A problem unstuck? Evaluating the effectiveness of sticker prompts for encouraging household food waste recycling behaviour

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A B S T R A C T

This Randomised Control Trial (RCT) investigated the effectiveness of using stickers as a visual prompt to encourage the separate collection of household food waste for recycling in two local authorities in South East England. During a baseline period of up to 15 weeks, separately collected food waste was weighed (in tonnes) and averaged across households in both treatment (N = 33,716 households within 29 defined areas) and control groups (N = 30,568 households within 26 areas). A sticker prompt was then affixed to the lids of refuse bins in the treatment group area only. Weights for both groups were subsequently measured across a 16-week experimental period. Results showed that, in the control group, there was no change in the average weight of food waste captured for recycling between the baseline and experimental period. However, there was a significant increase (20.74%) in the treatment group, and this change in behaviour persisted in the longer term. Sticker prompts therefore appear to have a significant and sustained impact on food waste recycling rates, while being simple, practically feasible and inexpensive (£0.35 per household) for local authorities to implement at scale.

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1. Introduction

Changing patterns of human production and consumption in industrialised nations have resulted in increased levels of household food waste (Parfitt et al., 2010). In the United Kingdom (UK), households are responsible for generating around half of the 15 million tonnes of food and drink waste that is produced each year (House of Commons, 2015; WRAP, 2011). The EU Landfill Directive (1999/31/EC) specifies that Member States must reduce levels of biodegradable waste sent to landfill to 35% of 1995 levels by 2020, but does not prescribe the treatment options, collection systems, or other policies that should be introduced to meet these targets (Defra, 2011).

In the UK, local authorities are responsible for the collection and disposal of biodegradable waste, which has traditionally been sent for disposal to landfill sites (House of Commons, 2015). Methane, a greenhouse gas far more potent than carbon dioxide (CO_2), is released when biodegradable waste (which includes household food waste) decomposes anaerobically at landfill sites (Graham-Rowe et al., 2015). The UK Waste and Resources Action Programme (WRAP) (WRAP, 2011) estimate the annual environmental impact of manufacturing, distributing, storing, using and disposing of edible food and drink in the UK to be around 17 million tonnes of CO_2 equivalent.

If collected separately from residual waste (refuse), food waste can be used as a feedstock for anaerobic digestion (AD), a 'recycling' process that produces methane-rich 'biogas' that can be used to generate renewable energy, and 'digestate' which can be used to produce agricultural bio-fertiliser (Zhang et al., 2007) and has a lower disposal cost (approximately 50%) than landfill (Nomura et al., 2011). Households are issued with a small food waste bin (known as a 'caddy') for use inside the house and a larger caddy that is stored outside. The purpose of introducing the service is to encourage households to separate their food waste from their refuse and store it in their indoor caddy before transferring it to the outdoor caddy in advance of their weekly collection day. By diverting food waste in this way, local authorities can increase their overall recycling rate, while saving money and improving their environmental performance.

When the first local authorities in the UK introduced separate food waste collection services in 2006, just 1% of household food waste was being collected separately (Defra, 2015). By 2013/14,

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more than half of the local authorities responsible for waste collection in England had introduced some form of food waste collection scheme (House of Commons, 2015). As a result, the total amount of separately collected food waste in England increased from 118,000 to 290,000 tonnes between 2010 and 2014 (Waste Data Flow, 2016). Despite this dramatic improvement, almost a third of the refuse waste stream in England is still composed of food waste (WRAP, 2011). This suggests that many households are still not participating in the scheme, or those that are taking part are not using their caddies as effectively as they potentially could be. Since the successful management of any household recycling scheme is dependent on the effective participation of a sufficient number of households, local authorities must introduce policy interventions designed to encourage public participation (Karim Ghani et al., 2013).

To encourage food waste separation behaviour, local authorities have a number of policy interventions at their disposal (Dahlén and Lagerkvist, 2009; Steg and Vlek, 2009). The decision about which policy interventions should be introduced is not a simple one for decision-makers as they must be clearly effective, in the sense of producing changes in behaviour that are sustained in the longer term (Steg and Vlek, 2009). An intervention must also be practically feasible to introduce and there must be a sufficient means of accurately monitoring the impact of the intervention to understand whether it was successful or not (Steg and Vlek, 2009). They must also be cost efficient to implement as local authorities in England are currently under increasing pressure to deliver 'more with less', following a 40% reduction in funding from central government (LGA, 2014). Hence there is an obvious attraction for the use of relatively simple and cost-effective approaches.

An emerging body of literature has advocated the use of 'nudge interventions' as alternatives to more traditional forms of behavioural intervention (Dolan et al., 2010; Thaler and Sunstein, 2008). Nudge approaches have been hailed to be a potentially powerful, low-cost set of tools for policy makers who are faced with addressing the challenge of weighing environmental sustainability against fiscal responsibility when making decisions, particularly during times of austerity (Dolan et al., 2010; John, 2013; Kallbekken and Sælen, 2013).

Nudge is a valuable theoretical framework that summarises ideas drawn from the field of behavioural economics, which itself draws insights from the field of psychology (Kirakozian, 2016). Proponents argue that traditional policy tools have ignored the fact that much human behaviour is automatic in nature (Michie, 2015), recognising that behaviours most often occur as a consequence of both automatic and reflective processes running in parallel. Nudge interventions, therefore, mainly target the automatic system and seek to change the 'choice architecture' of individuals to encourage changes to attitudes and behaviour (Sunstein, in press). The approach assumes that people will rely on past ways of thinking and acting unless they are encouraged to act or think differently. The options for changing behaviour centre on providing reminders and cues that both recognise where the individual currently is while also placing them in a choice environment.

Good designers of nudge policy interventions can steer individuals down new decision pathways without them necessarily noticing that it is happening. Behavioural change is achieved by altering how individuals view the attractiveness of an alternative course of action by improving the messages they receive or the opportunities they have. While no "precise, operational definition of nudging" (Marteau et al., 2011: 263) currently exists, a taxonomy of interventions published in a recent House of Lords report (House of Lords, 2011) described nudges as being any one of the following: changes to the physical environment; information provision; changes to the default policy and the use of social norms and salience.

One form of nudge intervention, 'visual prompts' has had a wide applicability within a variety of behavioural fields. Visual prompts are a form of informational intervention designed to stimulate action or serve as a reminder to engage in a behaviour that might otherwise be forgotten (Chui et al., 2015). Visual prompts usually take the form of posters, signs, stickers or flyers (Bartram, 2009), and display factual or persuasive information, or provide cues to aid behavioural decision-making (Geller et al., 1982; Sussman and Gifford, 2012). Their intensity can vary from simple notices that raise awareness or provide procedural information, to more comprehensive statements that provide context and rationale (Tucker, 2001).

Several studies have demonstrated the effectiveness of visual prompts as a means for encouraging transportation (e.g., Cope et al., 1991; Huybers et al., 2004) and health behaviours (e.g., Amass et al., 1993; Andersen et al., 2012). They have also been used to encourage certain pro-environmental behaviours, for example: litter reduction in public places (Baltes and Hayward, 1976; Geller et al., 1976); increasing workplace recycling (Austin et al., 1993); and reducing household energy consumption (Sussman and Gifford, 2012; Winett, 1978).

The effects of prompts on general household recycling behaviour specifically have also been widely documented, but results are not consistent. Some research has shown that single prompts in isolation can be an effective way of increasing recycling (e.g., Arbuthnot et al., 1976; Burn, 1991; Jacobs and Bailey, 1982; Oskamp, 1995; Spaccarelli et al., 1990), while other studies suggest that prompts are less effective than other types of intervention (Goldenhar and Connell, 1992; Schultz, 1999; Werner et al., 1998; Witmer and Geller, 1976). A recent meta-analysis found that prompts were one of the most effective intervention types for encouraging pro-environmental behaviour (Osbaldiston and Schott, 2011). However, as 78% of the studies included in the analysis tested interventions in combination, it was not possible for the authors to make definitive conclusions about which interventions were most effective in isolation. It is therefore possible that prompts are effective but only when delivered in combination with other types of intervention.

Other research has explored the elements of design that can improve the effectiveness of visual prompts. Several authors have indicated that ensuring the final product is noticeable, simple and clear is important (Sussman et al., 2012). Adding pictures to written information may also improve effectiveness (Roberts et al., 2009), provided the images used are congruent with the text (Jae et al., 2008) and they do not 'cloud' the message (van Meurs and Aristoff, 2009). Some studies have shown that certain attempts to persuade using visual prompts can cause individuals to protest and engage in undesirable behaviours (Sussman and Gifford, 2012). This phenomenon, which threatens the perceived freedom of individuals, is known as psychological reactance (Brehm, 1966; Dillard and Shen, 2005) and can be reduced by constructing messages using positive and polite language (Aronson and O'Leary, 1983; Reiter and Samuel, 1980). Finally, prompts work most effectively for those behaviours that are 'simple, easy, effortless and repetitive' to perform (Frederiks et al., 2015: 1391), and on those individuals who already feel motivated to engage in the target behaviour (Schultz, 2013).

The persuasive impact of a visual prompt will not only depend on the message and its design, but also on the recipient's capacity to attend to and cognitively process the information (Borgstede and Andersson, 2010). The same authors also suggest that the most important factor for any behavioural intervention is attracting the attention of the target audience. Most previous studies on prompting used leaflets or posters as the medium of delivery, yet their effectiveness has been called into question (cf. Read, 1999). The more permanent nature of a bin sticker may allow for repeated