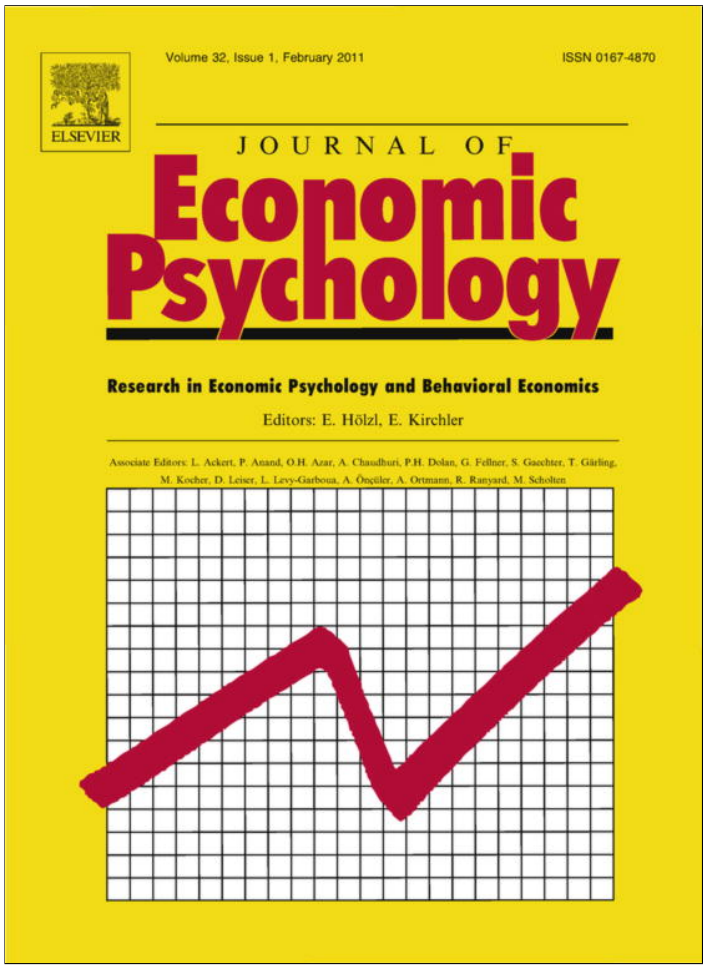

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Influencing behaviour: The mindspace way

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ABSTRACT

The ability to influence behaviour is central to many of the key policy challenges in areas such as health, finance and climate change. The usual route to behaviour change in economics and psychology has been to attempt to 'change minds' by influencing the way people think through information and incentives. There is, however, increasing evidence to suggest that 'changing contexts' by influencing the environments within which people act (in largely automatic ways) can have important effects on behaviour. We present a mnemonic, MINDSPACE, which gathers up the nine most robust effects that influence our behaviour in mostly automatic (rather than deliberate) ways. This framework is being used by policymakers as an accessible summary of the academic literature. To motivate further research and academic scrutiny, we provide some evidence of the effects in action and highlight some of the significant gaps in our knowledge.

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1. Introduction

Over the last decade or so, behavioural economics, which seeks to apply evidence from psychology to economic models of decision-making, has moved from a fringe activity to one that is increasingly familiar and accepted (DellaVigna, 2009; Kahneman, 2003a, 2003b; Leiser & Azar, 2008; Poundstone, 2010; Thaler & Sunstein, 2008). Moreover, there is increasing agreement across the behavioural sciences that our behaviour is significantly influenced by factors associated with the context or situation we find ourselves in. The sheer volume of results emerging from the behavioural economics literature, however, can make it difficult to see which effects appear to have common characteristics and hard to sort robust effects from one-off results. This sometimes makes it difficult to apply behavioural economics in practical policy settings, such as when designing policy to discourage some things (vandalism, littering, excess debt and excess absenteeism) and encourage others (volunteering, voting, saving for retirement, and increasing productivity). Against this background, this paper presents 'MINDSPACE' as a helpful mnemonic for thinking about the effects on our behaviour that result from contextual (rather than cognitive) influences.

In broad terms, there are two ways of thinking about individual behaviour and how to influence it. The first is based on influencing what people consciously think about. We might call this the 'cognitive' model. The presumption is we will analyse the incentives offered to us, and act in ways that reflect our best interests (however so defined). We can therefore influence behaviour by 'changing minds': that is, through conscious reflection on the surrounding environment. The contrasting model focuses on the more automatic processes of judgement and influence – the way we simply respond to the environment. This shifts the focus of attention away from facts and information, and towards the context within which people act. We might call this the 'context' model of behaviour. The context model recognises that people are sometimes seemingly irrational and inconsistent in their choices, often because of the influence of surrounding factors (see Thaler and Sunstein (2008) and Ariely (2008); for recent reviews).

These two approaches are founded on two distinct 'systems' operating in the brain that have been identified by psychologists and neuroscientists: 'System 1' processes, which are automatic, uncontrolled, effortless, associative, fast, unconscious and affective; and 'System 2' processes, which are reflective, controlled, effortful, rule-based, slow, conscious and rational (Chaiken & Trope, 1999; Evans, 2008). System 2, the 'reflective mind', has limited capacity, but offers more systematic and 'deeper' analysis; System 1, the 'automatic mind', processes many things separately, simultaneously, and often unconsciously. Evidence of separate brain structures for automatic processing of information has provided substantial support to this dual process model (Rangel, Camerer, & Montague, 2008).

Partly owing to the dominance of standard economic models, and the rational choice paradigm in general (Elster, 1986), most traditional interventions in public policy have relied on the reflective mind (System 2) as a route to behaviour change, which utilises information (e.g. persuasion and education campaigns) and incentives of various kinds to change cognitive assessments of the costs and benefits of different decisions. Unfortunately, this approach leaves a substantial proportion of the variance in behaviour to be explained (see Webb & Sheeran, 2006). For example, Sheeran (2002) report a meta-analysis of 422 studies, which implied that changing intentions would account for 28% of the variance in behaviour change, and meta-analyses of correlations between intentions and specific health behaviours have found similar effects in studies of condom use (Sheeran, Abraham, & Orbell, 1999) and exercise behaviour (Hausenblas, Caron, & Mack, 1997). There may be many cases where both systems work simultaneously for the same behaviour, and understanding the contextual cues that make one system override the other is important when considering the lessons from behavioural economics.

This paper therefore focuses on the more automatic (System 1) and often context-based drivers of behaviour, because they rely on changing the environment within which the person acts without necessarily changing the underlying cognitions. There are now hundreds of different claimed effects and influences on behaviour. Some of the claims in the literature are based on just one or two studies or interventions or may not translate well to different target audiences. It is helpful for academic discourse, if we can bring together the robust effects on behaviour so that research can explore these effects further and, where appropriate, revise and update our understanding of what these robust effects really look like and the contexts within which they are most pronounced. Policy-makers too require a framework or structure within which to think about interventions designed to 'nudge' people in particular directions.

In the next section, we 'gather up' the most robust effects that have been repeatedly found to have strong impacts on behaviour operating largely, but certainly not exclusively, on the automatic system. This article is an 'integrative review', not a 'systematic review', of the literature, so our research synthesis aims to bring together emergent themes from the literature in a deliberately memorable form, using the mnemonic MINDSPACE. In so doing, the effects can be tested and scrutinised more directly by academics and can additionally be used a 'toolkit' or 'checklist' by policy-makers (Halpern, 2010; Halpern, Bates, Beales, & Heathfield, 2004).

In the third section, we consider some of the policy issues. The MINDSPACE framework is becoming widely used within the policymaking community, and particularly through its application by the UK's Behavioural Insight Team based in the Cabinet Office (see for example, Cabinet Cabinet Office, 2010, 2011; Halpern, 2010). We explain how policy makers can use MINDSPACE to improve the effectiveness of existing and new behaviour change policies. The need for robust evaluations of interventions is made clear, with a recommendation that policymakers work with academics to ensure the effectiveness and cost effectiveness of interventions that apply these insights.

In the final section, we begin by discussing the relationship between MINDSPACE and *Nudge,* the book that captured policymakers' attention and introduced them to behavioural economics. We then provide concluding remarks and directions

for future research. Whilst this framework is proving a useful checklist for policy-makers, it has been exposed to only limited academic scrutiny to date, and a major purpose of this paper is to fill this gap.

2. The MINDSPACE framework

We discuss the nine most robust effects on behaviour according to the mnemonic MINDSPACE (Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitment and Ego). MINDSPACE is derived from our judgement of how best to categorise and group a large body of literature and behavioural influences, but there is no special significance to the ordering of the categories – and there is inevitably some overlap between the effects. Table 1 summarises the elements, and the following subsections explain each effect in turn.

2.1. Messenger

The weight we give to information depends greatly on the automatic reactions we have to the perceived authority of the source of that information – the 'messenger'. There is much evidence that signals of authority can generate compliant behaviour, even when such behaviour is stressful or harmful. For example, nurses might comply unthinkingly with doctors' instructions, even if they are wrong or foolish (Hofling & et al., 1966); and indicators of prestige (e.g. a luxury car) have been observed to produce greater deferential behaviour than when the indicators are absent (Doob & Gross, 1968).

There is also evidence that people are more likely to act on information when the messenger has similar characteristics to themselves (Durantini, Albarracın, Mitchell, Earl, & Gillette, 2006). The 'Health Buddy' scheme involved older students receiving healthy living lessons from their schoolteachers. The older students then acted as peer teachers to deliver that lesson to younger 'buddies'. Compared with control students, both older and younger 'buddies' enrolled in this scheme showed an increase in healthy living knowledge and behaviour e.g. with some beneficial effects for BMI (Stock et al., 2007). In the case of microfinance, there is increasing evidence that people are more likely to take credit from people who are more like them (Karlan & Appel, 2011).

Authority may also be generated through more formal means if experts deliver it. One study showed that health interventions delivered by research assistants and health educators were more effective in changing behaviour compared with interventions delivered by either trained facilitators or teachers – and health educators were usually more persuasive than research assistants (see Webb & Sheeran, 2006). Thus, this automatic deference to formal sources of authority may be more extensive and powerful than a rational analysis would indicate, and can prompt behaviour that would not take place without the authority cue.

We are also affected by the feelings we have for the messenger: for example, we may discard advice given by someone we dislike (Cialdini, 2007). Feelings of this kind may override traditional cues of authority, so that someone who has developed a dislike, or distrust, of government interventions may be less likely to listen to messages that they perceive to come from 'the government'. Those from lower socio-economic groups are more sensitive to the characteristics of the messenger being similar to them e.g. age, gender, ethnicity, social class/status, culture, profession, etc. (Durantini et al., 2006). We may also use more cognitive means to assess how convincing a messenger is. For example, we will consider such issues as whether there is a consensus across society ('do lots of different people say the same thing?') and the consistency across occasions ('does the communicator say the same thing in different situations?') (Kelley, 1967; Lewis, 2007).

This messenger effect is different from a signalling effect: the former is based on credible individuals giving information which becomes attended to, whereas the latter is based on placing more weight on a piece of information because it is seen to be true or signals quality about the choice or information. The information given by an effective messenger might not necessarily signal quality but a credible messenger will increase the likelihood that a piece of information 'is seen to be true'. It will also be more likely to be seen to be true when the information is salient, and so signalling will effectively be covered by different elements of MINDSPACE).

Table 1
The MINDSPACE framework for behavior change.

MINDSPACE cue	Behaviour
Messenger	We are heavily influenced by who communicates information to us
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses
Norms	We are strongly influenced by what others do
Defaults	We 'go with the flow' of pre-set options
Salience	Our attention is drawn to what is novel and seems relevant to us
Priming	Our acts are often influenced by sub-conscious cues
Affect	Our emotional associations can powerfully shape our actions
Commitments	We seek to be consistent with our public promises, and reciprocate acts
Ego	We act in ways that make us feel better about ourselves

2.2. Incentives

Incentives are central to economics, whose students are taught very early on that "people respond to incentives". The economic law of demand says that we are sensitive to prices and costs (Kreps, 1990; Pearce, 1986). Thus, healthier lifestyles can be promoted by offering incentives that encourage people to eat healthier foods, take more exercise, drink less alcohol and give up smoking (Marteau, Ashcroft, & Oliver, 2009). The impact of incentives clearly depends on factors such as the type, magnitude and timing of the incentive. Behavioural economics suggests other factors can affect how individuals respond to incentives, which can allow us to design more effective schemes. The five main, related insights from behavioural economics are that:

2.2.1. Reference points matter

Economic theory assumes that we care only about final outcomes. Evidence suggests that the value of something depends on where we see it from – and how big or small the change appears from that reference point (see Kahneman and Tversky (2000) for a review of the literature). If the utility of money is judged relative to very locally and narrowly determined reference points, a small incentive could have a great effect (Thornton, 2008). As possible evidence of this, incentives were used in Malawi to encourage people to pick up their HIV result (many do not otherwise): take-up was doubled by incentives just worth one-tenth of a day's wage. This could also be consistent with standard models of diminishing marginal utility but realistically only if determined from a reference point (of zero in this case as nobody has ever been paid to pick up a test result), and not relative to total wealth (Kahneman & Tversky, 1979). Similar evidence of reference point effects is provided by Fehr and Goette (2007) and Crawford and Meng (2011).

2.2.2. Losses loom larger than gains

We dislike losses more than we like gains of an equivalent amount (Kahneman & Tversky, 1979), which is due to the reference point effect outlined above. Loss aversion matters because the decision making process originates from distinct neural systems in the brain (see Tom, Fox, Trepel, & Poldrack, 2007). For example, framing effects are triggered when people decide to take risks for large gains or to accept a sure loss; and it is associated with activity in the amygdala – a brain area implicated in processing fear and other aversive states, which suggests that the emotional system mediates decision biases (De Martino, Kumaran, Seymour, & Dolan, 2006). Most current incentive schemes offer rewards to participants, but a recent review of trials of treatments for obesity involving the use of financial incentives found no significant effect on long-term weight loss or maintenance (Paul-Ebhohimhen & Avenell, 2008). An alternative may be to frame incentives as a charge that will be imposed if people fail to do something. One recent study on weight loss asked participants to deposit money into an account, which was returned to them (with a supplement) if they met targets. After 7 months, this group showed significant weight loss compared to their entry weight and the weight of participants in a control group did not change (Volpp, Troxel, Fassbender, et al., 2008). There needs to be greater evidence on the impact of loss aversion on experienced versus inexperienced consumers (see List, 2004).

2.2.3. We overweight small probabilities

Economic theory assumes that we treat changes in probability in a linear way – the change from 5% to 10% probability is treated the same as the change from 50% to 55%. Evidence suggests, however, that people place more weight on small probabilities than theory suggests (Kahneman & Tversky, 1979, 1984) – we overweight changes in probability moving from certainty to uncertainty more than intermediate changes. In particular, we are prone to overestimate the probability of unlikely but easy to imagine or recall events, such as winning the lottery. This opens the door to encouraging gambling, but can also be used for potentially more positive effect, such as lottery-based savings products (Tufano, 2008). Similarly, people are likely to over-emphasise the small chance of, say, being audited, which may lead to greater tax compliance than rational choice models predict.

More recent attempts to model some aspects of probability weighting utilise the accessibility framework (Kahneman, 2003a, 2003b), according to which probability judgements are based on the amount and intensity of the information accessed. In the domain of risk, for example, certain insurable events are encountered in everyday life more frequently from personal experience, TV, newspapers, advertisements and conversations, which may induce mistaken feelings that some sorts of risk are more frequent (e.g., Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978). Kusev, van Schaik, Ayton, Dent, and Chater (2009) demonstrate greater risk-averse behaviour for more accessible risks, which implies that, when making risky decisions, human preferences are affected by the accessibility of events (and their frequencies) in memory – even after outcome values and probabilities are known. The fitted probability-weighting function that explained the data exhibited greater risk aversion, which was caused by over-weighting when the insurance decision scenarios are related to more accessible hazardous events in memory. Such effects of the context of the (risky) event on perceptions of probability have obvious implications for influencing behaviour in more natural settings. For example, media campaigns can induce feelings that some sorts of risk are more frequent by presenting examples of real cases of fatal outcomes (e.g., cancer deaths caused by smoking). Such vivid, frequently encountered cases (not just general information) will affect perceptions of vulnerability, because human judgments are often constructed by sampling exemplars from memory or the environment (Stewart, Chater, & Brown, 2006).

2.2.4. We allocate money to discrete mental accounts

We think of money as sitting in different 'mental budgets' – salary, savings, expenses, etc. Spending is constrained by the amount sitting in different accounts (Thaler, 1999), and we are reluctant to move money between such accounts. Mental accounting means that identical incentives vary in their impact according to the context: people are willing to take a trip to save £5 off a £15 radio, but not to save £5 off a refrigerator costing £210 (Thaler, 1985). This means that policies may encourage people to save or spend money by explicitly 'labelling' accounts for them, without removing their control over exactly how the money is used. For example, there is evidence from the UK that the labelling of a particular benefit as a "Winter Fuel Payment" led to significantly more recipients spending the money on fuel than if it had been treated as cash (Beatty, Blow, Crossley, & O'Dea, 2011).

2.2.5. We inconsistently live for today at the expense of tomorrow

We usually prefer smaller, more immediate payoffs to larger, more distant ones. £10 today may be preferred to £12 tomorrow. But £12 in 8 days may be preferred to £10 in a week's time. This implies that we have a very high discount rate for now compared to later, but a lower discount rate for later compared to later still. This 'hyperbolic discounting' (Laibson, 1997) leads people to discount the future very heavily when sacrifices are required in the present – for example, to ensure improved environmental outcomes in the future (Hardisty & Weber, 2009). McClure, Laibson, Loewenstein, & Cohen, 2004; McClure, Ericson, Laibson, Loewenstein, & Cohen, 2007) report neurobiological evidence that competing neural valuation systems, one with a low discount rate and one with a high discount rate, determine choices between immediate small monetary payoffs and larger but delayed payoffs. In behaviour change, there is evidence that the immediacy of reward has an impact on the success of schemes to treat substance misuse (Lussier, Heil, Mongeon, Badger, & Higgins, 2006).

These five aspects of incentives are discussed and differentiated from the standard economic model in DellaVigna (2009). It is clear that there is a great deal of good field evidence for these five effects, and these underpin the main texts in this area (see Ariely, 2008; Kahneman & Tversky, 2000; Thaler & Sunstein, 2008).

2.3. Norms

Social and cultural norms are the behavioural expectations, or rules, within a society or group, or alternatively a standard, customary, or ideal form of behavior to which individuals in a social group try to conform (Axelrod, 1986; Burke & Payton-Young, 2011). Social norms can influence behaviour because individuals take their cues from what others do and use their perceptions of norms as a standard against which to compare their own behaviours (Clapp & McDonnell, 2000). The operation of social norms is at least partly conscious: conformity may be a deliberate strategy, since we may obtain pleasure from choosing to behave like everyone else – even though this choice may not be maximising overall utility.

There are, however, at least two arguments that the effect of social norms has a powerful automatic component. First, there is evidence that those engaging in conformist behaviour demonstrate no awareness of having been influenced by the behaviour of others (Chartrand & Bargh, 1999). Second, social norms can lead to behaviour that is difficult to explain in terms of 'rationality'. A well-known illustration of this is provided by Latane and Darley (1968) finding that the presence of inactive people strongly reduced the probability that a subject would act in an apparently dangerous situation. What is key for modelling the likelihood of social norms impacting on behaviour is that social norms induce a positive feedback loop in behaviours, where the more widely that a norm is followed by members of a social group, the more everyone wants to adhere to it (Burke & Payton-Young, 2011). The exogenous impact of social norms has been used by economists in areas such as energy use (Allcott, 2011), charitable giving (Frey & Stephen Meier, 2004), voting (Gerber & Rogers, 2009), retirement savings (Duflo & Saez, 2003) and employee effort (Bandiera, Iwan, & Imran, 2006).

We draw out four main lessons about norms. First, if the norm is desirable, let people know about it. In seatbelt use, the 'Most of Us Wear Seatbelts Campaign' used a social norms approach to increase the number of people using seatbelts. Initial data collection showed that individuals underestimated the extent to which their fellow citizens used seatbelts either as drivers or passengers: although 85% of respondents to a survey used a seatbelt, their perception was only 60% of other citizens adults did. An intensive social norms media campaign was launched to inform residents of the proportion of people who used seatbelts, and the self-reported use of seatbelt significantly increased (Linkenbach & Perkins, 2003).

Second, relate the norm to the target audience as much as possible. In recycling, when a hotel room contained a sign that asked people to recycle their towels to save the environment, 35% did so. When the sign used social norms and said that most guests at the hotel recycled their towels at least once during their stay, 44% complied. And when the sign said that most previous occupants of the room had reused towels at some point during their stay, 49% of guests also recycled (Cialdini, 2003). In finance, it seems that the behaviour of visible work colleagues (Duflo & Saez, 2003) and neighbours (Karlan, 2007) impact financial decisions.

Third, norms may need reinforcing. In energy conservation, a US energy company, OPower, sent statements that provided social comparisons between a household's energy use and that of its neighbours (as well as simple energy consumption information), with smiley faces if consumers were below the average (which also includes affect). The scheme was seen to reduce energy consumption by 2% relative to the baseline. Interestingly, the effects of the intervention decayed over the months between letters and increased again upon receipt of the next letter (Allcott, 2009).

Fourth, descriptive norms can backfire when people hear that others are behaving worse than them. For example, when households were given information about average energy usage, those who consumed more than the average reduced their consumption – but those who were consuming less than the average *increased* their consumption. This 'boomerang' effect

was eliminated if a happy or sad face was added to the bill, thus conveying social approval or disapproval (see the role of affect below) (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007).

In line with wider literature on the power of automatic channels of influence, there is considerable evidence that it is 'declarative' norms that do much of heavy lifting – in other words, we are influenced more by what we see or think others are doing rather than norms that refer to what we 'ought' to be doing (Cialdini, Kallgren, & Reno, 1991). Such declarative social norms may affect behaviour through various channels. For example, norms may provide a genuine signal about what others have found to be the best option – a tourist might be wise to choose the busy restaurant over that no-one else seems to be in. Following the behaviour of others may also give us direct pleasure – the feeling of being a part of the latest fashion or the 'in-group' – without necessarily maximising overall utility.

2.4. Defaults

Most decisions have a default option, which is the option that will come into force if no active choice is made. Defaults exert influence as individuals regularly accept whatever the default setting is, even if it has significant consequences. Many public policy choices have a no-action default imposed when an individual fails to make a decision. Defaults have been related to various factors such as hyperbolic discounting (O'Donoghue & Rabin, 1999), loss aversion (Kahneman & Tversky, 1991) and presumed 'suggestions' that imply a recommended action (Johnson & Goldstein, 2003). The reason we discuss this principle as a separate category is because we aim to illustrate how defaults are used to influence behaviour rather than as a claim about the underlying mechanisms (which may differ across contexts).

Structuring the default option to maximise benefits for citizens can influence behaviour without restricting individual choice. For example, in an attempt to increase pension uptake, a US corporation switched their default from active to automatic enrolment. Introducing automatic enrolment into the scheme significantly increased participation but, interestingly, was also seen to eliminate most of the previous differences in participation due to income, sex and race. The increase in uptake was particularly large for low and medium income workers (Madrian & Shea, 2001), and has been found in further studies (such as Choi, Laibson, Madrian, & Metrick, 2004; Cronqvist & Thaler, 2004). Following suit, the 2008 Pensions Act has changed the default in the UK: from 2012, employees will be automatically enrolled in a pension plan, but still have the opportunity to opt-out if they wish.

Such powerful effect of defaults on behaviour has been observed in a wide range of other settings like organ donation decisions (Abadie & Gay, 2004; Johnson & Goldstein, 2003), choice of car insurance plan (Johnson, Hershey, Meszaros, & Kunreuther, 1993), car option purchases (Park, Jun, & MacInnis, 2000), and health care (e.g., an opt-out policy of routine vaccinations and routine testing of patients and health care workers; Halpern, Ubel, & Asch, 2007).

The optimal default depends on the population being analysed. If people have highly heterogeneous choices, then defaults may not be optimal, and multiple equilibria could arise (Carroll, Choi, Laibson, Madrian, & Metrick, 2009). It is still unclear to what extent active decisions should be used instead of defaults, and what changes behaviour in a way that maximises their lifetime utility. For policymakers, an attractive compromise can be the use of a 'prompted' or 'required' choice – in effect removing the common default of making no choice at all. For example, from mid-2011, on-line applicants for UK driving licences will need to answer a question on organ donation, and it is estimated that this is likely to roughly double the number of people joining the organ register through this route.

2.5. Salience

Our behaviour is greatly influenced by what our attention is drawn to (Kahneman & Thaler, 2006). Attention can either be voluntarily controlled, or, it can be captured by some external event (Pashler, 1998). The latter type of attention is referred to as exogenous, bottom-up, or stimulus-driven, and a separate neurophysiological mechanism is devoted to processing salient events when an attentional switch or behavioural switch is elicited (Zink, Pagnoni, Martin, Dhamala, & Berns, 2003; Zink, Pagnoni, Martin-Skurski, Chappelow, & Berns, 2004). In our everyday lives, we are bombarded with stimuli. As a result, we tend to unconsciously filter out much information as a coping strategy. People are more likely to register stimuli that are novel (messages in flashing lights), accessible (items on sale next to checkouts) and simple (a snappy slogan) (e.g., see Houser, Reiley, & Urbancic, 2008). Simplicity is important here because our attention is much more likely to be drawn to things that we can understand – to those things that we can easily 'encode'. For example, we are much more likely to be able to encode things that are presented in ways that relate directly to our personal experiences (e.g., frequencies) than to things presented in a more general and abstract way (Gigerenzer & Hoffrage, 1995).

Behaviour change studies have demonstrated that information is taken into account only if it is salient. For example, Mann and Ward (2007) reveal that when attentional or cognitive resources are restricted, individuals can focus only on the most salient behavioural cues, which leads to actions that are under the motivational influence of those cues. In particular, the participants were more likely to respond to health-promoting messages and exhibit significantly more self-control when salient, and attention-grabbing, cues suggested restraint in the domains of eating, smoking, and aggression.

Models of attention in psychology discuss voluntary and involuntary attention (where the latter is largely unconscious) whereas economists have focussed largely on conscious attention where the allocation of attention is voluntary (see Chetty, Looney, & Kroft, 2009). This is, however, beginning to change. For example, in a recent US experiment researchers chose 750 products subject to a sales tax that is normally only applied at the till, and put additional labels next to the product price, showing the full amount including the tax. Putting the tax on the label, rather than adding it at the till, led to an 8% fall in

sales over the three-week experiment. In addition, it has been shown that, over a 30-year period, taxes that are included in posted prices reduce alcohol consumption significantly more than taxes added at the register (Chetty et al., 2009).

When making a decision, we often lack knowledge about a topic (for example, buying a DVD player). Experiments show that we look for an initial 'anchor' (i.e. a price for a DVD player) on which to base our decisions. For example, it has been shown that the minimum payment amount on credit card statements attracts our attention and 'anchors' our decisions. When a credit card statement had a 2% minimum payment on it, people repaid £99 of a £435 bill on average; when there was no minimum payment, the average repayment was £175. In other words, presenting a minimum payment dragged repayments down (Stewart, 2009). The power of anchors is such that they work even if they are totally arbitrary. If people are asked to write down the last two digits of their social security number, this 'anchors' the amount they bid for items and their estimates of historical events – even though clearly there is no logical connection between the two (Ariely, Loewenstein, & Prelec, 2003).

The implication of such findings is that interventions can change behaviour by making important dimensions salient. This is illustrated by Dupas (2009) in a field intervention testing whether information on HIV risk can change sexual behaviour among teenagers in Kenya. Providing information on the relative risk of HIV infection by partner's age group led to a 28% decrease in teen pregnancy and 61% decrease in the incidence of pregnancies with older, riskier partners. In contrast, there was no statistically significant decrease in teen pregnancy after the introduction of the national HIV education curriculum, which provided only general information about the risk of HIV and did not focus the message on the risk distribution in the population. By making the age of partner salient, the intervention reduced a complex multi-attribute choice dilemma to a heuristic decision based on one salient attribute/cue, which enabled the teenagers to select behaviours that improve their welfare.

2.6. Priming

Priming (or activation of any sort) of knowledge in memory makes it more accessible and therefore more influential in processing new stimuli (Richardson-Klavehn & Bjork, 1988). Depending on the nature of the task, there could be perceptual/attention, motor/action, or semantic priming respectively (LaBerge & Buchsbaum, 1990; Strack & Deutsch, 2004). Priming shows that people's later behaviour may be altered if they are first exposed to certain sights, words or sensations (Bargh, 2006; Bargh & Chartrand, 1999; Williams & Bargh, 2008). In other words, people behave differently if they have been 'primed' by certain cues beforehand. Priming seems to act outside of conscious awareness.

Many things can act as primes. First, words. Exposing people to words relating to the elderly (e.g. 'wrinkles') meant they subsequently walked more slowly when leaving the room and had a poorer memory of the room. In other words, they had been 'primed' with an elderly stereotype and behaved accordingly (Dijksterhuis & Bargh, 2001). Asking participants to make a sentence out of scrambled words such as *fit*, *lean*, *active*, *athletic* made them significantly more likely to use the stairs, instead of lifts (Wryobeck & Chen, 2003). Priming words such as *collaborate*, *trust*, *share* and *teamwork* before a public goods game significantly increased contributions to the public good (Drouvelis, Metcalfe, & Powdthavee, 2010). Priming can even occur by simply asking people what they intend to do, because such questions alter the ease of recalling and mentally representing the new behaviours. Levav and Fitzsimons (2006) demonstrated that asking the participants to indicate the likelihood of flossing their teeth in the coming week significantly increased the frequency of this behaviour over that period.

Second, sights. If a happy face is subliminally presented to someone drinking, it causes them to drink more than those exposed to a frowning face (Winkleman, Berridge, & Wilbarger, 2005). The size of food containers primes our subsequent eating. Moviegoers ate 45% more popcorn when it was given to them in a 240 g container than a 120 g container; even when the popcorn was stale, the larger container made them eat 33.6% more popcorn (Wansink & Kim, 2006). Deliberately placing certain objects in one's environment can alter behaviour – 'situational cues' like walking shoes and runner's magazines may prime a "healthy lifestyle" in people (Wryobeck & Chen, 2003), while placing a poster of eyes above an honesty box where people can get coffee or tea makes them pay three times as much for their drinks (Bateson, Nettle, & Roberts, 2006). In this way, priming can reinforce existing intentions to act in a certain way. Vohs, Mead, and Goode (2006) report related evidence that participants primed with money (a stack of Monopoly money in visual periphery or screensavers showing money), which prompt concepts related to rational economic exchange and self-sufficiency, are less willing to volunteer to help another person, donate less, prefer to work alone and selecting more individually focused leisure experiences.

Third, smells. Mere exposure to the scent of an all-purpose cleaner led significantly more people to keep their table clean while eating in a canteen (Holland, Hendriks, & Aarts, 2005). Being exposed to pleasant, neutral or unpleasant smells below the level of conscious detection significantly influenced subjects' rating of the likeability of faces they subsequently saw (Li, Moallem, Paller, & Gottfried, 2007). Similar research on consumer behaviour suggests that odours increase gambling in casinos (Hirsch, 1995) and intentions to visit a store (Spangenberg, Crowley, & Henderson, 1996).

What is less understood is which of the thousands of primes that we encounter every day have a significant effect on our behaviour. For instance, it has been found that using a credit card primes humans to spend more and spend faster (Feinberg, 1986), and impacts on our willingness to pay for normal goods (Prelec & Simester, 2001). A field experiment showed that criminal activity can be made more likely by factors in the environment that 'prime' an offender's behaviour. The *broken windows theory* suggests that if a few windows of a derelict factory were not repaired, the tendency was for vandals to break a few more. In six controlled field experiments it has been demonstrated that graffiti or littering can indeed encourage another behaviour like stealing because 'when people observe that others violated a certain social norm or legitimate rule, they are more likely to violate other norms or rules' (Keizer, Lindenberg, & Steg, 2008).

When priming is linked to limited attention, it is conceivable that a great deal of the decisions in our lives might be made without us consciously knowing about them (Wilson, 2002). The focus of our attention can in some be unconscious too – we attend to things without knowing it (Morewedge & Kahneman, 2010). So, seemingly out of the blue, we might fancy a pizza, not recognising that our desire has been triggered by the billboard of a new menu available at a pizza chain (Kessler, 2010).

2.7. Affect

Affect (the act of experiencing emotion) is a powerful force in decision-making. Emotional responses to words, images and events can be rapid and automatic, so that people can experience a behavioural reaction, and also use emotional evaluations as the basis of decisions, before they realise what they are reacting to and before cognitive evaluation takes place (Kahneman, 2003a, 2003b; Slovic, Finucane, Peters, & McGregor, 2002). It has been argued that *all* perceptions contain some emotion, so that 'we do not just see a house: we see a handsome house, an ugly house, or a pretentious house' (Zajonc, 1980). This means that many people buy houses not because of floor size or location, but because of the visceral feeling they get when walking through the front door – and may or may not make a better decision as a consequence (Dijksterhuis, Bos, Nordgren, & van Baaren, 2006).

Emotional, rather than deliberative, responses can drive financial decisions. In one experiment, direct mail advertisements for loan offers varied in the deal offered, but also in elements of the advert itself. It was found that the actual advertising content had a significant effect on take up of loans, rather than just prices. Including a picture of an attractive female increased demand for a loan by the same amount as a 25% decrease in the interest rate (Bertrand, Karlan, Mullainathan, Shafir, & Zinman, 2010). Similarly, Gibson (2008) show that consumer brand choice can be changed by repeated pairing of positive or negative words and images with a brand.

Provoking emotion has been shown to change health behaviours too. Attempts to promote soap use in Ghana were originally based around the benefits of soap – but only 3% of mothers washed hands with soap after toilet use. Researchers noted that Ghanaians used soap when they felt that their hands were dirty (e.g., after cooking or travelling), that hand-washing was provoked by feelings of disgust. As a result, the intervention campaign focused on provoking disgust rather than promoting soap use. Soapy hand washing was shown only for 4 s in one 55-s television commercial, but there was a clear message that toilet use prompts worries of contamination and disgust, and requires soap. This led to a 13% increase in the use of soap after the toilet and 41% increase in reported soap use before eating (Curtis, Garbrah-Aidoo, & Scott, 2007). Judah et al. (2009) presents evidence that intervention messages provoking disgust can improve hand-washing in western society too. Further evidence during visceral states, such as hunger, has shown that they can change consumption decisions (Read & van Leeuwen, 1998). Lerner, Small, and Loewenstein (2004) found that disgust and sadness (induced by a prior, irrelevant situation) reduces selling prices for normal goods. Moreover, emotions have also been shown to impact on choices over short and long time horizons (Loewenstein, 1996) and decisions under uncertainty (Loewenstein, Weber, Hsee, & Welch, 2001). These results demonstrate that incidental emotions can influence decisions even when real money is at stake. So contexts can induce affect, which then impacts upon the prices used in the market place. These prices might then anchor the prices for other goods and have profound effects on the economy (Ariely et al., 2003).

2.8. Commitment

We tend to procrastinate and delay taking decisions that are likely to be in our long-term interests (O'Donoghue & Rabin, 1999). Many people are aware of their will-power weaknesses (such as a tendency to overspend, overeat or continue smoking) and use commitment devices to achieve long-term goals (Becker & Mulligan, 1997). So pre-commitment in itself might be a rational reflective action, even if the subsequent effects of commitment devices operate mainly on the automatic system (e.g., automatic fear of being excluded from the group as a result of failure to stick to one's publicly made commitments and reputation damage, Bicchieri, 2006). For example, one major study designed a commitment savings product for a Philippine bank, which was intended for individuals who want to commit now to restrict access to their savings. It turned out that Philippine women (who are traditionally responsible for household finances and in need of finding solutions to temptation problems) were significantly more likely to open the commitment savings account than men (Ashraf, Karlan, & Yin, 2006). On the whole, the product significantly increased savings.

It has been shown that commitments usually become more effective as the costs for failure increase. Indeed, people may often impose penalties on themselves for failing to act according to their long-term goals (Trope & Fishbach, 2000). Students, for example, are willing to self-impose costly deadlines to help them overcome procrastination (Ariely & Wertenbroch, 2002). One common method for increasing such costs is to make commitments public, since breaking the commitment will lead to significant reputational damage. These principles have been applied to help smokers quit. Individuals were offered a savings account in which they deposited funds for 6 months, after which they took a test for nicotine. If they passed the test (no presence of nicotine) then the money was returned to them, otherwise their money was forfeited (Gine, Karlan, & Zinman, 2008). Surprise tests at 12 months showed an effect on lasting cessation: the savings account commitment increased the likelihood of smoking cessation by 30%.

Nevertheless, commitment devices do not depend on tangible penalties or rewards for their behavioural effects. Even the very act of writing a commitment can increase the likelihood of it being fulfilled, and commitment contacts have already been used in some public policy areas (Cialdini, 2007). To increase physical exercise, commitment to achieving a symbolic

goal (such as 10,000 steps a day using a pedometer) appears to significantly increase success. An experimental study compared two groups; one group signed a contract specifying the exercise goals to be achieved whilst a control group were simply given a walking programme but did not enter any agreement or sign a contract. All participants recorded daily walking activity for 6 weeks and the contract group were significantly more likely to achieve their exercise goals (Williams, Bezner, Chesbro, & Leavitt, 2005). This needs further research, and especially whether the outcome of the targets matter, such as whether money is used, and to whom the goes (see Burger & Lynham, 2010).

A final aspect of commitment is the importance of reciprocity. We have a very strong instinct for reciprocity, which is linked to a desire for fairness that can lead us to act irrationally. For example, people will refuse an offer of money if they feel it has been allocated through an unfair process and when by refusing they can punish the person who allocated it unfairly (Güth, Schmittberger, & Schwarze, 1982). We can see the desire for reciprocity strongly in the attitude of "I'll commit to it if you do". Reciprocity effects can mean that, for example, accepting a gift acts as a powerful commitment to return the favour at some point, which is why free samples are often effective marketing tools (Cialdini, 2007).

2.9. Ego

We tend to behave in a way that supports the impression of a positive and consistent self-image. When things go well in our lives, we attribute it to ourselves; when they go badly, it is the fault of other people, or the situation we were put in – an effect known as the 'fundamental attribution error' (Miller & Ross, 1975). Our desire for positive self-image leads to an (often automatic) tendency to compare ourselves against others and 'self-evaluate' (Tesser, 1986). When we make these comparisons, we are biased to believe that we perform better than the average person in various ways: 93% of American college students rated themselves as being "above average" in driving ability (Suls, Lemos, & Stewart, 2002; Svenson, 1981).

We think the same way for groups that we identify with. Psychologists have found this group identification to be a very robust effect, and it can change how we see the world (Hewstone, Rubin, & Willis, 2002). The classic illustration of this effect is sports fans' memories of their team's performance in a match. Fans systematically misremember, and misinterpret, the behaviour of their own team compared with the opponents. A match in which both teams appear equally culpable of committing fouls to an impartial observer will be seen by a partial fan as one characterised by far more fouls by the opposing team than their own (Hastorf & Cantril, 1954).

Advertisers are well aware that we view the world through a set of attributions that tend to make us feel better about ourselves (Tajfel & Turner, 1979). Male respondents donate more to charity when approached by more attractive female solicitors for door-to-door fund-raising, which suggests that giving is also the result of a desire to maintain a positive self-image (in the eyes of the opposite sex in this case) (Landry, Lange, List, Price, & Rupp, 2006). This suggests that, for example, attempts to reduce smoking should consider if smoking is bound up with a desire for self-esteem and positive self-image, which means self-esteem may be an effective route for change (pointing out that smoking causes yellow teeth and impotence) (Gibbons & Blanton, 1998; Gibbons, Gerrard, Lane, Mahler, & Kulik, 2005). Of course, this is not a blanket prescription – for people with very low self-esteem, a more effective route may be to build their sense of self-efficacy.

We also like to think of ourselves as self-consistent. So what happens when our behaviour and our self-beliefs are in conflict? Interestingly, often it is our beliefs that get adjusted, rather than our behaviour (Festinger, 1957). The desire for consistency is used in the *foot-in-the-door technique* in marketing, which asks people to comply with a small request (e.g. filling in a short questionnaire for free), which then leads to them complying with larger and more costly requests (e.g., buying a related product) (Burger, 1999). Once they have made the initial small change to their behaviour, the powerful desire to act consistently takes over – the initial action changes their self-image and gives them reasons for agreeing to subsequent requests ("I did that, so I must have a preference for these products"). In other words, small and easy changes to behaviour can lead to subsequent changes in behaviour that may go largely unnoticed (Bem, 1967). This has already been shown for political preferences and voting over time (Mullainathan & Washington, 2009). This approach challenges the common belief that we should first seek to change attitudes in order to change behaviour. Similarly, it has been shown that the greater the expectation placed on people, the better they perform, known as the *pygmalion effect* (Rosenthal, 1974; Rosenthal & Jacobson, 1992).

People's ego could change the demand for certain goods based on the other behavioural effects mentioned above. We might change our energy consumption because of social norms, but then the ego compounds on this behavioural bias. Akerlof (2002) suggests that these behavioural processes are important to macroeconomic variables such as saving and poverty.

3. Applying MINDSPACE

The vast majority of public policy aims to change or shape our behaviour, and policy-makers have various means of doing so. The MINDSPACE framework can be used whenever behaviour change is being considered, including when considering how best to enforce existing or new legislation. Speculatively, for example, incentives, norms and salience could all be used to help to make existing laws around not serving alcohol inappropriately work better – at the moment, there is no incentive to enforce the law, no norm behaviour and the law is surely far from being salient to many landlords and bar staff.

We have focussed most of our discussions on how to make less coercive policies – softer nudges – work better. Public policy "disasters" have often been attributed to a failure to obtain or apply evidence about how individuals are likely to behave in response to the initiative (Lewis, 2002; National Audit Office, 2006). Accordingly, the MINDSPACE framework aims to

give policy makers a better understanding of how (for example) people respond to incentives and which types of information are salient. The logic here is that if government is already attempting to shape behaviour, it should do so as effectively as possible, and MINDSPACE can help.

MINDSPACE also enables policy-makers to understand the ways in which government actions may be changing the behaviour of citizens unintentionally. For example, it has been remarked that some priming effects operate in ways that many people find surprising or difficult to explain (Bargh & Chartrand, 1999). Indeed, it is quite possible that the state is producing unintended – and possibly unwanted – changes in behaviour. The insights from MINDSPACE offer a rigorous way of reassessing whether and how government is shaping the behaviour of its citizens. Our hope is that MINDSPACE will allow policy makers to consider the 'behavioural dimension' of all government action in a more sophisticated and informed way.

The framework can also be applied to improve the process of policy-making itself. As has previously been noted, those who work in government bureaucracies are not immune to the effects set out above (Janis, 1972; Sutherland, 1992). For example, it is quite possible that loss aversion and mental accounting may contribute to the lack of innovative reallocations of budgets. Notably, the main guidance for appraising policy options issued by the UK Government now includes a section that aims to counter 'optimism bias' (Her Majesty's Treasury, 2003). The MINDSPACE framework attempts to increase awareness of the effects of similar heuristics.

This paper does not seek to provide a detailed discussion of how to integrate the MINDSPACE framework into policy making but we would like to emphasise two main points. First, although we have proposed our framework as a 'checklist', it is clear that to influence behaviour effectively requires more than an acknowledgement of the power of (for example) defaults. The context in which people behave shapes the options that are available to them and affects their ability to select these options. Infrastructure, prices and spatial factors are all likely to affect behaviour significantly, and need to be given due consideration.

Second, there is the need to produce and analyse data on the effectiveness of attempts to influence behaviour. Some of the factors that influence behaviour are fairly obvious and easy for government to influence; others are more difficult to establish. Most importantly, it can be unclear or uncertain how the various effects will interact in specific cases, which means that robust evaluation of interventions is crucial. In particular, much more can be done with field experiments, which have been under-used in research into behaviour change but have the potential to establish the underlying causes of changes in behaviour (Harrison & List, 2004). Whatever the precise details of the studies, we argue that there should be greater collaboration between policy-makers and academics. There has been enormous progress through analysis of secondary data and lab experiments, and the time is ripe to enhance the evidence base by taking control data in a real world environment. Indeed, the same rigour that is used to evaluate the effectiveness and cost-effectiveness of health technologies and, increasingly, public health interventions must be applied to behaviour change interventions. The recent contributions from List (2011) and Ludwig, Kling, and Mullainathan (2011) should provide academics and policy officials with a greater understanding of implementing such research in the field.

4. Discussion

We have set out what we consider to be the most robust effects on behaviour that operate largely, though not exclusively, on the automatic system. MINDSPACE – messenger, incentives, norms, defaults, salience, priming, affect, commitment and ego – is helpful for gathering up many of the things that influence our behaviour. The MINDSPACE framework, or any other such 'gathering up' of contextual influences on behaviour, also raises some conceptual issues and prompts many research questions, of course.

Policies that change the context – the 'choice architecture' – and thus 'nudge' people in particular directions have captured the imagination of academics and policymakers at the same time as the limitations of traditional approaches have become apparent. Popularised in Thaler and Sunstein's (2008) book *Nudge,* the theory underpinning many of the policy suggestions are built on decades of research in the behavioural sciences, and particularly behavioural economics. Some of the elements in our MINDSPACE framework overlap with and even explain Thaler and Sunstein's (2008, pp. 81–100) six principles, or *nudges*, of good choice architecture: *incentives*, *understand mapping*, *defaults*, *give feedback*, *expect error*, and *structure complex choices*.

Clearly, 'incentives' and 'defaults' are directly represented in MINDSPACE. We suggest that the other effects from Nudge can be interpreted as part of 'salience' because they all aim to translate choice-related information into a format that is manageable by a cognitive system with a limited capacity for information processing and representation. To 'understand mapping' requires translation in terms of a single most salient (prominent, useful, important, memorable, etc.) dimension, and serves the processing principles of judgment heuristics that operate with one attribute at a time (see Gigerenzer, Hoffrage, & Goldstein, 2008). Similarly, 'giving feedback' requires that the feedback is salient.

'Expect errors' involves errors such as forgetting to take one's pills and can be solved by making the task and its key attributes more salient without changing the task per se. Such errors can also be avoided using other techniques such as 'defaults' (taking placebo pills for the days without a pill) or 'priming' (taking the pill after some regular daily activity). Finally, 'structuring complex choices' similarly involves redesigning the choice environment when people make choices between multi-attribute alternatives. This is done to make choice environments manageable by mental heuristics, such as ordering alternatives (e.g., colours) by similarity (see Mussweiler, 2003).

There of course many unresolved issues in applying nudge-like, Mindspace-type interventions. In particular, how long do the various effects last? On the face of it, the effects of, say, priming appear fleeting, and last for only a short while after exposure to the prime. This does not mean, however, that their impact is fleeting, since the behaviour and decision may have been changed in that interval: the priming effect may have led to someone making a commitment that translates into longer-lasting change. Thus, effects such as priming may be thought of as 'triggers'. Others may be seen as 'self-sustaining' effects: once enacted, their mode of operation supports continuity. For example, the use of defaults is based on the status quo bias, which encourages stability and minimum effort over time.

There is also relatively little practical evidence about how the effects might habituate over time. Success will probably depend on whether the individual is broadly happy with the result – in other words, the reinforcement that follows it. The best interventions will certainly be those that seek to change minds alongside changing contexts. Smokers trying to quit deliberately try to avoid some of the primes that encourage their smoking, such as the habit of having a cigarette with a drink. MINDSPACE effects that direct them away from smoking are likely to be welcomed rather than consciously resisted. The effect may then reinforced by the sense of feeling good.

Another important question, especially as it relates to policy, is whether the effects of MINDSPACE differ across the population, and what impact this has on inequalities. Traditional interventions that aim to 'change minds' through education and information generally work best on the better educated and informed to begin with. As a result, information about how to access smoking cessation programmes, for example, has had the greatest effect on more affluent smokers, and thus widened the gap between the most and least healthy (even if the absolute levels of health have risen in both groups) (Schaap et al., 2008). In contrast, interventions that 'change contexts' may affect us all in broadly similar ways and may therefore not widen any existing inequalities. They may even narrow some of the gaps: changing the pensions default to automatic enrolment brought a particularly large increase in take-up amongst low and medium income workers, eliminating most of the previous differences in participation due to income, sex, job tenure and race (Madrian, 2001). Overall, though, the evidence on the distributional consequences of MINDSPACE is still sparse.

Future research challenges also involve conceptually joining up the effects, both within MINDSPACE and across the dual processing model of the brain, so that we have a clear understanding of the underlying mechanisms driving these various effects. Neuroscience now offers profound insights into how the human brain implements high level psychological functions, including decision making. Such knowledge has been combined with insights from other disciplines to spawn new disciplines, a pertinent example being the field of neuroeconomics (Glimcher, Camerer, Fehr, & Poldrack, 2009). This new field has already generated remarkable findings into questions as diverse as how people learn in an optimal fashion, how human preferences are formed and the mechanisms that explain common deviations from rationality in our choice behaviour. The wider impact of these findings is that they suggest a profound revision in how we construe the architecture of the human mind.

As with all of the effects and the relationships between them, we need more research to establish how robust they are in real world settings. Lab experiments have taught us a lot but the most important lessons about what influences our behaviour – and when and how – will come from field experiments that take the control of the lab out into the real world (Harrison & List, 2004). Thus, the next steps for behavioural economics are large field studies in areas that will generate policy relevant information (see DellaVigna, 2009, for the gathering of field studies in the area).

We recognise that there are inevitable compromises in reducing a body of effects into a smaller grouping of over-arching categories or effects. As authors we spent considerable time shifting the literature, filtering out effects that lacked clear replication and grouping together those that made appear robust into a limited number of categories. A key test of the framework among the academic community will be whether there are major effects that are not adequately captured within it. Another, more subtle critique could be that the MINDSPACE framework blurs the boundaries between external levers (such as defaults) and internal psychological mechanisms (such as affect). To practitioners, this distinction may not be that important since their focus is primarily on possible policy levers.

We have focussed on 'going with the grain' of human behaviour in ways that will bring about changes in behaviour that individuals may appreciate. It is beyond the scope of the present paper to discuss what 'appreciate' will really look like, but this should result in measurable changes in utility, however this is defined. It is worth noting that we are being nudged in various directions all of the time and we should, in the very least, be alert to the source of those nudges. We hope that MINDSPACE will make us a little more alert to such effects, so that we can begin considering further their appropriateness in different individual, organisational and policy settings.

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