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DISCUSSION PAPER

BEHAVIOUR CHANGE INTERVENTION TOOLS

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Executive Summary

This report provides a review of empirical studies on the use of tools in voluntary behaviour change interventions in order to draw conclusion about the effectiveness of these tools. Articles were selected for inclusion based on a search of various social and environmental psychological journals and databases (eg PscylInfo, www.cbsm.com), and tools were classified as prompts, norm appeals, commitment, feedback or incentives.

Prompts were found to be successful at encouraging simple behaviours such as switching off lights or using a recycling bin but were not sufficient to motivate larger behaviour changes. As such prompts are best used in combination with other behaviour change tools as they do not promote attitudinal or motivational change in themselves. Some forms of prompts appear to be more effective than others: prompts that specify clear actions; prompts that occur in close proximity to the point where individuals must decide how to act; and obtrusive and easily noticeable prompts. Both visual and verbal prompts appear to be effective, especially in combination. Whether prompts can promote sustained behaviour change is yet to be resolved.

Norm appeals can be successful in promoting behaviour change when incorporated into messages, or when community leaders are used to promote the desired behaviour. Norm appeals have been found to lead to changes in attitudes as well as behaviours and to lead to sustained change. Reference groups for norm appeals should be selected carefully; people appear to take their behavioural cues more from the particular situation they are in at the time than from key groups with which they identify.

Encouraging people to make a commitment appears to be a very effective tool to promote behaviour change. Commitments have been found to be more effective than prompts, information, conversations and incentives, and the effects on targeted behaviours appear to be sustainable. Commitments also seem to lead to attitude change, changes in other related behaviours, and behaviour changes among the peers of those making the original commitment. The most effective commitment appears to be one made by an individual rather than a group, written rather than verbal, public rather than private, and one

which involves a specific rather than a general goal. Combining commitments with feedback appears to be particularly effective.

Feedback was found to be effective at promoting behaviour change both with and without a commitment. Feedback seems to be best when it is individual and personalised, although group feedback has also been successful in encouraging behaviour change. Similarly, while people prefer more frequent feedback (eg daily), less frequent feedback (eg monthly) has also been successful. Feedback that includes a commendation for achievements is particularly effective. Feedback comparing an individual's performance to that of others was not found to be effective as people would rationalise that their situation was unique. Ongoing feedback was found to sustain behaviour change, but not all studies found that the behaviour was sustained once the feedback was removed.

Incentives have been shown to be effective in the short term, but behaviour changes seem to disappear once the incentive is removed, and appear to add little when used in combination with commitment or feedback than that achieved by the commitment or feedback alone. Incentives need to be used very carefully as they may override intrinsic motivation if they are particularly large, but may not actually motivate people sufficiently to complete a trial if too small. However incentives might be used successfully to encourage one-off behaviours such as survey participation, and are more valuable if they help to overcome specific barriers to performing a targeted behaviour. Care should be taken to choose an incentive that will be attractive to the target group of participants, not to another group such as those already carrying out the desired behaviour.

Overall, all tools were found to be effective in at least some settings, and interventions which combined more than one of the above tools were generally more effective than interventions using one tool alone. Some common limitations of the studies included small sample sizes, lack of a long-term follow-up, lack of an analysis of cost-effectiveness and over-reliance on self-report data. There was also a lack of reporting on the characteristics of participants, particularly regarding their prior levels of motivation. Future research should examine whether the effectiveness of interventions is moderated by the characteristics of the person receiving the intervention.

1. Background/Purpose of Report

Historically, behaviour change interventions have relied on large-scale information campaigns. These campaigns were based on the belief that people simply need to be educated about an issue in order to bring about behaviour change. Information campaigns have taken a variety of forms: workshops, brochures, mass media campaigns, posters and so on. However as evaluative methods improved, it became apparent that while educating people about an issue might improve knowledge, it was not sufficient to achieve actual changes in behaviour. Workshops on energy conservation (Geller, 1981), brochures and information sheets (Kohlenberg, Phillips & Proctor, 1976), presidential appeals (Luyben, 1982) and mass media campaigns (Staats, Wit & Midden, 1996) have all entirely failed to lead to changes in behaviour. As such, behaviour change interventions have now turned towards the use of other, more targeted tools such as commitment, feedback and incentives. This is not to suggest that information has no role to play, however; studies have shown that when used in combination with other behaviour change tools, information in itself becomes more effective (Geller, Erickson & Buttram, 1983; Cooper & Meiklejohn, 2003).

The aim of this report is to review empirical studies on the use of various tools in voluntary behaviour change interventions in order to draw conclusions about the effectiveness of each of these tools. It endeavours to build upon the recently completed evaluation of tools used in the Travel Smart Households in the West program, and to provide a sound empirical basis from which to develop future behaviour change approaches. The tools this report examines are prompts, norm appeals, commitment, feedback and incentives. The report reviews studies on each of these tools in turn and examines which factors determine the effectiveness of these tools alone and in combination. Effective tools are primarily considered to be those that lead to a measurable change in a target behaviour, particularly in the longer term. The ability of the tools to lead to attitude change is also considered where possible, but is not emphasised as research has repeatedly indicated that a change in attitudes will not necessarily lead to a change in behaviour (eg Schuman & Johnson, 1976; Finger, 1994; Archer et al, 1987; De Young, 1989). Where the information is available, the cost effectiveness of an intervention is also considered. From this review, conclusions about the overall effectiveness of these tools are drawn, and gaps

and limitations in the research to date are highlighted. Finally recommendations are made regarding how to incorporate these findings into the planning of future behaviour change interventions.

2. Literature Review

Articles for this review were selected based on a search of various social and environmental psychological journals and databases (eg PsycInfo, www.cbsm.com). Reference lists of articles were also used to locate additional studies. Criteria for inclusion were that the article described the use of specific tools in a behaviour change intervention and provided a sufficiently detailed evaluation so that the effectiveness of individual tools could be determined. Tools were classified as either prompts, norm appeals, commitment, feedback or incentives. This classification system was based on that used in previous reviews of behaviour change interventions by Abrahamse and colleagues (2005), Schultz, Oskamp and Mainieri (1995) and McKenzie-Mohr (2008). This classification scheme was found to cover nearly all studies included in the review; the four studies which did not fit have been included in an 'other' section. For each of the tools reviewed below, a definition is given, followed by a review of the case studies relevant to that tool, and conclusions about the effectiveness of that tool are drawn.

2.1 Prompts

2.1.1 Definition

One of the simplest intervention tools to use is a prompt. This is because unlike other interventions which aim to change attitudes or motivation, the purpose of the prompt is to remind a person to do something they were already disposed to do. Prompts attempt to overcome the barrier of habit or forgetfulness; for example, people often simply forget to do a lot of sustainable things such as turning off lights, checking the air pressure on their tyres or taking their green bags to the shops. According to McKenzie-Mohr (2008), a prompt is a "visual or auditory aid which reminds us to carry out an activity that we might otherwise forget". Prompts can take a variety of forms including signs,

posters, stickers and flyers. They are a common inclusion in many voluntary behaviour interventions but often their effectiveness is only evaluated in combination with the other tools used in the intervention. The review below will focus on nine studies in which the contribution of prompts to the resultant behaviour change can be isolated.

2.1.2 Case studies

Luyben (1980) investigated the role of informational prompts in encouraging lecturers at a US college to turn off lights at the conclusion of lectures in order to reduce energy waste. It was thought that many lecturers did not turn off the lights as they were unsure as to whether another class followed theirs. As such, a letter was sent to each of the lecturers informing them which of their classes occurred prior to an unscheduled period, and requesting that they turn off the lights after these classes. The results showed that the percentage of unoccupied rooms with lights off increased from a baseline of 67% to 80%. However, a downward trend was observed, with the percentage beginning to fall back to baseline in the last three weeks of the period. Subsequently, a second prompt was introduced, a poster placed next to the light switch in lecture rooms asking people to turn off the lights after specified classes. This raised the percentage back up to 84%. Thus the results suggest that a simple letter prompt may be effective in changing behaviour, but that the change may not be sustainable unless reinforced.

Austin, Hatfield, Grindle and Bailey (1993) investigated the effects of sign prompts placed above rubbish and recycling bins on the recycling behaviour of staff and students in two academic departments at a US university. In the first department, brightly coloured signs labelled 'TRASH' and 'RECYCLABLE MATERIALS' were placed over their respective bins, which were located immediately beside each other. Recycling increased from 51% at baseline to 84% once the prompts were in place. In the second department, the proximity of the rubbish and recycling bins was also manipulated. The bins were initially located four metres apart, and the baseline recycling rate was 51%. This increased to 60% when the sign prompts were placed above the bins, and even further to 66% when the bins were placed in close proximity to each other. This

suggests that prompts are most effective when they occur at the point at which individuals are expected to respond to them. It should also be noted that before and during the study the university had a recycling program which consisted mainly of small stickers placed on the receptacles; however judging from baseline rates these were not particularly effective. Thus the visibility of prompts would also appear to be important.

The effectiveness of proximal prompts was also demonstrated by Reid, Luyben, Rawers and Bailey (1976) in a newspaper recycling program conducted in four US apartment complexes. Prior to the intervention, newspaper recycling boxes were placed in the laundry rooms and participation rates were generally poor, with the apartment complex managers considering discontinuing the program. The intervention consisted of a door-to-door interview in which residents were informed that additional recycling bins would be placed in the complex at specific locations (verbal prompt). The new recycling bins were placed adjacent to the large garbage bins in the complex and identified with a large sign (visual, proximal prompt). Results showed that the combination of these two prompts led to increases from 50 to 100% over baseline in the weight of recycled paper collected.

Houghton (1993) attempted to separate out the effectiveness of verbal and proximal visual prompts on littering in the cafeterias of two high schools in Western Australia. The study consisted of five phases: baseline, verbal prompts, verbal prompts and visual prompts, visual prompts only, and follow-up. Verbal prompts took the form of reminders by the school principal at morning assembly to try to keep the school neat and tidy by placing litter in receptacles. Visual prompts were large posters bearing the message "Please place your litter in the bins provided" along with arrows pointing to the nearest bin. Each phase lasted for a week, except for follow-up which occurred six weeks after the experiment concluded. Results found that the combination of verbal and visual prompts was most effective, although possible order effects made it difficult to ascertain whether visual prompts were more effective than verbal prompts. While littering increased slightly after the removal of both prompts, it was still well below the baseline at the six-week follow-up, suggesting the behaviour change was relatively sustainable.

Horsley (1988) examined the importance of the wording on a visual prompt, contrasting an ambiguous, negative sign (“We treat litterbugs like all insects”) with a clear and positive sign (“Please save our landscapes: don’t litter”). Self-report surveys indicated that the positive sign was more effective, with 20% of respondents indicating that it would influence their decision not to litter, while 40% of respondents indicated that the negative sign would actually make them want to litter. While these results should be interpreted cautiously as actual behaviour change was not assessed, they suggest the importance of a prompt specifying clear actions to be taken.

Another study investigating the wording of sign prompts is Smith and Bennett’s (1992) attempts to reduce lawn-walking at a university campus. Four types of sign prompts were used. The first prompt gave a specific request: "Do not cut across grass". Another prompt referred to the long-term consequences of walking across the lawn: "Cutting across the grass will eventually destroy it", while the third prompt gave the short-term consequences: "Cutting across the grass will save 10 seconds". Finally, the fourth prompt combined both the specific request and the short-term consequence: "The path only saves 10 seconds, take the sidewalk". The response-specific prompt reduced lawn-walking from 82% to 41%, while the combined prompt reduced it even further to 8%.

Geller, Brasted and Mann (1979) examined the role of visual appeal in prompt effectiveness. Specifically, they placed unique and obtrusive bins which resembled giant birds and displayed a prominent anti-litter prompt in a shopping mall, anticipating that by simply making the bins more interesting, more people would deposit their litter. The weight of the rubbish in regular bins was compared to that in the bird bins for 36 weeks, and a substantial difference was found: an average of 15.05 lbs in the bird bins compared to 9.34 lbs per week in the regular bins. In addition, areas around the bird cans had less litter.

Yokley and Glenwick (1984) investigated the effectiveness of more personalised prompts, as well combining prompts with incentives, on the immunization of preschool children. Families of preschool children identified as immunization deficient from health clinic records of a mid-sized US city were assigned to one of six conditions: a general prompt in the form of a letter reminding parents to ensure their child’s immunization record was up-to-date, a

specific prompt letter which mentioned precisely which immunizations the child was missing, the specific prompt as well as increased clinic hours, the specific prompt and monetary incentives, a contact control and a no contact control. All interventions except the general prompt showed some improvement over the control groups. The monetary incentive group showed the largest effect, followed by the increased access group and the specific prompt group, suggesting that prompts can be made more effective by removing barriers or offering incentives at the same time. However the specific prompts alone appeared to be the most cost-effective intervention.

An example of a prompt-based intervention which was not successful at changing behaviour is Linn, Vining and Feeley's (1994) attempt to increase the purchase of environmentally friendly products. Tags were placed under products that were packaged in recyclable material, in minimal packaging or had non-toxic materials in three supermarkets. Participants were chosen randomly through a phone survey and were classified as either experimental or control depending on whether they did more or less than 10% of their shopping at one of the three stores. Forty-four percent of the experimental participants reported seeing the sign prompts and 36% knew the meaning of the tags. However, the participants were no more likely to purchase the environmentally friendly products. This may be because, unlike the previous examples, complying with these prompts would have required a significant effort on the part of participants, and thus a higher level of motivation. Prompts are more likely to be effective if people are already predisposed towards a behaviour change but simply need a reminder to carry out the action.

2.1.3 Conclusion

It would appear that prompts can play a role in inducing people to change their behaviour, although some forms of prompts appear to be more effective than others. The work of Horsley (1988) and Smith (1992) suggests it is important that prompts specify clear actions, and it is even better if prompts can be tailored to the individual (Yokley & Glenwick, 1984). Prompts also appear to be more effective when they occur in close proximity to the point where individuals must make the decision to act (Austin et al, 1993; Reid et al,

1976). It is less clear whether visual or verbal prompts are more effective (Houghton, 1993) but in general it is probably easier for a visual prompt to be more proximal to the decision point. Prompts should also be obtrusive and thus noticeable (Geller et al, 1979; Austin et al, 1993).

Whether prompts can have a long-term effect on behaviour remains unresolved; while Houghton (1993) found a sustained change in behaviour at a six week follow-up, Luyben (1980) found a falling-off effect to occur during the intervention itself. Schultz, Oskamp and Mainieri (1995) have raised a criticism that the apparent effectiveness of prompts may be due to averaging across all types of people, and that prompts are only really influencing highly motivated people. This would be consistent with Linn et al's (1994) study, which found that prompts alone were not sufficient to encourage a substantial behaviour change. Ultimately, prompts are probably best used in combination with other interventions as they do not promote any attitudinal or motivational change in themselves.

2.2 Norm appeals

2.2.1 Definition

People tend to take their cues from how to behave from other people. Since Asch's classic line experiments of the 1950s it has been well established in the psychological literature that individuals will tend to conform to the majority, even when the response of the majority is blatantly incorrect. More recently, this tendency to rely on social norms to determine behaviour has begun to be exploited in behaviour change interventions, either by modelling of the desired behaviour by (often incognito) research assistants, or by enlisting the aid of key community members to model the desired behaviours for their neighbours. This latter approach is akin to that suggested by Malcolm Gladwell's "tipping point" theory. Gladwell (2000) suggests that to move an idea to the tipping point, the point where social norms change and social transformations occur, requires people who are well-connected ('connectors'), well-informed ('mavens'), and those who are good at communicating and persuading ('salesmen') to all promote the same idea. While this latter method of recruiting community leaders is clearly the more feasible for a large scale intervention

than paying research assistants to serve as models, both approaches will be reviewed below in order to demonstrate the effectiveness of social norms.

2.2.2 Case Studies

Goldstein, Cialdini and Griskevicius (2008) attempted to use social norms to encourage the reuse of towels by hotel guests. Traditional appeals to guests to reuse towels tend to make reference simply to environmental protection. Goldstein and colleagues contrasted this with signs that also included a normative appeal: “the majority of guests reuse their towels”, and found that these normative appeals were most effective, in particular when the norms made reference to behaviour occurring in the same setting (i.e. “the majority of guests *in this room* reuse their towels”). In contrast, norms relating to gender or citizenship were not as effective, despite these identities being rated as more important to an individual. This suggests that people tend to take their cues for behaviour more from their current setting than from their social identity.

Reich and Robertson (1979) similarly examined the effectiveness of two different appeals on controlling litter at a public swimming pool. When patrons purchased items from the concession stand they were handed a flyer containing an extreme demand (“don’t litter”), a normative appeal (“help keep your pool clean”) or a message unrelated to littering. The frequency of littering was measured by counting the number of each type of flyer that was left around the swimming pool and not placed in a bin. They found that the “don’t litter” flyer was littered 50% of the time, compared to only 30% for the normative appeal flyer.

Aronson (1990) clearly demonstrated the effectiveness of social modelling over prompts on encouraging university students to use less water when showering at the gym. Initially, administrators placed a sign in the shower requesting students to “1. Wet down. 2. Turn water off. 3. Soap up. 4. Rinse off”. However only 6% of students actually complied with this sign, despite being aware of it. Next, an undergraduate was used to model the appropriate behaviour. The undergraduate would enter the shower room and follow the specified procedure on the sign while another student was also present. This second student was then found to comply with the sign 49% of the time.

Compliance increased to 67% when two models were employed. While employing models is unlikely to be a cost-effective method on a large or long-term scale, it nonetheless highlights the power of social norms in changing behaviour.

A more sustainable method of social modelling is to recruit motivated volunteers from a neighbourhood to promote the desired behaviour. Hopper and Nielson (1991) recruited volunteer 'block leaders' to speak with residents about recycling, encourage them to recycle, and to send them a reminder notice (prompt) a week before the monthly collection date. Other groups of residents were just sent the prompt and information, or just the information. The results clearly demonstrated the effectiveness of the block leaders: residents visited by block leaders recycled a third more often than those receiving just the prompts, and three times more often than those receiving information only. In addition, the visits by the block leaders also led to a change in attitudes, unlike the other two conditions, with more residents reporting that they felt an obligation to recycle.

Jason, Zolik and Matese (1979) looked at the relative effectiveness of prompts and modelling on encouraging dog owners to pick up dog droppings. At baseline only 5% of dog owners picked up after their dogs, and prompt signs had little effect on that. However, when instructions and modelling were introduced, over 80% of the dog owners picked up after their dogs. This decreased somewhat after the intervention finished, but a 3- and 5-month follow-up still showed a considerable reduction in the amount of defecations present. This again demonstrates the point made in the prompts section – prompts do not serve to change behaviours unless people are already motivated to change behaviour, while other interventions such as modelling here can serve to increase motivation to change behaviour as well.

2.2.3 Conclusion

The studies reviewed above clearly indicate that norms can be used as a powerful tool to promote behaviour change. Norm appeals can be incorporated into messages, or behavioural norms can be established by recruiting community leaders to promote the desired behaviour. Goldstein et al's (2008)

study suggests it is important to consider where people take behavioural cues from when constructing a norm appeal – often the norms of a particular situation or location a person finds his or herself in will be the most powerful influence on behaviour, and behaviours will not necessarily carry across different settings. Unlike prompts, norm appeals have been found to lead to changes in attitudes as well as behaviours (Hopper & Neilson, 1991), and the changes may be sustainable (Jason et al, 1979), but more studies with a long-term follow-up are needed to confirm this.

2.3 Commitment

2.3.1 Definition

Studies have repeatedly shown that getting people to make a commitment can be one of the most effective interventions around. This commitment can be written or verbal, public or private, individual or group; although some forms of commitments appear to be more effective than others, as will be seen in the review below. Commitments seem to work because people value consistency, between what we say and what we do, and between what we do at different points in time. When we do something which is inconsistent with our prior actions or beliefs, we experience what Leon Festinger (1957) terms ‘cognitive dissonance’, a state of discomfort, and we will take steps to reduce this either by changing our behaviour or our attitudes. Thus commitments have the potential to influence both behavioural and attitudinal change, and seem to have long lasting effects. Commitments have often been combined with other intervention tools such as prompts, feedback and incentives, and studies looking at these combinations have been reviewed here also.

2.3.2 Case Studies

The Clean Air Commute (Tools of Change, 2008a) is a one day event held in Canada that encourages members of the public to use a cleaner method of transportation on one day in the month of June. A pilot program was run in 1996 to examine whether a commitment could help to extend on the one day

behaviour change to make a lasting impact on commuter behaviour. Seven companies volunteered to participate in the pilot; three of these were chosen to serve as controls. The other four companies were sent a package containing a poster, letter and questionnaire for distribution. The letters commended employees for already participating in the one day event and informed them that they had a further opportunity to participate through the pilot. The questionnaire ended with a request for employees to commit to participate in the three-month pilot, and to indicate the type and frequency of travel behaviour change they would undertake. This commitment was reinforced by making it public, with the activities, names and signatures appearing on a display at worksites. Results were also marked on this display at the end of each month. In comparison to the controls, the participants were significantly more likely to have taken public transport, cycled or walked to work, and were also more likely to intend to do so in the coming summer, indicating the powerful effect a commitment had on sustaining behaviour change. The effects were also found to carry over, both to non-work-related travel and also to other employees in the same organization.

The Recycling Roadshow (Read, 2008) was another large-scale public campaign based on commitments, this time aiming at increasing participation in a curbside recycling program in Kensington and Chelsea, UK. The failure of traditional information campaigns to increase recycling rates led to the development of this door-to-door canvassing campaign in which recycling unit staff went to the streets in an attempt to talk to as many residents as possible. They answered residents' questions and concerns about recycling and attempted to gain a verbal commitment from residents to begin participating in the program. Results indicated an ongoing increase in recycling in the region, from 9% of household waste before the program to 11% in 1996 and 13% in 1999. Feedback also suggested that those who made the commitment were more likely to participate. While a lack of a control makes it difficult to interpret these results, as societal attitudes towards recycling were changing in general across these times, one strength of this program is that the cost effectiveness was actually evaluated: the annual program cost \$20 000 to run including labour and materials costs, while the savings in disposal costs and recycling credit payments amounted to more than \$22 000.

Commitments were also used successfully to encourage participation in a curbside recycling trial in New Zealand (Bryce, 2008). All households involved in the trial received a letter two weeks before the first collection explaining the trial. A week later, recycling bins were delivered as well as 'kits' containing information and stickers. In addition, some of the households were asked for a verbal commitment to participate in the trial, while a third group of households were asked both to make the commitment and to mail an \$8 payment for their bin using a reply paid envelope. Both of the commitment groups were found to recycle significantly more than the 'kit' only group. The payment had no effect on recycling behaviour, with just less than half of those in the third group actually sending the money.

Aronson (1990) applied the tools of commitment and vivid, personalised communication to home energy audits to try to improve the percentage of people actually implementing recommended changes after participating in a home audit. A standard audit involved a visit by an energy expert who would meet face-to-face with householders and make an assessment of what should be done to make their home more energy efficient. The new audit involved training auditors to use vivid examples, personalise the material, frame statements in terms of losses, get householders actively involved in the audit and to ask householders to make a commitment to carry out the recommendations. The results were compelling, with 61% of householders receiving the new audit weatherising their homes compared to 39% in the control group and a 15-20% national average. The high percentage in the control group compared to the average was likely due to some of the untrained auditors picking up the new techniques from the trained auditors.

The 1-2-3 Campaign Against Global Warming (North, 2008a) was a campaign run by the 1st Unitarian Church in Portland, Oregon, US in 2001 to inform people about the dangers of global warming and to get them to take action to reduce carbon emissions. Congregants were asked to reduce their thermostats by one degree, reduce their driving speeds by two miles per hour and replace three regular lightbulbs with compact fluorescents. Participants were asked to sign a pledge form committing to take any or all of the three actions. A subsequent evaluation survey indicated that 98% of pledging households fulfilled at least some of their pledges, with over half of households

fulfilling all actions. Ninety-five per cent also planned to continue their actions. Again, some carry over was also seen, with 63% taking additional actions against global warming and 60% telling others about the program.

A similar program focused on healthy eating was also run at the same church (North, 2008b). The Food for Thought (and Action!) campaign involved mail-outs to congregants which requested them to sign a written pledge to eat less meat, more fruit and vegetables and more organic food. Results were similar to the previous campaign, with 95% fulfilling all or some of their pledge, 94% planning to continue the actions they had started, 52% taking additional actions and 62% telling others. While neither of these campaigns involved control groups with which to compare these figures, nor any information about households that did not pledge, the size of these numbers reinforces the idea that a commitment can be a powerful tool to create enduring behaviour changes.

Werner and colleagues (1995) investigated methods of inducing residents to participate in a free curbside recycling program. They compared the effectiveness of a flyer alone with flyers and telephone calls, face-to-face conversations and face-to-face conversations with signature commitments. The signature commitment was found to be by far the most effective, with these residents being more likely to participate, and to participate more than once, than those in the other conditions. In addition, the results showed that those who had participated also developed more favourable attitudes to recycling after four months, indicating that a commitment can lead to both behaviour and attitude changes over time.

The Turn It Off project (McKenzie-Mohr, 2001) used prompts and commitments to attempt to reduce car engine idling at school and bus drop off/pick up zones in Toronto, Canada. Driver idling behaviour was observed in three different conditions: control, sign only and signs with a commitment. In the sign only condition, a minimum of four 'no idling' signs were placed prominently in the locations where motorists frequently idle. In the commitment condition, in addition to the signs, motorists were approached and asked to make a public commitment to switch off their engine, by placing a sticker on their windscreen which said "For Our Air: I Turn my Engine Off When Parked". These motorists also received an information card explaining the benefits of reducing idling.

Prior to the intervention, 53% of motorists were observed idling. The signs by themselves did not reduce idling incidence and duration. However, the combination of commitment and signs reduced idling by 32% and idling duration by 73%, again demonstrating the power of a public commitment.

De Leon and Fuqua (1995) looked at combining a commitment with group feedback in order to enhance participation in an apartment-based recycling scheme in the US. Households were split into four groups. All groups initially received a cardboard recycling box to be placed outside their apartment door and an instruction letter explaining the collection procedures. The weight of material recycled was then monitored for six weeks to establish a baseline. Following the sixth week, one group was mailed a letter asking them to sign a commitment to recycle as much paper as they could. This commitment meant their names would be published in a local newspaper. A second group received a flyer taped to their door giving group feedback about the amount recycled over the previous six weeks, and advising them that further group feedback would be published in the local newspaper. A third group received both the commitment letter and the feedback, while the fourth group served as a control. Data were then collected on recycling for the next five weeks. Results showed that the combined intervention group was most effective, achieving a 40% increase on baseline. The feedback only group was also effective with a 25% increase. However, inconsistent with other studies on commitment, the commitment only group achieved only a 5% increase over baseline. The authors suggest that this may be because they obtained informed consent from participants before baseline data was collected, and that this consent may have served as a commitment to recycle initially. Another possibility is that the commitment condition was less effective as it was solicited via the mail rather than in a face-to-face context. Thus the authors recommend not placing too much weight on the commitment condition's results, but argue this makes the effectiveness of the feedback even more significant.

Wang and Katzev (1990) attempted to increase paper recycling in Portland Oregon dormitories using commitments and incentives. Students were allocated into one of four groups: they either made a group commitment to recycle for four weeks, an individual commitment, were offered incentives on condition that more than half of the group recycles in a week, or were a control

group. All four groups received information and recycling bags. The individual commitment was found to be the most effective, with 67% recycling during the intervention, followed by the incentive (54%), the group commitment (48%) and the control (9%). In addition, participants in the individual commitment group continued to recycle during the follow-period. This would suggest that making an individual commitment is more powerful than a group commitment. This is perhaps because group commitments allow for social loafing, and take the responsibility away from the individual.

Pardini and Katzev (1983-1984) compared the effectiveness of verbal and written commitments on increasing household newspaper recycling. Households were randomly assigned to an information only, a verbal commitment or a written commitment condition. The frequency of participation and the weight of the newspapers recycled was assessed during a two-week intervention period and a two-week follow-up period. The written commitment group performed best on both measures, followed by the verbal commitment group. In addition, those who made the written commitment maintained the gains during the follow-up period.

Delhomme, Kreel and Ragot (2008) investigated the effect of a commitment to observe speed limits during driver rehabilitation courses for traffic regulation offenders in France. Participants in the course were assigned to either an experimental or control group. Those in the experimental group were asked to make a public commitment to observe speed limits. Just over 50% of participants agreed to this, and follow up phone interviews showed a positive effect of commitment on self-reported speed limits both in the short term and more than five months after the course. A follow-up study by Delhomme, Grenier and Kreel (2008) compared the commitment and control conditions of the original study to a condition in which participants were asked both to make a commitment and to specify actions they would take to help keep the commitment. Fewer participants were willing to commit (only 38%), but again a commitment was found to have a positive effect on self-reported compliance with speed limits in both the short and long term, with a slightly larger effect being found for those who specified actions. Overall these results should be interpreted cautiously as the self-reports may have been subject to a social desirability bias, but they still indicate a positive role of commitments.

However they also point to the need to examine what makes a person more willing to make the commitment in the first place.

Living Smart (Winefield, 2005) is a Western Australian program focusing on individuals setting goals to take action around sustainable behaviours. Goal-setting involves a combination of both commitment and feedback. The program comprises workshops on ten topics with smaller discussion group meetings and field trips. The key idea is that people decide what behaviour they want to change and then learn about how to do things differently together. An evaluation of the pilot project showed that participants who set goals significantly increased their environmental behaviour compared to a control group who did not set goals. Achieving goals was found to generally increase motivation. A strength of the program was also seen to be the participatory nature of the goal setting and the program in general.

McCaul and Kopp (1982) compared the effects of a public or private commitment and an explicit or general commitment on encouraging college students to collect aluminium cans for recycling. Half of the students consented to having their names published while half remained anonymous. Half of the students were provided with an explicit target, to collect four cans per day, while the other half were simply asked to collect as many as they could. Cans were collected for a two week period. No difference in the number of cans collected was found between those making a public and those making a private commitment, but students who received an explicit standard collected more cans than those without a standard, further suggesting that specific commitments are more effective. The authors suggest that previous studies have found public commitments to be more effective because they increase monitoring; in this study self-monitoring was very easy as cans were collected in an open bag kept in the participant's room so this may be why public commitments were found to be no more effective than private commitments.

Pallak, Cook & Sullivan (1980) examined the effectiveness of a public compared to a private commitment in reducing energy consumption in households. All the households in the study received home visits in which energy conservation strategies were explained. The public commitment group was told their names would be publicised with the results of the study, while the private commitment group was simply asked to make a private commitment to

reduce energy usage. Both groups were told the study would last one month. After one month, the public commitment group had reduced their energy usage by 10-20% compared with controls, and this was sustained over a year. In contrast, the private commitment group did not differ significantly from controls.

Shippee and Gregory (1982) looked at the use of mild or strong public commitments to motivate small businesses to conserve energy. The small businesses were allocated into three groups: a mild commitment group (names published in newspaper), a strong commitment group (names and energy savings published in newspaper) and a control group. All three groups received information on energy conservation and an energy audit. As a result, the mild commitment group used 30% less gas than in the previous year, while the strong commitment group actually used 1% more than the previous year, although 14% less than the control group. No significant electricity savings were found. The authors suggested that the strong commitment group may have been less successful due to reactance to a perceived loss of freedom, or to despair/quitting when they could not demonstrate consistent energy reductions for the publicity program. The failure to reduce electricity consumption may be because most of the electricity was used on the display lighting, which the small businesses did not want to reduce in fear of compromising sales. Thus the failure of the strong commitment group may not have been due to a strong public commitment per se, but rather due to the goals being a little unrealistic to achieve.

Cobern, Porter, Leeming and Dwyer (1995) contrasted the effects of signing a commitment to change one's own behaviour to signing a commitment to change one's own behaviour and to talk to one's neighbours about their behaviour on grass cycling (leaving grass clippings on a lawn). Before the intervention, grass bags were present at garbage collection 50% of the time. The individual commitment group reduced this to 30% of the time, while the commitment and communication group reduced this to 10%. These changes were found to be sustained during a follow-up one year later. This suggests that making a commitment not just to change one's behaviour but to become an advocate for that change is particularly effective at leading to sustained behaviour change.

How can we encourage someone to make a commitment? Boyce and Geller (2001) looked at the effects of direct and indirect rewards on performing a targeted behaviour. In their first study, indirect rewards, or rewards for making a commitment to give out thank-you cards, resulted in the most participation and led to the most cards used per participant. In addition, students in the indirect rewards condition continued to hand out cards during the withdrawal phase. In their second study, students in one class received tickets for a raffle if they signed a petition to hand out two or more cards, while in a second class, students got one entry into the raffle for each card delivered. While significantly more cards were distributed in the direct reward condition, significantly more students handed out at least one card in the indirect condition.

2.3.3 Conclusion

Encouraging people to make a commitment appears to be a very effective tool to promote behaviour change. Commitments have been shown to be more effective than prompts (McKenzie-Mohr, 2001), information and conversations (Werner et al, 1995), and incentives (Wang & Katzev, 1990). The effects of commitments have also been shown to be sustained for at least up to a year (Delhomme et al, 2008; Werner et al, 1995; Cobern et al, 1995; Pallak et al, 1980). In addition to changes in targeted behaviours, commitments have led to attitude change (Werner et al, 1995), to changes in other related behaviours, and to behaviour changes among the peers of those making the original commitment (Tools of Change, 2008a; North, 2008a, 2008b).

The effectiveness of the intervention appears to depend at least somewhat on the form of the commitment. Individual commitments appear to be more effective than group commitments (Wang & Katzev, 1990); written commitments are more effective than verbal commitments (Pardini & Katzev, 1983-1984); and public commitments are more effective than private commitments (Pallak et al, 1980). In addition, more specific commitments which specify either actions (Delhomme et al, 2008) or quantitative goals (McCaul & Kopp, 1982) were also found to lead to larger behaviour changes. Similarly, a greater degree of commitment, such as committing to promote a behaviour to friends as well as carry out a behaviour, can lead to greater changes in a

person's behaviour (Cobern et al, 1995). Combining commitments with feedback can be particularly effective (DeLeon & Fuqua, 1995). However it is necessary to make sure goals remain achievable, otherwise individuals may give up and revert to previous behaviours (Shippee & Gregory, 1982).

Ultimately what will be critical to the success of an intervention is how many people are willing to make the commitment in the first place; for example, Delhomme and colleagues (2008) only managed to obtain commitments from just over a third of their study participants in their second study, limiting the effectiveness of the intervention. One strategy that may help to obtain commitments is to offer an incentive to make the commitment, rather than an incentive to carry out the behaviour (Boyce & Geller, 2001). Future studies might like to examine who chooses to make a commitment or not to make a commitment, and why they do so.

2.4 Feedback

2.4.1 Definition

Feedback about performance is a commonly used intervention tool, particularly in interventions focusing on energy conservation, where people find it difficult to monitor their own energy usage. However it can easily be applied to a variety of settings where some sort of progress or behaviour can be reported on. It can simply be numeric data, or it can be more qualitative, such as a simple 'Congratulations! You're on track!'. Feedback pairs naturally with commitment and goal setting, so many of the studies reviewed below incorporate both, although some have examined feedback alone.

2.4.2 Case Studies

Midden, Meter, Weening and Zieverink (1983) considered the effectiveness of feedback, rewards and information on influencing energy use in family households in the Netherlands. Households were assigned to one of four interventions: (1) general information about how to conserve energy in the home, (2) weekly feedback with respect to the magnitude and financial consequences of people's personal energy consumption, (3) weekly feedback

comparing energy consumption with that of comparable households, or (4) weekly comparative feedback and financial rewards for decreases in energy use. The results indicated that the individual feedback and the financial reinforcement with comparative feedback strategies were most effective at reducing energy use. The comparative feedback strategy was sometimes effective, and the general information strategy was not effective. Most importantly it should be noted that feedback with financial rewards was no more effective than feedback alone; strategy 1 was thus the most cost-effective strategy. Post-intervention surveys suggested that the comparative feedback was not always effective as people rationalised that their individual situations were unique.

Curry, Wagner and Grothaus (1991) also compared the use of feedback (an intrinsic motivator) with the use of rewards (an extrinsic motivator) in a self-help smoking cessation program. All participants received a self-help program of eight units to be reported on weekly. In addition, participants were assigned to one of four groups. One group received written, personalised feedback on completion of the progress reports for the first two units of the program, another group received a prize incentive for returning the first two progress reports, a third group received both the feedback and the incentive and a fourth group served as a control. The financial incentive was found to increase the use of the self-help materials, but did not increase cessation rates among the program users and was associated with higher rates of relapse. In contrast, the feedback alone group showed higher rates of completion of the later units of the program, higher rates of smoking cessation three months after commencement of the program, and more continuous abstinence up to 12 months after the program. The authors suggested that the financial incentive may have overridden participants' internal motivation to quit; participants may have attributed early participation to a desire to enter the prize draw, thus reducing their sense of commitment to quitting and their self-confidence in their ability to quit. In contrast, the feedback served to emphasise why participants wanted to quit and that they had the ability to do so.

Aitken, McMahon, Wearing and Finlayson (1994) investigated whether feedback was able to help reduce residential water consumption. Households were divided into three treatment groups: feedback only, feedback and

dissonance (pointing out discrepancies in their stated attitude and their actual behaviour) and control. Results indicated that both of the feedback conditions were effective in getting high consumers of water in particular to significantly reduce their water consumption during the treatment period. No long term follow-up occurred to determine whether these decreases were maintained.

Brandon and Lewis (1999) monitored the energy consumption of households in Bath, UK over a nine month period in order to determine the effectiveness of different types of feedback on reducing energy usage. Households were divided into six groups and received either no feedback at all or various forms of feedback such as consumption compared to previous consumption or similar others, energy saving tips in leaflets, a computer, or feedback relating to financial or environmental costs. The computer, which was able to display a graph tracking previous consumption as well as energy saving tips, was the only form of feedback found to have a significant effect on consumption, although this was largely due to small sample sizes and large interindividual variability. Focus groups conducted after the final meter reading suggested that participants desired more personalised feedback, and thus the authors suggested that the development of more visible, readable meters might be the most effective way to reduce energy consumption.

Van Houwelingen and Van Raaij (1989) compared the use of a monitor providing continual feedback on gas consumption and located in a highly visible living area with monthly written feedback and with self-monitoring of meters. All households received information on energy conservation and were set a target of reducing gas consumption by ten percent compared to the previous year. The monitor was able to display the target daily gas consumption based on this 10% goal alongside the actual daily gas consumption; daily targets were adjusted based on the external temperature. Those households receiving continuous feedback via the monitors saved more gas (12.3%) than those receiving monthly feedback (7.7%), those taught to self-monitor their gas meter (5.1%) and those who only received information (4.3%). However, at a follow-up one year after the feedback was removed, all groups had returned to similar levels to controls.

Hayes and Cone (1981) examined whether monthly feedback comparing residents' electricity usage to their usage in the same month in the previous

year would be sufficient to encourage energy conservation. Residents were unaware that they were part of a study into electricity conservation; they simply received a letter once a month with their electricity bill which informed them whether or not they were saving energy compared to the previous years (and if so offered congratulations). Energy savings were given in percentage form, kWh form and dollar form. Compared to controls in a similar geographic area, the feedback group achieved a clear decrease in electricity consumption, but when feedback was withdrawn consumption returned to higher levels. However the authors determined that it would be cost-effective to maintain feedback indefinitely: providing 12 months worth of letters cost \$16 per participant, and would cost much less on a large scale, while participants saved an average of \$80 of electricity per annum.

Becker (1978) demonstrated that the combination of a difficult (but achievable) goal and feedback was most effective at motivating families to reduce their electricity consumption. Eighty families were asked to set a goal to reduce their electricity consumption for several weeks during the summer, half of them by 20% and half by 2%. Half of these families were given feedback three times a week about their consumption, and half received no feedback. In addition, twenty families served as controls. The challenging goal – feedback group conserved the most electricity (13-15%) and was the only group that consumed significantly less electricity than the control. The easy goal – feedback group did manage to achieve their goal, saving an average of 4.6%, but this was not statistically significant. The challenging goal – no feedback group saved 1.3% and the easy goal – no feedback group actually used 1.2% more electricity than the control group. Overall this suggests that access to feedback is critical to helping people to achieve set goals, but also that goals must not be too easy if they are to be motivating.

Van Houten, Nau and Marini (1980) looked at whether a sign providing group feedback could be successful at reducing speeding behaviour down an urban highway. An electronic sign was placed showing the percentage of drivers not speeding, both in the previous time period and the record to date. Time periods were either daily or weekly, and the authors also examined whether the sign alone would serve as a prompt when no numbers were displayed. Results revealed that the daily and weekly postings were equally

effective in reducing speeding behaviours. The effects were most pronounced in reducing the speeds of the faster drivers. However, the sign had no influence when numbers were not posted, suggesting that while feedback does not have to be particularly frequent to be effective, it does need to be continually provided. The authors also found that the weekly posting remained effective during a six month follow-up, suggesting that feedback can continue to be effective in the long term.

Seaver and Patterson (1976) investigated whether feedback that contained a commendation for achieving behaviour change would be more effective than feedback simply showing that a behaviour change had occurred in motivating conservation of fuel-oil for home heating. Householders were randomly assigned to one of three groups receiving feedback which showed their rate of fuel consumption in the current period compared to last winter and how much money they would have saved or lost, feedback and a commendation in the form of a decal stating “We are saving oil”, which households were told they were given because they achieved a reduction in consumption, or a control group. The feedback and commendation group were found to save significantly more oil in the next period compared to the feedback alone group and the control group. It would appear that feedback containing praise and recognition for behaviour change is particularly effective at motivating people to continue their behaviour change.

2.4.3 Conclusion

Not only can feedback be effective at changing behaviour, in the case of at least one study above it was also extremely cost-effective (Hayes & Cone, 1981). The intrinsic motivation reinforced by feedback seems to be far more powerful than extrinsic motivators; adding financial incentives to feedback did not make it more effective (Midden et al, 1983), and in some cases made it less effective (Curry et al, 1981). To take full advantage of intrinsic motivation, feedback was found to be most effective when combined with goal-setting and commitments (Becker, 1978; Winefield, 2005).

Individual, personalised feedback appears to be the ideal form of feedback (Brandon & Lewis, 1999), although group feedback has also worked

in some situations (Van Houten et al, 1980; DeLeon & Fuqua, 1995). While comparative feedback could potentially be effective as it incorporates norm appeals, in practice it needs to be used with caution as people have been found to rationalise that their situation is unique and that comparisons are therefore not relevant (Midden et al, 1983). It is also important to consider seasonal or situational differences that affect behaviour when giving comparisons such as historic comparisons (Hayes & Cone, 1981). People prefer to receive more frequent feedback (Van Houwelingen & Van Raaij, 1989) but less frequent feedback has still been successful (Hayes & Cone, 1981; Van Houten et al, 1980). It seems likely that there is an optimum amount of feedback that balances frequency with cost-effectiveness, and that this frequency is unique to the situation. Finally, feedback that contains recognition or praise for achieving behaviour change in addition to advising people that they have achieved the change is also particularly effective (Seaver & Patterson, 1976).

Ongoing feedback has been found to sustain behaviour changes for at least six to twelve months (Van Houten et al, 1980; Hayes & Cone, 1981). Behaviour changes may (Midden et al, 1983) or may not (Hayes & Cone, 1981; Van Houten et al, 1980) be sustained after removing the feedback, but the behaviour is more likely to be sustained if it has been combined with a specific commitment.

2.5 Incentives/Rewards

2.5.1 Definition

Incentives, whether financial or otherwise, are offered to motivate people to undertake an activity they would not have otherwise done, or to encourage them to undertake that activity more frequently. Research has generally focused on financial incentives (that is, incentives with a tangible value), and this review will do the same, as less tangible incentives to do with recognition are more aligned with other interventions such as feedback and norm appeals. Examples of commonly used incentives include coupons, entries into a lottery, cash payments, marketing merchandise and free bus tickets. Incentives have been used both alone and in conjunction with other tools, and in an attempt to motivate one-off or ongoing behaviours.

2.5.2 Case studies

The Bus Niche Marketing Project (Sutherland Shire Council, 2004) offered targeted residents living within 400m of two major bus services in the council region the opportunity to travel on the selected services using a free bus pass for a two week period, with the aim that they would continue to use the bus after the trial period. Of the 1300 people initially contacted, 30% expressed an interest in participating. However in the end only 42 people actually completed the two week trial; as such, results should be interpreted cautiously as such a small sample may not generalise. During the trial, a shift in mode share among active pass users from car to bus ranged from 25% to 85%. Due to the low take-up rate of the pass, in overall terms as a proportion of the total population, this only represented a shift of between 1.5 and 2%. In addition, a decline in bus use of between 10 and 25% occurred four weeks after the trial period. It would thus appear that the incentive of a free bus pass was not particularly motivating to take up the trial, and that even among those who used the pass, the behaviour change was not entirely sustained once the incentive was removed.

Another study which demonstrated the temporary effectiveness of incentives was Foxx and Schaeffer's (1981) company-based lottery aimed at reducing the amount of driving by employees. Employees were divided into an experimental and a control group. The intervention consisted of a one-month lottery during which experimental employees were rewarded for reducing average miles driven per day. The lottery consisted of four weekly lotteries and one grand drawing held at the end of the month. During the intervention, employees in the experimental group managed to reduce their average daily mileage by 11.6% compared to baseline while the control employees actually increased their average mileage by 21.2%. However, once the lottery finished the experimental group also exceeded their initial baseline average, indicating that there was no long-term behaviour change achieved. The intervention did manage to approximately break even: the petrol savings equated to \$75, while the cost of the intervention was \$79.

The effectiveness of incentives was again found to be short lived in a nutrition program in New Zealand run by Ashfield-Watt (2005). The program

involved supplying free fruit for six weeks to low decile Auckland primary school children. During the six weeks, fruit intake in the intervention group was significantly higher than that in a control group, but fell to a similar level again at a six week follow-up.

Guelph 2000 (Tools of Change, 2008b) provided a home visit service that encouraged City of Guelph, Ontario, Canada residents to undertake a wide variety of conservation related actions in their homes. As an incentive to participate in the home visits, householders were offered a free tree for their property through the Shade Tree Program. The trees were established trees from 12 to 21 feet high so represented a significant offer. The Shade Tree Program generated a total of 489 home visits, 35% of the total number of visits generated for the year, and was the single largest source of home visits (the second largest source was word-of-mouth at 30%). So the incentive would appear to have been effective in generating visits. The program creators assert that the visits generated by the shade tree program prompted home upgrades to the value of \$1.3 million but do not indicate the amount of energy savings these upgrades would represent, nor whether this amount of upgrades is substantially greater or less than upgrades following home visits generated by different means. They also note that most of the interest in the shade tree program came from people in newer houses, which were already more energy efficient. Thus the incentive may not have targeted the correct group of people.

Are incentives more effective when combined with other interventions? Bachman and Katzev (1982) compared the effects of free bus tickets with a commitment on increasing bus ridership. Eighty-three non-bus riding car drivers were assigned to one of four conditions: a control where route and schedule information were provided, a commitment condition where participants agreed to ride the bus at least twice a week for the four weeks of the intervention, an incentive condition where participants were provided with unlimited free bus tickets during the intervention and a combined commitment and incentive condition. All three of the experimental conditions were equally more effective than the control condition, both during the intervention and at two subsequent follow-up periods. Importantly, the inclusion of a financial incentive was no more effective than the cheaper commitment-only intervention, suggesting that incentives may not be the most cost-effective way to achieve behaviour change.

A similar finding was made by Katzev and Johnson (1984) in their investigation of the effectiveness of incentives and commitments in promoting electricity conservation. Subjects were assigned to either a questionnaire condition, where they were asked to complete a short energy conservation survey, a commitment condition where they were asked to reduce electricity consumption by 15%, an incentive condition where individuals were offered a highly attractive monetary incentive for conserving electricity, a questionnaire and commitment condition, a questionnaire, commitment and incentive condition and a control condition. During the conservation period, homeowners in the commitment and combined groups (all of which included a commitment) were found to conserve more electricity than the other groups; again, adding an incentive made the intervention no more effective. In contrast to the above study, however, the behaviour change was not sustained.

Incentives can be more effective than education campaigns to change behaviour. Anderson and colleagues (2001) evaluated the Michigan Farmers' Market Nutrition Program, which used coupons and education to try to increase fruit and vegetable consumption in a low-income population. Participants were assigned to one of four interventions: education about the use, storage and nutritional value of fruits and vegetables; farmer's market coupons worth \$20; education and coupons; or control. While the education intervention was found to have a positive impact on attitudes, the coupons actually had a direct effect on increasing fruit and vegetable consumption. The coupons did not however change attitudes about fruit and vegetable consumption, and there was no follow-up to see if the change was sustained. The maximum impact was achieved through combining education and coupons.

To refer to a study discussed previously in the commitment section, Wang and Katzev's (1990) attempt to use commitment or incentives to encourage paper recycling also deserves a mention here. While the individual commitment condition was found to be most effective, the incentive condition was nonetheless fairly effective, and more effective than the group commitment condition. This may have been because of the form of the incentive: incentives were only provided if at least half of the group recycled. Thus there was also some social pressure to perform the target behaviour. Empirical study directly comparing individual rewards with group rewards would have to be conducted

to confirm whether group rewards are generally more effective, but it is nonetheless an interesting point. However, the group incentive still failed to achieve any long term behavioural changes, and was still less effective than the individual commitment.

What sort of incentive is most effective? One study by Jeffrey and colleagues (1993) cited in Wall and colleagues' (2006) review of the use of monetary incentives in modifying dietary behaviour compared cash payments contingent on weight loss with free prepackaged meals. Differences between the groups were small but favoured the groups involving free food provision. However, a subsequent study (Wing et al, 1996, cited by Wall et al, 2006) suggested that it was actually the structured meal plans rather than the free food that was the key. This would seem to indicate that the effectiveness of an incentive is not in its monetary value but in its ability to remove barriers to behaviour change.

A similar finding regarding the effectiveness of incentives which remove barriers was made by Cooper and Meiklejohn (2003) in their pilot of a travel behaviour change initiative targeting students at Monash University's Clayton campus. Initial focus groups with students highlighted that the \$79.20 annual cost and administrative hurdles involved in obtaining a public transport concession card were a major disincentive to using public transport, especially as it was comparable to the cost of an annual on-campus car parking permit (\$77.00). The focus groups also highlighted that money, rather than the environment or health, was the key motivator for university students, and that students tended to decide on their method of transport to campus early in their student life and stick to it throughout their studies. It was thus decided that the program would target first year students at the beginning of the academic year. Five pack types were developed; three for potential public transport users containing either a concession card, a monthly bus ticket and information; a concession card and information, or information only; one for potential cyclists or walkers containing a map, t-shirt and water bottle, and one for students whose only option was to drive, containing car pool information and five two-hour bus tickets. 1179 students were recruited and assigned a pack type based on their term-time address. A phone call was then made to these students to conduct a pre-survey on attitudes and behaviour around transport and to

provide information about the contents and collection details of the pack they had been assigned. 771 students agreed to pick up their packs; but while 90% of those assigned to the packs containing concession cards collected the packs, only around half of those assigned to the other packs actually collected them. An evaluation survey was conducted four weeks after pack collection. Results from self-report surveys indicated that the packs containing the concession cards were most effective at reducing car usage and increasing public transport usage. The pack aimed at people with driving as the only option actually had a greater influence on public transport use than the information-only pack, suggesting again that incentives are more effective than information. Interestingly, the information was rated as more useful by those receiving the packs containing information and incentives than by those receiving the information alone. Overall this pilot would seem to suggest that the use of an incentive specifically designed to overcome an identified barrier can be effective. It would also seem to indicate that smaller incentives such as drink bottles, t-shirts and bus tickets may not be sufficient to motivate people to participate in a program.

A third example of the successful use of incentives to overcome barriers is the Go Boulder program run in Boulder, Colorado, US (Tools of Change, 2008c). The aim of the Go Boulder program was to induce people to shift from single occupant vehicle use to alternative transport in order to reduce traffic congestion and air pollution. Initial focus groups and public meeting highlighted that many people were unwilling to consider public transport due to concerns about the availability of transportation in unforeseen circumstances such as having to work late. As such, the Boulder City Council designed a program where businesses could provide free transit “ECO Passes” to their employees for \$40 per employee per year. The passes also gave employees a guaranteed free taxi ride home if they had to work late or in an emergency, to overcome the barrier that had been identified. Results showed that the program was very successful; among individual businesses using the ECO Passes increases in bus ridership between 59 and 400% were achieved. In addition, very little abuse of the Guaranteed Ride Home occurred. Overall, a 6% shift in percentage daily trips from single-occupant vehicles to other modes was achieved across the community.

Another situation in which incentives can be more effective is to encourage one-off behaviours such as responding to a survey. Edwards and colleagues (2002) conducted a systematic review of 292 studies examining factors influencing response rates to surveys. They found that including a monetary incentive with the survey doubled the odds of response over not including an incentive. In addition, the odds of response almost doubled when incentives were not conditional on response; that is, when an incentive such as a dollar coin or a chocolate frog was provided with the survey rather than on completion of the survey. Furthermore, the use of incentives with surveys may also increase the representativeness of the survey respondents by motivating those less intrinsically interested in the topic to respond. Roberts and colleagues (2000) compared the use of a direct payment with the use of a lottery on response rates to a questionnaire on the use of hormone replacement therapy (HRT). They found that the lottery did not increase the odds of response above that achieved without an incentive, but that the use of a direct payment of £5 nearly doubled the odds of response. In addition, the group that received the direct payment included a much larger proportion of women who did not use HRT than the no-incentive group. It would therefore seem that including an incentive with a survey may serve not only to increase responses, but to increase responses from groups of people less intrinsically interested in the subject matter, and thus to obtain more reliable results.

2.5.3 Conclusion

While incentives may have some effect on behaviour change, overall they do not appear to be one of the better tools to use in behaviour change interventions. This is particularly because studies have repeatedly shown that incentives have little to no long-term positive effect on behaviour once they are removed (Foxy & Schaeffer, 1981; Ashfield-Watt, 2005; Katzev & Johnson, 1984; Sutherland Shire Council, 2004). Incentives need to be used very carefully as they may override intrinsic motivation if they are particularly large (Curry et al 1981), but may not actually motivate people sufficiently to complete a trial if too small (Sutherland Shire Council, 2004; Cooper & Meiklejohn, 2003). Care should also be taken to choose an incentive which will attract the correct

group of people; for example Guelph 2000 (Tools of Change, 2008b) found that an offer of a free tree was more attractive to those with newly built houses, while those with older, less environmentally-friendly houses (and thus more established gardens) were the actual target group. In addition, incentives have been shown to have little effect on behaviour above and beyond commitment (Bachman & Katzev, 1982; Katzev & Johnson, 1984) or feedback (Midden et al, 1983), and no effect on attitude change at all (Anderson et al, 2001).

Under some conditions, however, incentives might be used effectively in behaviour change programs. For example, the short-term effectiveness of incentives suggests they might successfully be used to encourage one-off behaviours, such as agreeing to participate in a program, complete a survey (Edwards et al, 2002; Roberts et al, 2000), or even make a commitment to behaviour change (eg Boyce & Geller, 2001). Incentives can also be more valuable if they help to overcome specific barriers to performing a targeted behaviour (Cooper & Micklejohn, 2003; Wing et al 1996, cited by Wall et al, 2006; Tools of Change, 2008c).

Due to the often costly nature of including incentives in interventions, it is particularly important that a cost-benefit analysis be included in their evaluation, as well as a long-term follow-up. Most of the studies reviewed here failed to do this.

2.6 Other Tools

Seethaler and Rose (2005) investigated whether take up of the Indimark TravelSmart program in Victoria could be improved by incorporating the six principles of persuasion (reciprocation, commitment and consistency, social proof, liking, authority, and scarcity) into the announcement letter. The new letter was somewhat more effective, with 58% wanting to participate compared to 51% among controls receiving the standard letter. A smaller-scale pilot indicated that using the principles of persuasion in the telephone call subsequent to the letter was particularly effective, but unfortunately this could not be trialled in the larger study.

Bull, Kreuter and Schaff (1999) compared the effectiveness of three different types of messages on increasing levels of physical activity. Individuals

attending a clinic completed a questionnaire about their physical activity, and were then mailed information two days later. The information was either tailored to the particular responses they had made on the questionnaire (for example, to their stage of readiness to change), standard materials from the American Heart Association about exercise, or the standard materials personalised with the person's name at the top. Patients in the tailored group were more likely to increase their physical activities of daily living than were patients in the personalised, general and control groups and were less likely to be doing fewer physical activities of daily living at follow-up. There were no significant differences for amount of leisure time activities.

Davis (1995) explored the effects of message framing on responses to environmental communications. Specifically, communications were framed in terms of either gains or losses, in terms of their impact on current or future generations, and in terms of the recommended activities ("taking less" or "doing more"). Surveys of 112 undergraduate students indicated that communications discussing losses to the current generation were received most positively and yielded the highest levels of intent to participate in environmentally responsible behaviours. This is consistent with Tversky and Kahneman's findings that people are more sensitive to losses than gains, and emphasises the need to consider 'What's in it for me?' when developing messages.

Spaccarelli, Zolik and Jason (1989-1990) examined whether there was a difference in the effectiveness of presenting information in a brochure as compared to a face-to-face conversation. Without using any of the other tools discussed above, such as inducing a commitment or norm appeals, the conversation by itself was far more effective than the brochure in encouraging participation in a curbside newspaper recycling scheme.

3. Conclusions

All of the tools reviewed in this study have been successful in at least some contexts in promoting behaviour change. Commitment and feedback both appear to be particularly effective in bringing about changes, particularly in the light of the long term sustained effects found in some studies and particularly when used in combination with each other. Prompts appear to be effective in eliciting changes in behaviours where sufficient motivation already exists to make that change; thus they work best either in combination with other tools such as commitment and feedback which increase motivation, or for low effort behaviour such as switching off lights or using a recycling bin where little motivation is needed. The use of norm appeals seems to be quite powerful, whether in written communications or visual modelling, and appears to lead to long-term changes in attitudes as well as behaviours. Incentives have been shown to be effective in the short term, but behaviour changes seem to disappear once the incentive is removed, and incentives appear to add little beyond the changes achieved by commitment or feedback alone in combined interventions. However, some types of incentives may be more effective: incentives to encourage a one-off behaviour, or incentives which overcome a specific barrier to behaviour change. Overall, interventions which combined more than one of the above tools were generally more effective than interventions using one tool alone.

3.1 Gaps and Limitations

A number of gaps and limitations can be noted about the studies included in this particular review, and all conclusions should be considered in the light of these. Many studies contained only small sample sizes in each of their conditions, which limited their power to detect differences between the conditions. In addition, there was a general lack of long-term follow-up, and those that did include a follow-up usually did so less than six months after the intervention. It is very important to include a long-term follow-up to determine how sustainable any results are, particularly so that an accurate evaluation of the program's cost effectiveness can be conducted. Reporting of costs or

cost/benefit analyses were extremely uncommon, unfortunately, as were reports of the actual impact behaviour changes would have on environmental or other measures. Some studies also relied on self-reports of behaviour changes, which may have been subject to social desirability biases.

Another concern with a number of the studies is with their sample characteristics. It is possible that people who volunteered to participate in these studies were already more motivated or concerned about the issues under investigation than the general public, which might limit the generalisability of these results to the entire population. In general, studies have included little assessment of the personal characteristics of participants such as their demographics, lifestyle and attitudes; future research should examine whether the effectiveness of interventions is moderated by the characteristics of the person receiving the intervention.

3.2 Recommendations

- ◆ Interventions should incorporate more than one tool where possible
- ◆ Incorporating a commitment or pledge into behaviour change interventions is strongly recommended due to their demonstrated effectiveness over the short and long term, as well as the carry over effect to other activities and people
 - ◆ Commitments should be in writing, be made by individuals rather than groups, and be made public if possible. However, people may be more reluctant to make public commitments out of concern for privacy. A compromise might be ‘registering’ a commitment with an organising body, as occurs with Ride2Work Day – names are then only held by the organising body
 - ◆ Commitments should preferably include specific goals or actions, for example “I will ride to work at least twice a week” or “I will reduce my electricity consumption by installing energy efficient light bulbs and renewing the insulation in my ceiling”
- ◆ It is also recommended that feedback be incorporated into interventions as it has also been demonstrated to be effective, particularly when combined with a commitment

- ◆ Feedback should preferably be about individual performance but if this is not feasible group performance feedback has also been found to be effective – in fact group feedback might also be important to make people feel like they are contributing to a bigger picture
- ◆ Feedback which compares performance to that of others is not recommended as people tend to rationalise their situation is unique
- ◆ Feedback which compares performance to historic performance can be effective as long as consideration is made for seasonal or other systematic variations in behaviour (ie compare performance to the same month the previous year, consider whether something such as major road works may render comparisons unfair as bus services or bike routes may have been interrupted)
- ◆ Seek advice from participants about how frequently they would like to receive feedback – something such as energy or water conservation which is difficult to self-monitor may need more frequent feedback than other activities such as choice of transport to work
- ◆ Look into building in mechanisms for people to get their own feedback, for example a spreadsheet calculator to work out the quantity of greenhouse gas emissions a person will have saved by not driving to work; however feedback that contains praise and encouragement from others is also particularly motivating
- ◆ Norm appeals may be able to be effectively incorporated into other parts of the intervention, rather than a separate tool in themselves
 - ◆ For example, norm appeals could be incorporated into messages urging people to make a commitment ('make the pledge along with 1000 of your fellow neighbours')
 - ◆ Public commitments or publicly visible participation can encourage the development of community norms eg wearing a branded backpack while cycling to work, carpool participants could be asked to place a sticker in their car window stating that they carpool

- ◆ Prompts are a good supporting tool although are probably insufficient in themselves to change the behaviour of any but the most motivated people
 - ◆ Prompts are best when they are highly noticeable, and when they occur in close proximity to decision points. This is easy with turning off lights – the prompt can be placed next to light switches. For driving behaviour, the key would be to determine when people decide whether to drive or take alternative transport; for example, fridge magnets might be good if people decide when they get up in the morning and get breakfast. With something like carpooling where someone would need to register to use the matching software, prompts should occur when people are going to be able to do that easily, perhaps in the office near computers, or actually popping up on e-mails or the homepage
 - ◆ Prompts should preferably describe a specific action rather than a general philosophy or just the program brand
- ◆ Incentives should not form the main part of the intervention strategy due to their lack of long-term effectiveness and potential to erode intrinsic motivation
 - ◆ Incentives may be effective in encouraging one-off behaviours such as signing up to participate in a program, completing an evaluation survey, or even to make a commitment – although incentives should not be too large so they are not enough to justify making the commitment in itself; otherwise people may rationalise that they only made the commitment to obtain the incentive
 - ◆ Make sure incentives are attractive to the people you are aiming to attract. For example, high quality cycling equipment may actually attract people already riding rather than encouraging those new to riding. Lower quality equipment might actually be better as it can help to overcome a barrier for new riders but is unlikely to be attractive for existing riders who already own the equipment.
 - ◆ Incentives that overcome barriers to performing the desired behaviour can also be effective because these serve to make it

easier to carry out a behaviour people already have some motivation to carry out rather than as a financial inducement overriding internal motivation

- ◆ Good design and evaluation of interventions is critical in order to inform future decisions
 - ◆ To properly test the effect of an intervention combining two tools, four groups are necessary: a control group, a group with each of the tools by itself, and a combined group. Eight groups would be necessary when examining three tools. Pilot tests can be used to do this but it is necessary to have an absolute minimum of 20 participants per group; 50 would be more preferable especially if people vary a lot in their behaviour. Participants should ideally be randomly allocated to groups so you do not simply have more motivated people participating in interventions
 - ◆ Include a longer term follow-up after the intervention is finished so it is possible to assess whether behaviour changes are sustained
 - ◆ Include a cost benefit analysis to fully determine effectiveness of intervention. This should include measures of actual environmental impacts (or at least extrapolations from sound behavioural data)

4. References

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