



Review

'Nudge' interventions for improving children's dietary behaviors in the home: A systematic review



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ABSTRACT

Background: 'Nudges' subtly alter the social and physical environment to enhance capacity for subconscious, self-interested behaviors, without actively restricting options. Nudges could offer a much-needed strategy to foster sustainable improvements in dietary behaviors and weight status.

Aim: To systematically review the effectiveness of nudge interventions designed to improve children's dietary behaviors within the family home (or another environment if judged transferable to the home).

Methods: English-language studies published January 1996–January 2015 were identified in MEDLINE, Embase, CINAHL, PsycINFO and PubMed, followed by dual screening and quality evaluation. **Inclusion:** controlled studies; nudge with in-home potential. **Exclusion:** medical health conditions.

Results: Of the 40 included studies, 33 (83%) showed improvement in dietary behaviors (e.g. more vegetables, smaller unhealthy portions) and were more effective in older children/adolescents. The quality of most studies was rated as weak (43%) or moderate (40%), with only six studies rated strong (15%), reflecting major issues with quality, effectiveness and generalizability. Nudges were typically assessed in isolation and examined immediate effects on behavior.

Conclusion: Despite substantial methodological limitations and inconsistencies, the literature indicates that nudges may improve children's immediate dietary behaviors. It is unclear whether these improvements could be sustained or affect body weight (PROSPERO, CRD42016036373).

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1. Introduction

The benefit of a well-balanced diet is a universal truth, but achieving it is a global challenge. Poor diets, low in fruit and vegetable intake and high in saturated fats and refined sugars, lie at the heart of the obesity pandemic and the rise of non-communicable diseases, such as heart disease, cancer, and diabetes (World Health Organization, 2002). Dietary habits established early in life track through adolescence (Gasser et al., 2017) and adulthood (Mikkila et al., 2005). Thus, improving children's

diets has the potential to improve health globally.

Unfortunately, decades of intensive research and community investment have thus far failed to optimize children's diets. For example, one in four Australian children is overweight or obese, only one in twenty meets the recommended daily serves for both fruit and vegetables (Australian Bureau of Statistics, 2015), and energy-dense 'extra' foods are eaten at 2–4 times the suggested limits (Rangan et al., 2008). 'Common sense' educational and motivational approaches to improve children's dietary habits and ultimately their body weight have only had a modest impact and have failed to create sustainable change (Wake and Lycett, 2014; Collins et al., 2006). Furthermore, our obesogenic environment shows no sign of abating (e.g. readily available energy-dense snacks, fast food restaurants) (Swinburn et al. et al.). Thus, the current situation demands sustainable approaches that do not rely on motivation or education.

One such approach could be the behavioral economics concept

Abbreviations: PROSPERO, International Prospective Register of Systematic Reviews; PICO, Population, Intervention, Comparison and Outcome; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; EPHPP, Effective Public Health Practice Project; NS, Not specified.

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of ‘nudging’. ‘Nudges’ subtly alter the social and physical environment to enhance capacity for subconscious, self-interested behaviors (e.g. healthier eating) without actively restricting options (Thaler and Sunstein, 2008). Examples of nudges that could potentially support healthier eating include smaller crockery to reduce overeating, making unhealthy options less visible and making healthy options more visible. Nudges recognize that people do not always make rational decisions in health and other domains. Instead, ‘nudging’ seeks to positively influence the small, minute-by-minute and largely automatic everyday choices that *do* drive our behavior (Thaler and Sunstein, 2008).

The potential of applying nudges to health behaviors was recently highlighted by Arno and colleagues’ meta-analysis of 42 relevant studies. Overall, nudges increased healthy dietary behaviors in adults by around 15% on average (Arno and Thomas, 2016). At the population level, this offers huge potential for healthful change. However, almost half of these studies were conducted in laboratory settings, with their real-world applicability thus unconfirmed. A recent meta-analysis conducted for Holland et al.’s Cochrane Review provided moderate quality evidence that offering children smaller portions, packages and tableware can reduce their food and drink intake (Hollands et al., 2015). Similarly, Small et al.’s review indicated that portion size impacts the energy intake of young children, aged 3–5 years of age, in laboratory settings (Small et al., 2013). As both reviews were limited to nudges regarding sizing, it is not yet clear whether other nudges in children would have similar effects. Nonetheless, although the impact of nudges on sustained weight loss is not yet known, it seems plausible that the cumulative effects of individual nudges could sufficiently shift the balance of energy intake and expenditure to reduce obesity. Further, because they do not rely on education or income, nudges could be effective across all socio-economic groups.

In order to inform an in-home nudge intervention for obese children presenting to secondary care providers, we aimed to assess the effectiveness of nudge interventions designed (either explicitly or implicitly) to improve dietary behaviors in the home environment. Given the lack of a consensus definition of ‘nudging’, we targeted interventions that met the operational definition developed by Hollands et al. for use in public health, as follows: “Interventions that involve altering the properties or placement of objects or stimuli within micro-environments with the intention of changing health-related behavior. Such interventions are implemented within the same micro-environment as that in which the target behavior is performed, typically require minimal conscious engagement, can in principle influence the behavior of many people simultaneously, and are not targeted or tailored to specific individuals.” (Hollands et al., 2013). However, in keeping with the original formulation of ‘nudge’ by Thaler and Sunstein (2008), our definition does not include interventions that provide economic incentives (e.g. free fruit and vegetables) or that forbid options outright (e.g. removing unhealthy food entirely) (Thaler and Sunstein, 2008).

2. Methods

2.1. Protocol registration and information sources

Our protocol was prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO, CRD42016-036373) (Lycett et al., 2016) on 11 March 2016. Our search strategy was planned using the PICO components (Population, Intervention, Comparison, Outcome) for systematic reviews. The review was conducted and reported in adherence to the standards of quality for reporting (PRISMA) (Moher et al., 2009). Methodological quality of included studies was assessed using The Quality Assessment Tool for Quantitative Studies, developed by the Effective Public Health

Practice Project (EPHPP) (Thomas et al., 2004).

2.1.1. Search strategy

Our search strategy (Appendix A) was designed in consultation with an expert librarian from The Royal Children’s Hospital, Melbourne, Australia. We searched MEDLINE, Embase, CINAHL, PsycINFO and PubMed databases using subject headings and relevant keywords. We targeted English-language peer-reviewed articles published between January 1996 and January 2015. The PubMed search was conducted again in October 2015 to capture any more recent studies. Using the PICO framework, subject terms were combined and exploded where possible. The search terms were adapted for use with each database with specific filters for controlled trials employed where available. Additionally, reference lists of review articles and eligible full-text studies were searched for relevant studies.

2.2. Screening inclusion and exclusion criteria and rationale

Two investigators (AM, SD) independently screened titles and abstracts, and subsequently independently screened full texts. Discrepancies were resolved through third party adjudication (AK). Studies were included if they met the following inclusion criteria: 1) healthy children, 2) nudge intervention applicable to the home, 3) outcome related to improving diet-related behaviors and 4) controlled study. The PICO rationale for these criteria are described below.

2.2.1. Participants/population

We initially planned to examine studies involving healthy humans with no limits on age. However, given the review was intended to inform a nudge intervention in children, we later restricted the population to children to make the search more manageable. This was the only departure from our initial protocol (PROSPERO, CRD42016036373) (Lycett et al., 2016). We also excluded studies focusing on health conditions likely to influence outcomes (e.g. eating disorders, Prader-Willi syndrome) and studies examining effects of complex food labelling systems as this would be beyond the scope of an in-home nudge.

2.2.2. Intervention

We included studies that specifically examined nudges in the home, as well as other micro-environment settings (e.g. schools, restaurants and laboratories) if we judged it likely to be applicable in the home. As ‘nudge’ is a relatively new term with no clear MeSH terms, it was used as a keyword where appropriate. Other search terms/keywords used to capture nudge interventions were ‘mindless method’, ‘environment (home or food or eating)’ and ‘health promotion’.

2.2.3. Comparison (control)

Due to the anticipated heterogeneity of studies we included a range of control groups, as we anticipated insufficient randomized controlled trials for evaluation.

2.2.4. Outcomes

Studies were included if the outcomes measured improvements in diet-related behaviors (e.g. change in preference, purchase, selection or consumption of healthy foods). This included search terms/keywords such as ‘food intake’, ‘vegetables’, ‘fruit’, ‘food habits’, ‘calories’ and ‘overweight’.

2.3. Data extraction and quality ratings

A pre-piloted electronic form was developed for data extraction

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