



Review Article

A systematic review of interventions to increase breakfast consumption: a socio-cognitive perspective

Jessica A Harris* , Julia E Carins and Sharyn Rundle-Thiele

Social Marketing @ Griffith, Griffith University, 170 Kessels Road, Nathan 4111, Brisbane, QLD, Australia

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Abstract

Objective: Regular breakfast skipping is related to unhealthy dietary behaviours, such as consuming an overall poorer quality diet and lower rates of physical activity, both of which are linked to a higher BMI. Adolescent breakfast skippers struggle with mental focus, sleep issues and lower grades. Solutions that can be implemented to overcome breakfast skipping are needed.

Design: A systematic literature review was undertaken to identify programmes that aimed to increase breakfast eating. Following the PRISMA framework, studies were sourced to examine details of behaviour change, evidence of theory use and other important programme learnings and outcomes.

Setting: Breakfast consumption empirical studies published from 2000 onwards.

Participants: Nineteen empirical studies that aimed to improve breakfast eating behaviour.

Results: Out of the nineteen studies examined, ten studies reported an increase in breakfast consumption frequency for the entire study group or subgroups. Seven studies found no change, one was inconclusive and one observed a decrease in breakfast frequency. Positive changes to the dietary quality of breakfast were observed in five of the studies that did not observe increased frequency of breakfast consumption. Only six studies reported using theory in the intervention.

Conclusions: This evidence review points needed to extend theory application to establish a reliable evidence base that can be followed by practitioners seeking to increase breakfast eating rates in their target population.

Keywords

Breakfast eating
Behaviour change
Breakfast skipping
Social cognitive theory

Breakfast represents the first opportunity in the day to consume foods to provide sustenance to perform daily activities. Evidence indicates that breakfast skipping may be an indicator of poor dietary habits and behaviours in general^(1–4). Beyond the associations with unhealthy dietary patterns⁽⁵⁾ and dietary-related disease⁽⁶⁾, breakfast skipping is a concern as it is known to impair daily functioning, reducing concentration and cognitive performance⁽⁷⁾, decreasing energy and negatively affecting mood^(8,9), which can compound any problems children and adults experience during their school and work commitments. Breakfast skipping is a known risk factor for health, having been positively associated with non-communicable diseases^(3,10) and overweight and obesity^(11–14). Furthermore,

establishing breakfast habits when young can lead to lifelong habits including healthy eating behaviours^(3,7,10).

In Australia, 19% of adolescents and 12% of adults do not consume breakfast indicating that as many as one in ten adults is not meeting ideal breakfast recommendations^(15,16). Adolescents and young adults commonly engage in unhealthy habits such as breakfast skipping, certainly in western countries^(3,7,17,18). Recommendations for an ideal breakfast propose that it should provide 15%–25% of total daily energy⁽¹⁹⁾. In addition to providing energy and nutrients to commence the day's activities, research demonstrates that young people who eat breakfast demonstrate better food behaviours throughout the day⁽²⁰⁾.

*Corresponding author. Email jessica.a.harris@griffith.edu.au

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There is a critical time when adolescents transition to adulthood that it is thought to be the catalyst for unhealthy eating and behaviour⁽¹⁷⁾. This period is important for developing healthy eating behaviours due to the development of autonomy for emerging adults^(21,22). As adolescents move into adulthood, not only do eating issues arise but physical activity also slows which declines further as the adult moves through their lifespan. Over 33.6% of Australian adolescents do not meet physical activity guidelines⁽¹⁷⁾. As adolescence marks a critical time when behavioural changes occur, including eating behaviours, change from adolescence to adulthood is an optimal time to encourage healthy eating to allow new habits and behaviours to form^(23,24), including healthy breakfast habits that can then endure across the lifespan.

The reasons why adolescents and young adults do not eat breakfast have included a lack of self-efficacy, perceived barriers, other established behavioural patterns (such as late nights and disorganised mornings) and conflicts between competing demands and preferences⁽²⁵⁾. Other studies have found absence of hunger, low enjoyment of breakfast and lack of time to contribute, and use breakfast skipping as a weight loss strategy^(26,27).

Given the detrimental effects breakfast skipping has on daily functioning and long-term health, there is a need for interventions or programmes to improve breakfast consumption. Furthermore, the transitional stages of adolescence to adulthood suggest that behaviour change strategies need to be cognisant of the changing individual, social and environmental circumstances^(28,29). Social marketing is a widely recognised behaviour change discipline⁽³⁰⁾ that integrates knowledge from psychology, sociology, anthropology and more to help build programmes that can change people's behaviours to benefit themselves and the society in which they live, work and play⁽³¹⁾. The effectiveness of social marketing in the area of healthy eating has been demonstrated^(32,33), and the role of the environment on eating decisions is widely recognised⁽³⁴⁾. Breakfast, as a specific healthy eating behaviour, has received less attention in the social marketing field⁽³⁵⁾; therefore, opportunities exist to improve breakfast consumption using this approach.

Theories guide practitioners during the development of programmes ensuring that strategies are based on previous established knowledge that helps to explain relationships that are likely to affect programme outcomes and provide the basis for comprehensive evaluation of programme effectiveness⁽²⁵⁾. However, low utilisation or underreporting of theory has been observed in previous social marketing interventions^(36,37), including poor theory description and measurement^(38,39), stating that deepening and broadening theory use in social marketing remain a key area for improvement. Given social marketing is known to underutilise theory⁽⁴⁰⁾, the development of breakfast behaviour change programmes using social marketing should be theoretically informed. Furthermore, the nature

of breakfast consumption behaviour requires utilisation of a theory that acknowledges the role that social and environmental factors exert on food decisions, such as Social Cognitive Theory (SCT). SCT is a well-established theoretical framework, in both nutrition interventions and social marketing⁽³⁷⁾, and may be an important starting point for extending understanding the role theory can play in delivering behaviour change, particularly in regard to breakfast consumption.

This paper aims to understand how programmes have attempted to improve breakfast consumption, and whether theory contributed to programme success, thereby responding to the call to advance understanding of theory application in behaviour change programmes⁽⁴⁰⁾. Systematic literature reviews are a scientific tool to understand and examine a particular issue or topic in a methodical way to synthesise evidence⁽⁴¹⁾. Therefore, the aim of this study was to conduct a systematic literature review of the last 20 years of studies on breakfast eating programmes to determine programme effectiveness, analyse their programme features and their use of theory. SCT was used as a lens to examine theory use, to enable synthesis and to compare constructs across studies.

Methods

Search strategy

This study undertook a systematic literature review to examine interventions that aimed to change breakfast behaviour. The search was performed using eleven databases, namely Medline, Psych INFO, Inspec, NTIS, Web of Science, ProQuest G1 & G2, EBSCO, Emerald and ScienceDirect. The search protocol used the following key terms, grouped into two sets of terms: 'breakfast+eating' OR 'breakfast+skipping' OR 'breakfast+consumption' AND 'intervention*' OR 'Randomi#ed+Controlled+Trial' OR 'evaluation' OR 'trial' OR 'campaign*' OR 'program*' OR 'experiment' OR 'study' OR 'studies'. Results were limited to those published after the year 2000 to capture the past 20 years of research on this topic.

Exclusion criteria

All results from the database searches were combined and ordered, and duplicates were removed. After the initial ordering of papers, each title and abstract were reviewed by two independent reviewers to ensure that all relevant interventions were included. The following exclusion criteria were applied: (i) papers that were disease-related or not nutrition-focused, (ii) papers not in English and (iii) reviews or conceptual papers. Full articles for any remaining records were examined by two independent reviewers, and articles were only retained if the intervention aimed to change breakfast behaviour. Backward and



forward searching was conducted to identify any further papers associated with the identified studies. These related papers were used to obtain further study details not reported in the papers sourced during the initial search process. Screening of each record during the exclusion and inclusion process was conducted independently, and all differences were resolved through discussion between two researchers.

Study approach

The following data were extracted from each finally selected study: details of the study (author, year of publication and country), research/evaluation design, theory used (if reported), participants' (sample size, characteristics), details of the intervention, constructs or measures used in the study, duration of the study and study findings. Given the aims of this study included the effectiveness of the programme and examination of theory use, the authors also extracted data, or coded data extracted above to examine (i) theory, did the paper discuss the type of theory used and was their theory explanation weak, moderate or strong; (ii) behavioural focus (breakfast or healthy eating), whether the study targeted a single (breakfast) behaviour or multiple behaviours (including breakfast); (iii) constructs, did the paper report constructs or measures involved in changing behaviour, or measuring the change in behaviour that was equivalent to Social Cognitive Theories three main constructs of behavioural, cognitive or environmental; (iv) effectiveness of the programme, on breakfast consumption frequency; (v) effectiveness of the programme for dietary quality and (vi) other changes observed. The approach to coding was as follows. Theory was coded as none, weak, moderate or strong through study design, measures, providing key points on how data collection was obtained and analysis that could be reproduced. Studies were coded as having included SCT constructs (even if they did not mention SCT factors within their interventions) if equivalent behavioural, personal and environmental intervention strategies were included. Behavioural constructs were skills, practice and self-efficacy; personal factors were knowledge, expectations and attitudes, and environmental constructs were measured in social norms, access in community and influence on others (ability to change their own environment). Two authors thoroughly reviewed the studies and resulting in summary tables to ensure accuracy and relevance. Variation in outcome measures was expected, which limits the capacity to perform meta-analysis without substantial data transformation and assumptions. Therefore, this study conducted a critical narrative synthesis of interventions, focusing on the behavioural outcomes sought, theory use, the reporting of strategies targeting socio-cognitive constructs and the effectiveness of interventions.

Quality assessment

The National Health and Medical Research Council⁽⁴²⁾ quality assessment framework was used to assess the level of evidence provided by each study in support of intervention efficacy with ratings from I (highest) to IV (lowest). Each intervention was assessed and rated using this framework.

Results

The search produced 1052 records. After duplicates were removed, and the inclusion and exclusion process was applied, nineteen studies remained, reported in twenty-one papers. A PRISMA flow chart details the search process in Fig. 1.

The majority of studies (n 14) were school-based and involved primary schoolchildren (n 6), middle school (n 2), high school (n 5) or University students (n 1). The remaining studies were educational classes held outside schools (n 2), a free breakfast programme (n 1) and nationwide interventions (n 2). The studies were conducted in the USA (n 6), Canada (n 1), Australia (n 5), Iran (n 1), Turkey (n 1), Israel (n 1), Gom City (n 1) and Europe (n 3). The length of the studies varied greatly, from brief interventions conducted over 48-h durations to those programmes that lasted for a full year. The papers reporting the studies were published between 2005 and 2018, and these are summarised in Table 1.

Assessment quality

The quality assessment rating for National Health and Medical Research Council shown above in Table 1 has rated ten studies at level II, two studies level III-2 and 1 at level III-3 and five studies level IV. There was one case study that was not applicable as it only provided breakfast to schools and could not be assigned a level of evidence under this framework. Most interventions (n 10) were randomised control studies but had minimal strategies to prevent bias were reported, and the study design was described in full. Many articles did not provide data collection methods to the full extent to be reproduced nor did they provide evidence that the collection tools were reliable or valid. Thereby, most interventions were rated as weak according to National Health and Medical Research Council guiding frameworks. In future research, designs need to fully report programme design, methods and results for reproducibility.

Behavioural focus

The behavioural focus of the programmes varied. Eight studies focused on healthy eating as a broad concept and included breakfast eating as one aim in the programme. Each of these programmes was educative in nature, most adopting a lesson-based format^(43–48), although one focused on practical activities⁽⁴⁹⁾. The other

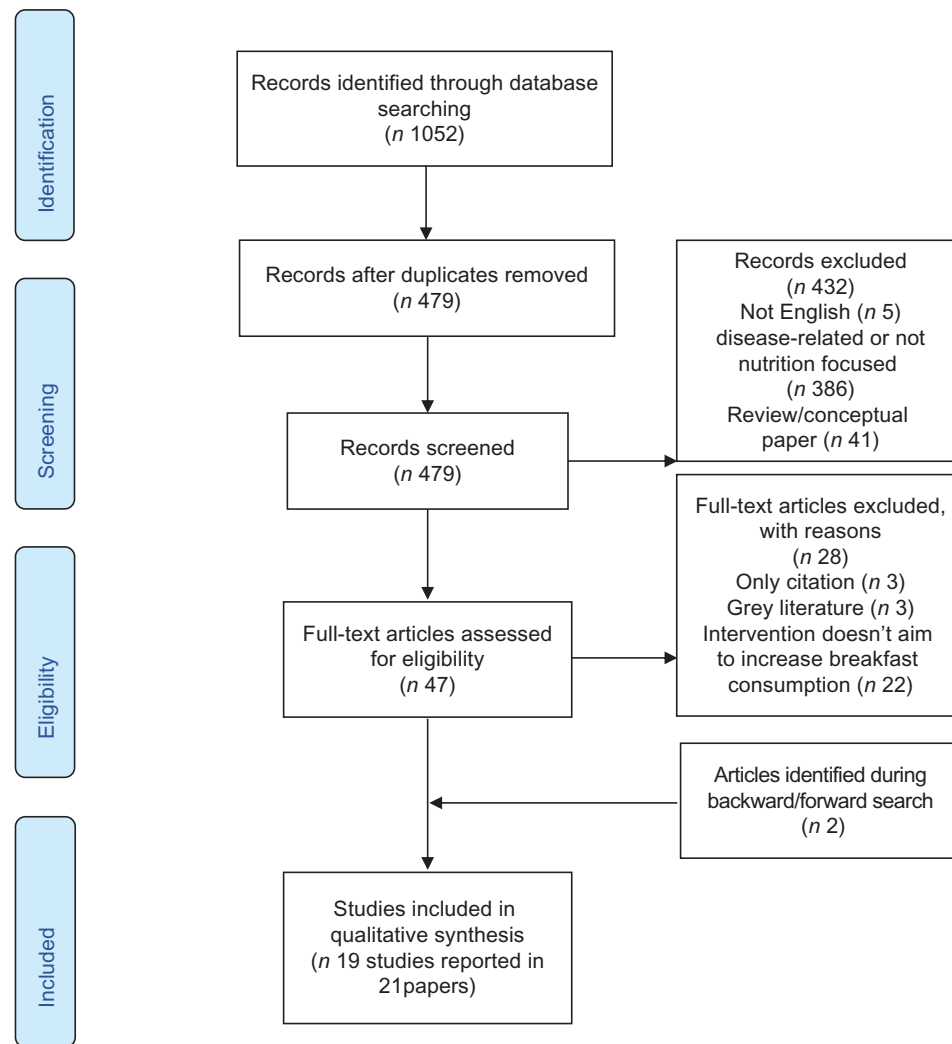


Fig. 1 (colour online) Prisma flow diagram

eleven studies focused on changing breakfast behaviour alone. Eight of these were educative or informative in nature, focusing on increasing understanding of the importance of breakfast, the health consequences of skipping breakfast, which foods are healthy breakfast foods, and encouraging healthy breakfast habits^(50–57). One of these programmes combined a mass media campaign within school education to reinforce the importance of breakfast⁽⁵⁴⁾. Another intervention tested messaging to improve attitudes towards breakfast⁽⁵⁵⁾. The remaining four breakfast-focused interventions made changes to breakfast programmes, by introducing free breakfasts in schools^(58,59), changing the frequency of school breakfast provision⁽⁶⁰⁾ or altering the way school breakfast was provided⁽⁶¹⁾. Most interventions included strategies within the intervention targeting personal factors, such as knowledge and self-efficacy; however, these appeared to be used less frequently in breakfast-only interventions (4 without *v.* 7 with personal strategies) compared with healthy eating interventions (0 without *v.* 8 with personal strategies).

Theoretical focus

Theory was rarely reported in the studies included in this review. Of the nineteen programmes examined, only six reported theory. The theories reported were SCT (two studies), Health Promotion Model (two studies) and Theory of Planned Behaviour (two studies). Three articles only made mention of the theory, two mentioning SCT^(45,46) and one mentioning Health Promotion Model⁽⁶¹⁾. Two studies could be considered as reporting weak application of theory, in that they described the behaviour in terms of the theory. Those were an application of Health Promotion Model⁽⁵¹⁾ and an application of Theory of Planned Behaviour⁽⁵³⁾. One article reported strong application of theory, having designed the intervention and measured programme performance using key Theory of Planned Behaviour constructs⁽⁵⁵⁾.

Despite not showing evidence of strong theoretical application, the two studies that self-nominated SCT as a theoretical basis did provide intervention descriptions showing evidence of strategies targeting each SCT construct



Table 1 Studies included in the systematic literature review

Study	Country and sample	Theory	Intervention	Experimental design and evidence level	Constructs/measures involved	Results
Women, Infants and Children (WIC) Education <i>Au et al.</i> ⁽⁵⁰⁾	USA Women (mothers of children aged 1–5 years) In person (<i>n</i> 359) Online (<i>n</i> 231)	None reported	Breakfast education class. A 2-month breakfast class teaching participants why it is important to eat breakfast daily, and the effects breakfast skipping has on overall health. Delivered in-person (one group) and online (second group). Online content mirrored in-person classes. Behavioural focus: Breakfast	Randomised controlled trial. Surveys pre and post (2 months) and follow-up (4 months) II	Knowledge, attitudes and breakfast behaviours.	Breakfast frequency: increased for both parent and child (online group). No change (in-person group). Knowledge: increased for both groups. Barriers: declined Self-efficacy: increased (online group). No change (in-person group).
Krachtvoer healthy diet programme ⁽⁴³⁾ .	Netherlands Students (12–14 years old) Intervention (<i>n</i> 1117) Control (<i>n</i> 758)	None reported	A school-based healthy diet eight-lesson programme that aims to increase fruit and breakfast consumption and decrease high-fat snacks. Behavioural focus: Healthy eating	Cluster randomised controlled trial Surveys pre and post (1–4 weeks) and follow-up (6 months) II	Breakfast behaviours	Breakfast frequency: no change Fruit frequency: increased Fruit juice frequency: increased Snack frequency: no change, although some changes to healthier snacks within categories
School Breakfast Program (SBP) ⁽⁵⁸⁾ .	USA. Elementary schools Intervention (<i>n</i> 2212) Control (<i>n</i> 2066)	None reported	Schools in the intervention group offered a free breakfast that met Federal nutrition standards. Control schools continued the traditional SBP (which offers free or reduced-price breakfasts only to low income recipients). Behavioural focus: Breakfast	Cluster randomised controlled trial Dietary recall questionnaire. Baseline, 48 h after, 7–10 d follow-up. II	Breakfast behaviours	Breakfast consumption (substantive) frequency: increased Breakfast consumption (any food) frequency: no change Breakfast dietary intakes: (energy and other nutrients): similar between groups All day dietary intakes: (energy and other nutrients): similar between groups
[Not Named] ⁽⁵¹⁾	Iran – Female middle school students Intervention (<i>n</i> 50) Control (<i>n</i> 50)	Health Promotion Model	Nutrition education intervention. Aimed to improve the frequency and nutrient intake of breakfast consumption. In class training 45–60 min over 4 weeks. Intervention group received classroom nutrition education plus designed nutrition education based on Pender's HPM. Control group received only classroom nutrition education). Behavioural focus: Breakfast	Randomised controlled trial Surveys pre and post (1–4 weeks) and follow-up (1 month) II	Perceived benefits Perceived barriers Perceived self-efficacy Activity-related affect (positive) Activity-related affect (negative) Interpersonal influences Situational influences Competing demands and preferences Commitment to plan of action Weekly frequency of breakfast consumption	Intervention Group: Perceived benefits: increased Perceived barriers: decreased Perceived self-efficacy: increased Activity-related affect (positive): increased Activity-related affect (negative): decreased Interpersonal influences: increased



Table 1 *Continued*

Study	Country and sample	Theory	Intervention	Experimental design and evidence level	Constructs/measures involved	Results
'Fits Me' programme ⁽⁵²⁾ .	Israel –elementary schoolchildren Case group (<i>n</i> 417) Control group (<i>n</i> 572) Trend analysis: (before: <i>n</i> 273; 1 year: <i>n</i> 380; 2 years: <i>n</i> 372; 3 years: <i>n</i> 364)	None reported	Nutrition education intervention. School-based intervention to promote daily eating of a healthy breakfast. Programme involved 1–2 class hours per unit, 4 units per year. Surveys completed by students and parents. Behavioural focus: Breakfast	Comparative study with concurrent controls Trend analysis (time series evaluation) Surveys pre and post (1 years) and follow-up (2 years) III-2	Breakfast importance Perceived healthiness of breakfast Daily breakfast eating Healthy breakfast eating	Situational influences: increased Competing demands and preferences: decreased Commitment to plan of action: increased Weekly frequency of breakfast consumption: increased Control Group: All constructs: no change Breakfast importance: higher in case group Perceived healthiness of breakfast: no change Daily breakfast eating: no change Healthy breakfast eating: higher in case group: increased healthy choices by parents Students: Breakfast importance: increased over time Perceived healthiness of breakfast: increased over time Daily breakfast eating: increased over time Healthy breakfast eating: increased over time Parents: Breakfast importance: increased over time Daily breakfast eating (of child): no change Healthy breakfast eating (of child): increased over time FV intake: no change Breakfast frequency: increased Fast food/restaurant eating: no change Sports Drinks: decreased
Health-related Fitness Course (HRF) ⁽⁴⁴⁾	USA – University students aged 18–34 years (<i>n</i> 76)	None reported	Health-related education intervention. 16-week full-time university course. Behavioural focus: Healthy eating	Case series (pre-post evaluation) Surveys pre and post (3–14 weeks) IV	FV consumption Meal patterns (breakfast, fast food, restaurant eating) SSB intake	FV intake: no change Breakfast frequency: increased Fast food/restaurant eating: no change Sports Drinks: decreased



Table 1 *Continued*

Study	Country and sample	Theory	Intervention	Experimental design and evidence level	Constructs/measures involved	Results
CHANGE project. [Not Named] ^(45,86)	UK – primary school Intervention (<i>n</i> 89) Comparison (<i>n</i> 117) children 10–11 years.	Social Cognitive Theory	Nutrition education intervention. 20-week, Teacher led curriculum, learning resources, and homework tasks providing free breakfast to high and low socio-economic primary schools. Formative research undertaken to understand main barriers. Qualitative studies used to understand the importance parents play in children's eating	Cluster randomised controlled trial Surveys pre and post (20–30 weeks) II	Body size Physical activity Food consumption (breakfast, fruit, vegetables)	All other SSB: no change Breakfast frequency: increased (only in high socially economic backgrounds) Waist circumference: decreased
Students as Lifestyle Activists (SALSA) programme ⁽⁴⁶⁾	AU (<i>n</i> 519) year 10 students	Social Cognitive Theory	Behavioural focus: Healthy eating Pre and post survey to evaluate intentions of FV intake, breakfast consumption, sugar beverages and PA. Four 70-min classes integrated into PE. Behavioural focus: Healthy eating	Case series (pre-post evaluation) Peer education intervention Surveys pre and post (2014–2015) IV	Intention to change behaviour	Breakfast frequency: increased (male) Breakfast frequency: decreased (female) FV frequency: increased Intentions: increased Breakfast frequency: decreased Attitudes, perceived behavioural control, intention: increase Subjective norms: no change
[Not Named] ⁽⁵³⁾	Qom city (<i>n</i> 97) 6 grade students	Theory of Planned Behaviour	Educational programme. Pre survey to understand breakfast eating habits. Educational programme delivered through speech, discussion groups, pamphlets and posters. Total 5 sessions to students and one to parents. Post-test and then 2 months after intervention test. Behavioural focus: Breakfast	Randomised controlled trial Surveys pre and post (1–2 weeks) II	Attitudes, perceived behavioural control, intention, and practice of eating breakfast and subjective norms	Breakfast frequency: increased (females) Knowledge & behaviour: increased (males stronger than females)
HealthCorps programme ⁽⁴⁷⁾	New York (<i>n</i> 2255) students 13–20 years old.	None reported	10 lessons over the year focusing on nutrition and physical fitness messages. Self-reported surveys pre and post. Behavioural focus: Healthy eating	Case series (pre-post evaluation) Surveys pre and post (2012–2013) academic year. IV	Knowledge and behaviour	Breakfast frequency: increased Healthy options: increased Behavioural patterns: increased FV: increase Sugary drinks: decrease Barriers: decreased Breakfast frequency: increased Attitude: increased for consuming main meals Sugary and fatty food frequency: decreased
Red Apple Healthy Lifestyles Programme (RAHLP) ⁽⁴⁹⁾	AU – (<i>n</i> 176) 14/77-year-olds.	None reported	Intervention was pre-post and 3-month post assessment. Highly practical, hands on intervention about healthy eating, meal planning and budgeting. Cross-sectional convenience sample of 176 people. Behavioural focus: Healthy eating	Case series (pre-post evaluation) Surveys pre and post (1 years) and follow-up (3 months) IV	Healthy eating behaviour, barriers	Breakfast frequency: increased Healthy options: increased Behavioural patterns: increased FV: increase Sugary drinks: decrease Barriers: decreased Breakfast frequency: increased Attitude: increased for consuming main meals Sugary and fatty food frequency: decreased
[Not Named] ⁽⁴⁸⁾	Turkey (<i>n</i> 230) seventh graders	None reported	Nutritional food programme. Cross-sectional surveys, a nutrition diary, Dietary Behaviour Index. Nutritional guide only to intervention group. 12 h of training to students and 6 h training to mothers. Behavioural focus: Healthy eating	Randomised controlled trial Surveys pre and post (1 years) and follow-up (4 months) II	Attitudes	Breakfast frequency: increased Attitude: increased for consuming main meals Sugary and fatty food frequency: decreased

Table 1 Continued

Study	Country and sample	Theory	Intervention	Experimental design and evidence level	Constructs/measures involved	Results
[Not Named] ⁽⁵⁵⁾	AU (n 349)	Theory of Planned Behaviour	Theory based intervention. Four arm intervention: (1) positively framed attitude message (2) negatively framed attitude message (3) Perceived Behavioural Control (PBC) message (4) control task Behavioural focus: Breakfast	Randomised controlled trial Surveys pre and post (1–4 weeks) II	Attitude, PBC, intention, subjective norms	Breakfast frequency: no differences between control and intervention groups (breakfast frequency increased for both the negatively framed message group and the control group).
COMPASS study ⁽⁶⁰⁾	CA (n 24 137) grades 9–10	None reported	Naturally occurring administrative changes to school breakfast programmes. Changes involved modified frequency of breakfast programmes Behavioural focus: Breakfast	A comparative study with concurrent controls Questionnaire pre and post (1 year later) III-2	Breakfast behaviours (prevalence of breakfast skipping, everyday consumption and usage of breakfast programme)	Breakfast frequency: no change in prevalence (when schools increased frequency of existing breakfast programmes) Decrease in prevalence of breakfast skippers and increase in prevalence of everyday breakfast eaters (when a school introduced a programme)
Primary School Free Breakfast Initiative (PSFBI) ⁽⁵⁹⁾	UK (n 4350) baseline (n 4472) follow-up 9–11 years	None reported	National free healthy breakfast programme in Welsh state-based primary schools. Behavioural focus: Breakfast	Cluster randomised controlled trial Dietary recall questionnaire. Baseline, 4-month, 1 year follow-up. II	Breakfast eating behaviour, attitudes, cognitive performance, classroom behaviour and daily dietary habits	Breakfast frequency: no change Consumption of healthy foods at breakfast: increased Consumption of breakfast at school: increased Consumption of breakfast at home: decreased Attitude: increased Cognitive performance: no change Daily dietary habits (not breakfast): no change
[Not Named] ⁽⁵⁴⁾	AU (n 4237) 7–18 years	None reported	National breakfast promotion campaign. Television, radio and print advertising and media communication. Direct communication with Principals to provide information and advice for dissemination through the school community (canteen, parents and teachers). Behavioural focus: Breakfast	Case series (pre-post evaluation) Case series Surveys pre and post (6 years later) IV	Usual breakfast consumption; 'today' breakfast consumption; nutritional quality of breakfast score	Breakfast frequency: increased Nutrition quality: increased for all male age groups, and most female age groups
[Not Named] ⁽⁶¹⁾	USA (n 2560)		School-based programme involving increased canteen hours and a mobile	Case series (pre-post evaluation)	School breakfast participation	Breakfast participation: increased



Table 1 *Continued*

Study	Country and sample	Theory	Intervention	Experimental design and evidence level	Constructs/measures involved	Results
The Queensland School Breakfast Project ⁽⁵⁶⁾ .	AU (<i>n</i> 341) control (<i>n</i> 45) intervention 11–12 years	Health Promotion Model None reported	breakfast cart during students' morning study hall classes. Behavioural focus: Breakfast Health Promoting Schools process: working groups devise action plans that include strategies for the formal curriculum, school ethos, and the school-home-community interaction Behavioural focus: Breakfast	Canteen sales 2010–2011 Not applicable Cluster randomised controlled trial Surveys pre and post (February–April 2002) and follow-up (November–December 2002) II	Breakfast eating behaviour, intake of nominated breakfast foods	Breakfast frequency: no change Breakfast foods: reduced consumption of unhealthy foods intervention group (compared to control), few changes for either group for other breakfast foods
[Not Named] ⁽⁵⁷⁾	USA (<i>n</i> 75) high school students 9 th to 12 th Grade	None reported	Course embedded nutrition education in family consumer science (FCS) courses in secondary schools. 18-week course (5 times a week for 50 min). Behavioural focus: Healthy behaviour	Comparative study with concurrent controls Pre and post survey (Fall semester 2006) III-3	Knowledge, attitudes, behaviours	Breakfast frequency: increased (intervention group); no change (control group) Attitude: Increased (for interest in nutrition and perceived confidence – intervention group, no change for other attitudinal variables); no change (for any attitudinal variables – control group). Knowledge: increased (control group); no change (control group) Food consumption behaviours: higher milk consumption post-test (intervention group)

**Table 2** Effectiveness of behavioural change interventions using Social Cognitive Theory

Study	Theory use	Behavioural focus	Intervention focus	Effectiveness (increased frequency)	Effectiveness (increased dietary quality)
Women, Infants and Children (WIC) Education <i>Au et al.</i> ⁽⁵⁰⁾	None	Breakfast	Individual (educative)	✓	NA
Krachtvoer healthy diet programme ⁽⁴³⁾	None	Healthy eating	Individual (educative)	X	✓
School Breakfast Program (SBP) ⁽⁵⁸⁾	None	Breakfast	Environment (free breakfast)	✓	NA
[<i>Not Named</i>] ⁽⁵¹⁾	Health Promotion Model(weak)	Breakfast	Individual (educative)	✓	✓
'Fits Me' programme ⁽⁵²⁾	None	Breakfast	Individual (educative); social (educative to parents)	X	✓
Health-related Fitness Course (HRF) ⁽⁴⁴⁾	None	Healthy eating	Individual (educative)	✓	X
CHANGE project ^(45, 86)	Social Cognitive Theory (mention of theory only)	Healthy eating	Individual (educative)	✓	NA
Students as Lifestyle Activists (SALSA) programme ⁽⁴⁶⁾	Social Cognitive Theory (mention of theory only)	Healthy eating	Individual (educative)	✓ Only in males X in females	✓
[<i>Not Named</i>] ⁽⁵³⁾	Theory of Planned Behaviour (weak)	Breakfast	Individual (educative)	X	NA
HealthCorps programme ⁽⁴⁷⁾	None reported	Healthy eating	Individual (educative)	✓	NA
Red Apple Healthy Lifestyles Programme (RAHLP) ⁽⁴⁹⁾	None reported	Healthy eating	Individual (educative)	✓	✓
[<i>Not Named</i>] ⁽⁴⁸⁾	None reported	Healthy eating	Individual (educative)	✓	✓
[<i>Not Named</i>] ⁽⁵⁵⁾	Theory of Planned Behaviour (strong)	Breakfast	Individual (educative)	✓	NA
COMPASS study ⁽⁶⁰⁾	None reported	Breakfast	Environment (changes in administration of breakfast)	X	NA
Primary School Free Breakfast Initiative (PSFBI) ⁽⁵⁹⁾	None reported	Breakfast	Environment (free breakfast)	X	X
[<i>Not Named</i>] ⁽⁵⁴⁾	None reported	Breakfast	Social (educative to parents and community)	✓	✓
[<i>Not Named</i>] ⁽⁶¹⁾	Health Promotion Model (mention of theory only)	Breakfast	Environment (changes in administration of breakfast)	✓	NA
The Queensland School Breakfast Project ⁽⁵⁶⁾	None reported	Breakfast	Environment (changes in administration of breakfast)	X	✓
[<i>Not Named</i>] ⁽⁵⁷⁾	None reported	Healthy eating	Individual (educative)	✓	✓

(personal, behavioural, environmental). However, these interventions did not provide clear links to SCT constructs such as observational learning; goal setting; feedback and specific environmental facilitators. The failure to more comprehensively link theory to programme implementation was not unique to these interventions. Other studies not mentioning theories reported some SCT constructs with the most commonly reported including personal strategies such as knowledge from educative programmes, behavioural

constructs (e.g. self-efficacy and practice) and environmental constructs of decreasing barriers to breakfast consumption and social influences from peers, teachers and parents (see Table 2).

Studies reporting theory more often targeted multiple behavioural constructs. One study that reported using theory targeted a single construct, whereas the other five targeted multiple constructs. Studies that did not report using theory tended to target fewer constructs – nine of



these studies targeted a single construct, whereas four targeted multiple constructs. Studies reporting theory use also targeted behavioural constructs more often (one not targeting behavioural *v.* five targeting behavioural constructs) compared with studies not reporting theory use (ten not targeting behavioural *v.* three targeting behavioural constructs).

Intervention effectiveness

Positive change in the frequency of breakfast consumption was observed in eight of the nineteen studies^(44,48–51,54,57,61). A further two studies observed positive effects for subgroups, such as increases in frequency of breakfast consumption in only those from high socio-economic backgrounds⁽⁴⁵⁾, and increased frequency for females only⁽⁴⁷⁾. No change was observed in seven studies^(43,46,52,55,56,58,59), one was inconclusive⁽⁶⁰⁾ and one study observed a decrease in breakfast frequency⁽⁵³⁾. There were five studies that did not observe an increase in frequency of breakfast consumption but positive changes in the dietary quality of breakfast were observed^(43,52,56,58,59). Three studies found that healthier food options were being consumed even though breakfast frequency did not increase^(52,56,59), one found more substantial breakfasts were being consumed⁽⁵⁸⁾ and one found an increase in fruit consumption⁽⁴³⁾. Thirteen studies measured changes in psychological constructs, such as knowledge, attitudes or perceptions. Of these, six observed positive changes to psychological constructs paired with increases in breakfast consumption^(48–51,54,57), six saw positive changes to psychological constructs without resulting changes in behaviour^(46,47,52,53,56,59) and one saw no changes in either behaviour or psychological constructs⁽⁵⁵⁾. There appeared to be no pattern between intervention effectiveness (increased breakfast consumption frequency) and a singular breakfast behavioural focus (four effective, seven not effective) *v.* a broader healthy eating behavioural focus (four effective, four not effective). No pattern was observed between effectiveness and reported theory use (two effective, four not effective) *v.* no theory use (six effective, seven not effective); nor between effectiveness and strategies targeting a single construct (four effective, six not effective) *v.* interventions targeting multiple constructs (four effective, five not effective).

Discussion

Breakfast consumption is a protective factor against obesity and overweight⁽⁶²⁾, and food consumption early in the day is required to support physical and cognitive performance^(7,63); however, many adolescents, younger and older adults do not consume breakfast. This indicates the need for behaviour change programmes to increase breakfast consumption. This study aimed to analyse previous breakfast programmes to determine the effect of those programmes on breakfast consumption. This study also sought to evaluate the extent of theory use within the programmes and to examine the

features of the programmes to inform future programme development.

This review found mixed evidence of the effectiveness of interventions in increasing the frequency of breakfast consumption. Some studies failed to find a change to frequency, but found positive changes to the foods consumed, or to psychological measures that may, with a longer duration or more exposure result in behaviour change. Few patterns emerged that might explain the mixed success. The variation in intervention focus, intervention breadth and study design may have obscured any patterns.

The majority of studies in this review (eleven studies) focused on breakfast eating alone, whereas the remaining eight targeted healthy eating with breakfast eating as one component. Recommendations for intervention design often call for 'narrowing in' on a discrete behaviour, to more easily describe the steps individuals need to take and to facilitate measurement before and after intervention⁽⁶⁴⁾. There is some evidence that interventions focusing on a single behaviour are more effective than those focusing on multiple behaviours⁽⁶⁵⁾; however, this can oversimplify the complex interaction between influences particularly in area of food consumption⁽⁶⁶⁾ and confine intervention design to individually based strategies resulting in costly approaches. This review found no difference in effectiveness between interventions targeting singular *v.* multiple behaviours in healthy eating and breakfast interventions. Research carried out by Prochaska *et al.*⁽⁶⁷⁾ also revealed inconsistent findings on whether interventions targeting multiple or singular behaviours work best. There is some evidence that associates multiple unhealthy eating behaviours together. Driskell *et al.*⁽⁶⁸⁾ and Kremers *et al.*⁽⁶⁹⁾ found that low fruit and vegetable intake was associated with lower physical activity, and Keski-Rahkonen *et al.*⁽¹⁾ and Cohen *et al.*⁽⁷⁰⁾ noted that breakfast skipping had a link to lower physical activity. This suggests that the effectiveness of healthy eating interventions may rely on targeting behaviours together in order to get behaviour change. Even so, breakfast-only interventions were no more or less effective in increasing breakfast frequency than the broader healthy eating interventions, indicating that more research is warranted. This review adds to the existing literature that breakfast eating behaviours changed just as much when singularly looking at that behaviour compared with a multiple healthy eating behaviour change intervention.

In this review, many interventions were education programmes delivered in school settings with a focus on individual factors such as knowledge and self-efficacy. This indicates a dominant focus on changing what people think, which overlooks a person's ability and opportunity to perform the targeted behaviour. The studies targeting healthy eating in general frequently focused on delivering strategies to individuals, whereas programmes targeting breakfast often included behavioural or environmental



strategies, such as student educative strategies^(51,54,56), environmental strategies including parents and teachers⁽⁵¹⁾ and the wider community^(54,56). However, it is important to note the dominance of school-based interventions in this review, even though we did not restrict the search by age or setting, means few programmes are offering support to adolescents and emerging adults who are transitioning to adulthood, and as a result, are experiencing changes in behavioural routines and social and environmental influences. A broader focus on behavioural and environmental strategies is aligned to SCT⁽⁷¹⁾.

SCT is the most widely used social marketing theory (see Truong⁽³⁷⁾) and was a focal theory of interest chosen to guide this review, which aimed to inform the development of a theoretically informed programme aimed at increasing breakfast eating. Two articles^(45,46) used SCT, and a further two articles reported strategies targeting all three SCT constructs^(51,53). Given theory is often not clearly reported in articles reporting interventions, and some theoretical constructs are common to more than one theory; this review sought to identify the presence of SCT constructs within intervention strategies even if the intervention authors did not claim SCT was the foundation for their work. SCT construct strategies most commonly identified were personal strategies (e.g. classroom interventions focusing on knowledge), followed by environmental strategies that sought to decrease barriers by providing breakfast and increasing social support through educating family and peers on the importance of breakfast. Behavioural strategies were also evident, and these sought to change outcome expectancies. Reported theory use was low, but strategies targeting SCT constructs were commonly used in many interventions. Prior research^(72,73) has shown the use of one or more SCT constructs in healthy eating interventions is mostly effective^(72,73). Moreover, a review on the effectiveness of two or more healthy behavioural approaches saw a small but significant benefit when controlling both diet and physical activity compared with one behavioural approach⁽⁷⁴⁾. SCT has been noted as a valuable theory to effectively change behaviour in healthy eating and breakfast interventions⁽⁷⁵⁾, suggesting detailed application and testing are warranted. However, in this review, interventions containing strategies based on SCT equivalent constructs appeared no more or less likely to result in behaviour change.

Theory is important, providing valuable frameworks for the development and design of interventions to solve problems. Three different theories were mentioned or discussed by papers in this review – SCT^(45,46), Health Promotion Model^(51,61) and Theory of Planned Behaviour^(53,76). In this review, studies reporting use of a theory (any theory) generally produced interventions targeting multiple constructs and were more likely to include strategies targeting the behavioural construct – linking the behaviour with a desired outcome. However, use of a theory (whether weak or strong) was not associated with

effectiveness in these groups of studies, and neither was targeting all three SCT constructs. In this review, studies reporting theory use were just as likely to be effective as those not reporting use of theory. Furthermore, even when interventions were coded as using theoretical constructs (specifically SCT constructs), there appeared to be no link between the inclusion of theoretical constructs and effectiveness.

Transparent and clear reporting of theory can assist the research community to build robust and technical studies to evaluate and compare interventions⁽⁷⁷⁾. In health interventions, the use of theory helps researchers and practitioners to understand whether a behaviour change has occurred and to identify whether changes observed are a result of 'attitudinal, normative, self-efficacy, environmental or social' factors⁽³⁶⁾. Theory is known to improve the effectiveness of interventions, but theory application is still under reported or not used at all to design and/or evaluate interventions⁽³⁶⁾. Weak theory use is still commonly seen in social change programmes^(40,78–80), and this was supported in the current review. Limited levels of theory reporting do not assist the research and practice community to understand what works, when, where and why it worked⁽⁴⁰⁾. More rigour in theory application is needed. This is vital for the growth of behaviour change programmes and behavioural change disciplines⁽³⁷⁾.

This review examined interventions that aimed to improve breakfast consumption, from many countries around the globe. Some successful interventions included environmental changes (in isolation or combined with other strategies), suggesting a role for policymakers to create supportive environments on a broader scale, through legislation. Other interventions included strategies targeting behavioural or personal dimensions – those that are more commonly the focus for public health and social marketing researchers and practitioners. Despite mixed results, the findings should encourage those working in public health, social marketing and behavioural change more broadly to diligently consider which behaviours they are aiming to change, and which theoretical constructs or pragmatic behaviour change strategies are likely to lead to that change. Furthermore, meticulous reporting of these considerations during intervention development, and detailed reporting of the outcomes of evaluation using quality study designs will continue to build the evidence base to inform future practice.

Limitations and further directions

This study is restricted by several important limitations, which should be considered when interpreting the findings. First, the study is limited by the search parameters utilised and the theory application frameworks applied. For example, the review only includes studies that empirically test interventions aiming to change breakfast eating that have been published in peer-reviewed English literature.



Hence, studies that undertake experiments to examine breakfast eating, non-English and non-peer-reviewed studies were excluded. Grey literature may contribute important information, and future studies may benefit from examining these sources. Second, due to the heterogeneity in the identified programmes, study populations and reporting of results, a meta-analysis was not possible and a qualitative description of study outcomes was provided. Few studies included effect sizes and OR, limiting our ability to compare effectiveness of breakfast eating intervention. Finally, based on the theory assessments for included studies, there is a clear absence of rigorous theory application; hence, any conclusions drawn in the present review should be interpreted with caution given the absence of strong theory application in studies located in the present review.

Karadağ *et al.*⁽⁴⁸⁾ specifically noted that future research needs to go broader and involve environmental/social influences, supporting the recommendations of others^(81,82). Of the theories mentioned or used in this review, SCT is the only one that takes a broader view, but application of this theory within the studies was very weak. This suggests that there is a need for research that embeds and develops SCT to better understand how SCT can be used to positively change behaviour, particularly in the area of breakfast consumption. Future research should test if all three SCT constructs are required to create behaviour change, and whether all three increase the degree of behaviour change. This review is the formative stage of a larger research programme that seeks to embed SCT and test the use of all three constructs to increase breakfast consumption. This review was limited by large variation in evaluation design, measures and timeframe and future research that incorporates consistent outcome measures and intervention durations is recommended to permit meta-analytic studies to be undertaken. Many studies used pre- and post-surveys to record behaviour change, which is known to be impacted by social desirability bias⁽⁸³⁾ and future research that utilises more objective behavioural assessments (e.g. observing food selections) is recommended.

Conclusion

In summary, this review demonstrated that recent behavioural interventions targeting breakfast, and some extending to healthy eating, have had mixed success in increasing frequency of breakfast consumption. Theory, if proven effective, offers a roadmap that practitioners can confidently apply to receive intended outcomes, and the research community is working to identify effective theories that can be applied in public health and behaviour change practice⁽⁸⁴⁾. This evidence review identified that many studies did not apply theory to develop, measure and evaluate their studies. This is not inconsistent with

other research practice^(37,40). Until theory is proven ineffective, research practice needs to deliver strong theory application ensuring consistent application of theoretical constructs and measures to build an evidence base outlining clearly what works, when, where and why to assure all interventions deliver positive intended outcomes. Moving forward, researchers are encouraged to apply theory using guiding application frameworks⁽⁴⁰⁾. Utilisation of theory application frameworks delivers clear reporting demonstrating how interventions were theoretically informed. Strong theory application can deliver a more comprehensive understanding of behaviour change and the mechanisms that support programme effectiveness to emerge. Demonstrated evidence that theoretical constructs (e.g. individual, social and environmental mechanisms in the case of SCT) contribute to intended outcomes provides evidence supporting theories effectiveness over time. Furthermore, evaluation practice needs to be strengthened, and clear and consistent measurement of all theory constructs is needed to assess the contribution of each and every theory construct in achieving the intended change. Finally, there is a need for studies to be replicated to ensure reproducibility to permit a clear understanding of the role of theory in delivering behavioural change to emerge⁽⁸⁵⁾. Research that develops and tests theoretically developed interventions alongside similar testing of pragmatic interventions will shed light on the role of theory in behaviour change. Finally, further research can be applied to understand which behavioural strategies can help increase breakfast frequency in a broad sense and these need to be measured and evaluated using longitudinal methods and objective behaviour change measures.

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