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The Influence of Nutrition Information on Consumer's Portion Size Perceptions

In 2011-2012 in Australia, over 50% of adults aged 18 years and over were overweight (35.3%) or obese (27.5%)(1). In Australia, the prevalence of overweight and obesity has increased significantly, from 56.3% in 1995 to 61.2% in 2007-2008(1). Chronic conditions that have been linked to overweight and obesity include cardiovascular disease, diabetes, atherosclerosis, high blood pressure, stroke, sleep apnoea and some cancers(2). To avoid gaining excess weight, individuals should be encouraged to consume appropriate portion sizes of foods from the five core food groups and avoid consuming large amounts of discretionary foods, such as packaged snacks(3).

Research shows that food packaging and information presented are vitally important in the consumer decision making process (4).When provided with front-of-pack food labels, Australian adults identified the healthier product over 80% of the time, with the front-of-pack scheme that provided energy information only performing poorly (5).

A longitudinal cohort follow-up study by Thorndike et al. 2014, found healthier food choices were sustained over a two-year period when a traffic-light food labelling system was implemented, thus providing support for a long-term impact of such an intervention (6).

In a Study by Kleef et al. 2008, consumers reported that front-of-pack food labels were an improvement over nutrition information panels on the packaging alone, and they reported them as helpful in allowing a faster and easier way to compare food products (7).

In general, consumers' ability to estimate recommended portion sizes is poor. It has been found that self-selected portion sizes of common foods vary from the recommended standard serving sizes specified in the Australian Guide to Healthy Eating (AGHE) for both adults and children (8). Furthermore, the perceived healthiness of foods can bias product health perceptions (9), estimates of energy density and portion size selection(10). Provencher et. al. (10) found that study participants consumed 35% more cookies when they perceived them to be healthy compared with when they believed them to be unhealthy. Similarly, Faulkner showed that larger portions were selected when foods were labelled 'reduced fat'(11).

29 The Health Star Rating is a labelling system displayed on the front of food packages to provide
30 an overall rating of the nutritional value of the packaged food(12). It is designed to be a fast,
31 easy and standardised way of comparing similar packaged food products. Although not a
32 direct aim of the Health Star Rating, the initiatives' influence on portion size consumption of
33 food products by consumers is not known.

34 This study therefore aims to test whether the health star rating label and kJ's/100g energy
35 information will influence portion sizes selected compared to no information.

36 Based on previous findings by Provencher (10) we hypothesize that individuals would serve
37 themselves larger portions of foods that have a higher health star rating and smaller amounts
38 of food that have a low health star rating compared to when the same foods are offered
39 unlabelled. Further, we expected that a kJ per 100g label would not influence self-served food
40 portions. This is in accordance with findings of Watson et al (5), who studied the ability of
41 participants to use a range of front-of-pack labels and found that the scheme that provided
42 energy information only performed the poorest. Furthermore, the study found that the
43 energy-only label was used the least by participants thus supporting our hypothesis that the
44 kJ per 100g label would have the least effect on amounts of food chosen (5).

45 **METHODS**

46 This study was approved by the Human Research Ethics Committee: Approval No. H-2014-
47 0393.

48 Young adults aged 18 to 30 were recruited from the University of Newcastle Callaghan
49 campus and via social media, radio and newspaper advertisements. Nutrition and Dietetics
50 students were excluded due to nutrition knowledge that could confound evaluations.

51 Individuals required to follow a medically prescribed diet were also excluded.

52 Individuals participating received a \$3.60 hot beverage voucher and a small snack to
53 compensate for time. Those enrolled in nursing research courses at the University of
54 Newcastle were eligible to receive bonus course marks.

55 The study was piloted with 10 participants to refine the procedure. Each participant was
56 randomly assigned into one of three experimental groups. Group 1 viewed a kJ/100g label,
57 Group 2 viewed a 'Health Star' rating label and Group 3 received no information on nutrient
58 composition (control). Genders were balanced between the experimental groups. Participants
59 were individually invited to serve themselves food portions that they believed to be an
60 adequate amount for someone their age and gender from a Fake Food Buffet (FFB). The FFB is
61 a validated method, in which participants are invited to serve themselves from a buffet of
62 replica food items (13). The buffet contained breakfast cereals (Kellogg's Nutri-Grain, real
63 foods), chicken, fries and mixed vegetables (for a meal), with fruit salad and chocolates
64 presented as snack foods. All food items were labeled with the name of the food.

65 Upon completion of the serving task, the participant completed a computerized questionnaire
66 using Qualtrics (14). Self-reported anthropometrics, socioeconomic information (income,
67 education and family structure), authenticity of fake foods, liking of the offered foods and
68 consumption frequency were self-reported. Liking of the foods, hunger and frequency of
69 consumption of the FFB food items was measured on six-point Likert scales. Participants'
70 health interest was evaluated with five questions on a six-point scale derived from Roininen
71 et al (15).

72

73 Statistical Analysis was completed using SPSS Statistics 22 (IBM SPSS Inc., Chicago, IL). One
74 hundred and seventeen participants were included in the final data set. One participant was
75 excluded due to serving an unrealistically large amount of food. Group means were compared
76 using ANOVA (Analysis of Variance) and MANOVA (for the meal) and all tests were based on a
77 0.05 significance level. Furthermore, the mean served portion sizes were compared to the
78 recommended AGHE serving sizes using one sample t-tests. Test values, Means (*M*), Standard
79 Deviations (*SD*), significance levels (*P*) and effect sizes (η^2) are reported. The cut-off values
80 for effect sizes (η^2) are .01, .06, .14 (16). The study population was described using

81 descriptive statistics including BMI (body mass index), which is calculated from height and
82 weight (See Table 2).

83
84 **Results**

85 Statistical analysis using ANOVA indicated that there was no significant difference between
86 the three experimental groups in terms of kilojoules from the food served by category (see
87 Table 1). There was no difference in the total energy content of the self-served three-
88 component meal between the experimental groups ($P=.55$). Furthermore, the mean
89 differences of total in the self-selected portions of discretionary foods (chocolate: 221kJ; fries:
90 154kJ) from the FFB were significantly larger ($p<.001$) than the AGHE standard serving size
91 (600kJ)(3).

92
93 **Discussion**

94 In the current study it was found that the two tested types of food labels (health star rating
95 and kJ per 100g label) did not impact the portion of food selected from the FFB by young
96 adults, when compared to the control group condition (no food label).

97 This finding suggests that these two types of food labels do not influence portion size
98 selection in young adults. It is possible that the participants had pre-formed opinions on the
99 food products and did not consider the food labels when making their choices (17). This is
100 particularly likely as the foods chosen in this study were familiar to the participants. It
101 remains to be tested, whether energy or health star rating labels influence portion sizes of
102 unfamiliar or new foods.

103 The findings of the current study therefore do not support research by Provencher and
104 Faulkner(10, 11) which found that food labels that have the potential to increase product
105 health perception (such as 'low fat' labelling) led to larger portion size selection, as high
106 health star ratings on labels had no impact on portion size selection in the current study.

107 However, findings of the current study do support research by Collins et al. (8) which found
108 that self-selected portion sizes of common foods vary from the recommended serving sizes
109 specified in the AGHE, as significant differences were found in the self-selected discretionary
110 food portions compared to the AGHE standard serving size.

111 *Limitations.* Firstly, the replica foods were not edible and theoretically self- served food
112 quantities may not accurately reflect the total energy consumed using real foods. However,
113 the FFB has previously been shown to be valid and reliable compared to self-served real food
114 items (20). In addition, previous research indicates that adults tend to eat all of the food on
115 their plates and therefore served energy is likely to approximate consumed energy (18).
116 Furthermore, there is a potential for response bias whereby participants alter their usual food
117 serving behaviours under experimental conditions.

118 A potential further limitation is that participants were asked to serve what they perceived to
119 be an adequate portion of food from the FFB for someone their age and sex. Therefore, the
120 portion sizes served may not reflect their own usual portion sizes, rather what they perceive
121 others like them should consume. Additionally, the results for chocolate and fries were
122 judged in comparison to recommended serve size for discretionary foods according to the
123 AGHE and not 'adequate portion', which may have led to some confusion. However, this did
124 allow comparison of what participants perceive as an adequate portion of these foods relative
125 to the recommended serve sizes.

126 Finally, the participants in the current study consisted mainly of university students (96%). It
127 is therefore possible that participants had a higher baseline level of nutrition knowledge
128 compared to the general population, which may have influenced portion sizes selected.

129 Despite the limitations, the results of the current study have practical implications and
130 suggest that neither kilojoule information, nor the Heath Star rating label influence self-
131 selected portion sizes of familiar foods (as previously mentioned the authors do acknowledge
132 that influencing portion size selection of foods was not a direct aim of the Health Star Rating).

133 It is possible that food labels may have a stronger influence when selecting from unfamiliar
134 food items.

135 Consumer education is needed to improve understanding of front of pack labels in order to
136 assist consumers in making appropriate portion size choices. Recommendations for future
137 research in this area include testing the impact of energy and/or health star rating labels on
138 portion size selection of unfamiliar or new foods. Further, future studies could specifically ask
139 participants to serve themselves their usual portion size of foods as well as assess their
140 knowledge of an AGHE standard serve. Finally, future research could include the impact of
141 interventions tailored to education levels on food label use and portion size choice.

142

143 The authors conclude that although front-of-pack nutrition labelling might help consumers
144 when comparing and rating products based on their nutrition value, the two types tested do
145 not affect consumers' portion size selection.

146

Table 1: The energy per food category chosen compared among the experimental groups.

	Total (n=117, 30 males)		Control (n=40, 11 males)		Star Group (n=38, 9 males)		kJ Group (n=39, 10 males)		<i>F</i>	<i>P</i> ^c	η^2
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>			
Chicken a,b (kJ)	634	192	671	229	643	135	587	192	1.976	.143	0.034
Fries a,b (kJ)	754	366	798	418	740	370	723	305	0.449	.639	0.008
Vegetables a,b (kJ)	154	46	151	48	154	35	158	53	0.215	.807	0.004
Chocolate a (kJ)	821	429	938	514	756	372	762	365	2.347	.100	0.040
Fruit salad a (kJ)	417	126	433	103	409	133	409	140	0.483	.618	0.008
Cereal (kJ)	732	288	728	287	747	251	722	326	0.078	.925	0.001

Note. ^a Fake food items were used for these foods (13). Energy of corresponding amounts of real foods were reported (19, 20). ^b MANOVA was used for the meal components to take into account the 3 different dependent variables. ^c As there were no differences between group means, post-hoc tests were not carried out.

Table 2: Descriptive characteristics of study subjects (n=117) compared between groups: Anthrometric characteristics were not significantly different between groups.

	Total (n=117, 30 males)		Control (n=40, 11 males)		Star Group (n=38, 9 males)		kJ Group (n=39, 10 males)		<i>F</i>	<i>P</i>	η^2
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>			
Age (years)	24.2	3.7	24.1	3.6	24.4	3.9	24.3	3.6	0.084	.920	0.001
BMI (kg/m ²)	23.6	3.9	23.7	3.5	23.9	4.2	23.2	4.2	0.357	.701	0.006
Weight (kg)	67.1	13.6	68.7	13.6	67.8	13.5	64.9	13.6	0.831	.438	0.014
Height (cm)	168.4	9.5	169.8	10.6	168.3	9.3	167.2	8.5	0.745	.477	0.013
Hunger ^a	2.9	1.2	3.0	1.3	2.9	1.3	3.1	1.0	0.113	.893	0.002
Health interest	5.0	1.1	5.2	0.96	4.8	1.2	5.2	1.2	1.871	.159	0.032
Liking ^b											
Chicken	4.7	1.6	5.0	1.4	4.8	1.5	4.3	1.7	1.627	.201	0.028
Vegetables	5.0	1.1	4.9	0.9	5.0	1.3	4.9	1.2	0.103	.902	0.002
Fries	4.6	1.4	4.6	1.4	4.8	1.3	4.2	1.4	1.910	.153	0.032
Breakfast	3.8	1.6	4.1	1.5	3.8	1.6	3.4	1.6	1.916	.152	0.033
Cereal											
Fruit Salad	5.1	1.1	5.1	1.0	5.1	1.1	5.1	1.2	0.032	.968	0.001
Chocolate	5.1	1.2	5.1	1.2	5.1	1.2	5.1	1.3	0.050	.951	0.001
Consumption											
Frequency ^c											
Chicken	3.7	1.4	4.0	1.3	3.5	1.4	3.4	1.5	2.188	.117	0.037
Vegetables	5.4	0.7	5.5	0.6	5.2	0.7	5.5	0.8	1.745	.179	0.027
Fries	3.0	1.0	3.0	0.9	3.2	1.0	2.8	1.0	1.591	.208	0.030
Breakfast	3.8	1.9	4.4	1.5	3.5	1.9	3.6	2.1	3.082	.050	0.051
Cereal											
Fruit Salad	3.9	1.4	3.9	1.6	4.1	1.3	3.8	1.3	0.285	.752	0.005
Chocolate	4.1	1.2	4.0	1.2	4.2	1.2	4.0	1.3	0.225	.799	0.004

Note: BMI= body mass index (weight in kilograms divided by height in meters squared). Hunger^a levels were measured on a six-point scale (1=not hungry at all; 6=very hungry). Liking^b of the foods was measured on a scale from 1(=don't like at all); 6= like very much) and the frequency^c was measured on a

scale from (5 or more times per week; 2-4 times per week; once per week; 1-3 times per month; less than once per month; never) in the questionnaire. Health interest was evaluated with five questions derived from Roininen et al. (15)

References

1. Australian Bureau of Statistics. Overweight and Obesity Canberra: Australian Bureau of Statistics; 2012 [updated 2013 June 7 2015 February 1]. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4338.0~2011-13~Main%20Features~Overweight%20and%20obesity~10007>.
2. Better Health Channel. Obesity Victoria: State Government of Victoria; 2014 [updated 2015 may 29 2015 February 1]. Available from: <http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Obesity>.
3. National Health and Medical Research Council. Educator Guide- Eat for Health. Canberra Australian Government; 2013.
4. Arslanagic M PA, Kadic-Magljalic S. Perceptions of healthy food packaging information: do men and women perceive differently? *Procedia*. 2014;8(109):78-82.
5. Watson WL, Kelly B, Hector D, Hughes C, King L, Crawford J, et al. Can front-of-pack labelling schemes guide healthier food choices? Australian shoppers' responses to seven labelling formats. *Appetite*. 2014;72:90-7.
6. Thorndike AN, Riis J, Sonnenberg LM, Levy DE. Traffic-light labels and choice architecture: promoting healthy food choices. *American journal of preventive medicine*. 2014;46(2):143-9.
7. van Kleef E, van Trijp H, Paeps F, Fernandez-Celemin L. Consumer preferences for front-of-pack calories labelling. *Public Health Nutr*. 2008;11(2):203-13.
8. Collins CE, Bucher T, Taylor A, Pezdirc K, Lucas H, Watson J, et al. How big is a food portion? A pilot study in Australian families. *Health promotion journal of Australia : official journal of Australian Association of Health Promotion Professionals*. 2015.
9. Sutterlin B, Siegrist M. Simply adding the word "fruit" makes sugar healthier: The misleading effect of symbolic information on the perceived healthiness of food. *Appetite*. 2015;95:252-61.
10. Provencher V, Polivy J, Herman CP. Perceived healthiness of food. If it's healthy, you can eat more! *Appetite*. 2009;52(2):340-4.
11. Faulkner GP, Pourshahidi LK, Wallace JM, Kerr MA, McCaffrey TA, Livingstone MB. Perceived 'healthiness' of foods can influence consumers' estimations of energy density and appropriate portion size. *Int J Obes (Lond)*. 2014;38(1):106-12.
12. Commonwealth of Australia. About Health Star Ratings: Commonwealth of Australia; [updated 2014 December 6 2015 February 2]. Available from: <http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/Content/About-health-stars>.
13. Bucher T, Van Der Horst K, Siegrist M. The fake food buffet's examination of the influence of nutrition guidelines on meal composition. *Annals of Nutrition and Metabolism*. 2011;58:55.
14. Qualtrics. Provo, UT.
15. Roininen K, Tuorila H, Zandstra EH, de Graaf C, Vehkalahti K, Stubenitsky K, et al. Differences in health and taste attitudes and reported behaviour among Finnish, Dutch and British consumers: a cross-national validation of the Health and Taste Attitude Scales (HTAS). *Appetite*. 2001;37(1):33-45.
16. Kirk RE. Practical significance: A concept whose time has come. *Educ Psychol Meas*. 1996;56(5):746-59.
17. Bucher T, van der Horst K, Siegrist M. Fruit for dessert. How people compose healthier meals. *Appetite*. 2013;60:74-80.
18. Wansink B. Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual review of nutrition*. 2004;24:455-79.
19. Food Standards Australia New Zealand. The Australian Nutrient Database. In: Zealand FSAN, editor. 2011-2013.
20. Coles. Coles Online [2015 March 1]. Available from: http://shop.coles.com.au/online/national/?WT.mc_id=always-on_link_Coles.com.au_homepage-meganav-dropdown_shop-now.

1. Australian Bureau of Statistics. Overweight and Obesity Canberra: Australian Bureau of Statistics; 2012 [updated 2013 June 72015 February 1]. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4338.0~2011-13~Main%20Features~Overweight%20and%20obesity~10007>.
2. Better Health Channel. Obesity Victoria: State Government of Victoria; 2014 [updated 2015 may 292015 February 1]. Available from: <http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Obesity>.
3. National Health and Medical Research Council. Educator Guide- Eat for Health. Canberra Australian Government; 2013.
4. Arslanagic M PA, Kadic-Magljajlic S. Perceptions of healthy food packaging information: do men and women perceive differently? *Procedia*. 2014;8(109):78-82.
5. Watson WL, Kelly B, Hector D, Hughes C, King L, Crawford J, et al. Can front-of-pack labelling schemes guide healthier food choices? Australian shoppers' responses to seven labelling formats. *Appetite*. 2014;72:90-7.
6. Thorndike AN, Riis J, Sonnenberg LM, Levy DE. Traffic-light labels and choice architecture: promoting healthy food choices. *American journal of preventive medicine*. 2014;46(2):143-9.
7. van Kleef E, van Trijp H, Paeps F, Fernandez-Celemin L. Consumer preferences for front-of-pack calories labelling. *Public Health Nutr*. 2008;11(2):203-13.
8. Collins CE, Bucher T, Taylor A, Pezdirc K, Lucas H, Watson J, et al. How big is a food portion? A pilot study in Australian families. *Health promotion journal of Australia : official journal of Australian Association of Health Promotion Professionals*. 2015.
9. Sutterlin B, Siegrist M. Simply adding the word "fruit" makes sugar healthier: The misleading effect of symbolic information on the perceived healthiness of food. *Appetite*. 2015;95:252-61.
10. Provencher V, Polivy J, Herman CP. Perceived healthiness of food. If it's healthy, you can eat more! *Appetite*. 2009;52(2):340-4.
11. Faulkner GP, Pourshahidi LK, Wallace JM, Kerr MA, McCaffrey TA, Livingstone MB. Perceived 'healthiness' of foods can influence consumers' estimations of energy density and appropriate portion size. *Int J Obes (Lond)*. 2014;38(1):106-12.
12. Commonwealth of Australia. About Health Star Ratings: Commonwealth of Australia; [updated 2014 December 62015 February 2]. Available from: <http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/Content/About-health-stars>.
13. Bucher T, Van Der Horst K, Siegrist M. The fake food buffet's examination of the influence of nutrition guidelines on meal composition. *Annals of Nutrition and Metabolism*. 2011;58:55.
14. Qualtrics. Provo, UT.
15. Roininen K, Tuorila H, Zandstra EH, de Graaf C, Vehkalahti K, Stubenitsky K, et al. Differences in health and taste attitudes and reported behaviour among Finnish, Dutch and British consumers: a cross-national validation of the Health and Taste Attitude Scales (HTAS). *Appetite*. 2001;37(1):33-45.
16. Kirk RE. Practical significance: A concept whose time has come. *Educ Psychol Meas*. 1996;56(5):746-59.
17. Bucher T, van der Horst K, Siegrist M. Fruit for dessert. How people compose healthier meals. *Appetite*. 2013;60:74-80.
18. Wansink B. Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual review of nutrition*. 2004;24:455-79.
19. Food Standards Australia New Zealand. The Australian Nutrient Database. In: Zealand FSAN, editor. 2011-2013.
20. Coles. Coles Online [2015 March 1]. Available from: http://shop.coles.com.au/online/national/?WT.mc_id=always-on_link_Coles.com.au_homepage-meganav-dropdown_shop-now.

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