
- Milosavljevic, M., Navalpakkam, V., Koch, C., et al. (2012). Relative visual saliency differences induce sizable bias in consumer choice. *Journal of Consumer Psychology*, 22(1), 67-74.
- Moldovan, A. R., & David, D. (2012). Features of automaticity in eating behavior. *Eating behaviors*, 13(1), 46-48.
- Peake, J., Gargett, S., Waller, M., et al. (2012). The health and cost implications of high body mass index in Australian defence force personnel. *Bmc Public Health*, 12, 451.
- Reid, L. A. (2012). *Effect of point-of-decision nutrition labeling on food choices at a military dining facility*. (Dissertation/Thesis), Texas Woman's University.
- Rozin, P., Scott, S., Dingley, M., et al. (2011). Nudge to nobesity I: Minor changes in accessibility decrease food intake. *Judgment and Decision Making*, 6(4), 323-332.
- Sanderson, P. W., Clemes, S. A., & Biddle, S. J. H. (2014). Prevalence and socio-demographic correlates of obesity in the British Army. *Annals of Human Biology*, 41(3), 193-200.
- Skinner, B., Booth, C. K., Coad, R. A., et al. (2005). *Assessment of Nutritional Status and Fatigue Among Army Recruits during the Army Common Recruit Training Course*:

Part A: Catering Services and Diet. (DSTO-TR-1736). Fishermans Bend, Australia: DSTO.

Sproul, A. D., Canter, D. D., & Schmidt, J. B. (2003). Does point-of-purchase nutrition labeling influence meal selections? A test in an Army cafeteria. *Military Medicine*, 168(7), 556-560.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review*, 8(3), 220-247.

Streiner, D. L. (2007). Alternatives to placebo-controlled trials. *The Canadian Journal of Neurological Sciences*, 34(S1), S37-S41.

Stroebele, N., & De Castro, J. M. (2004). Effect of ambience on food intake and food choice. *Nutrition*, 20(9), 821-838.

Truong, V. D. (2014). Social marketing: A systematic review of research 1998–2012. *Social Marketing Quarterly*, 20(1), 15-34.

Velema, E., Vyth, E. L., & Steenhuis, I. H. M. (2017). Using nudging and social marketing techniques to create healthy worksite cafeterias in the Netherlands: Intervention development and study design. *Bmc Public Health*, 17(1).

Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual Review of Nutrition*, 24(1), 455-479.

Wymer, W. (2011). Developing more effective social marketing strategies. *Journal of Social Marketing*, 1(1), 17-31.