

IMPLEMENTATION INTENTIONS AND HEALTH BEHAVIOUR

1 General background

1.1 *The intention-behaviour relation*

Several theories that have been used extensively to predict health behaviours construe the person's *intention* to act as the most immediate and important predictor of subsequent action, such as the theory of planned behaviour (TPB; Ajzen 1991; Conner and Sparks, Chapter 5 in this volume) and protection motivation theory (PMT; Rogers 1983; Norman *et al.*, Chapter 3 in this volume). Intentions can be defined as the instructions that people give themselves to perform particular behaviours or to achieve certain goals (Triandis 1980) and are characteristically measured by items of the form 'I intend to do/achieve X.' Intentions are the culmination of the decision-making process; they signal the end of deliberation about a behaviour and capture the standard of performance that one has set oneself, one's commitment to the performance, and the amount of time and effort that will be expended during action (Gollwitzer 1990; Ajzen 1991; Webb and Sheeran 2005). Given the centrality of the concept of intention to models of health behaviour, it is important to ask how well intentions predict behaviour.

Sheeran (2002) approached this question by conducting a meta-analysis of meta-analyses of prospective tests of the intention-behaviour relation. Across 422 studies involving a sample of 82,107 participants, intentions accounted for 28 per cent of the variance in behaviour, on average. $R^2 = 0.28$ constitutes a 'large' effect size according to Cohen's (1992) power primer, which suggests that intentions are 'good' predictors of behaviour. Moreover, 28 per cent of the variance may underestimate the 'true' relation between intention and behaviour because this value was not corrected for

measurement artefacts such as lack of reliability or scale correspondence (see Sutton 1998; Sheeran 2002 for reviews).

However, Sheeran's (2002) meta-analysis does not address the question that most health psychologists probably really want answered, namely, to what extent do intentions predict behaviour *change*? An answer to this question can be gleaned from a meta-analysis of 51 studies ($n = 8166$) that reported intercorrelations among past behaviour, intention and future behaviour (Sutton and Sheeran 2003). Using these correlations as the input matrix for hierarchical regression shows that, not surprisingly, past behaviour is a good predictor of future behaviour ($R^2 = 0.26$). Importantly, however, intention is associated with a highly significant increment in the variance; an additional 7 per cent of the variance in behaviour was explained after prior performance had been taken into account. Thus, intentions have a reliable association with behaviour change, though the magnitude of this effect size is small-to-medium (cf. Cohen 1992).

Orbell and Sheeran (1998) pointed out that indices of association (such as percentage variance) do not illuminate the *sources* of consistency and discrepancy between intention and behaviour. To gain insight into this issue, Orbell and Sheeran decomposed the intention-behaviour relation into a 2 (intention: to act vs not to act) \times 2 (behaviour: acted vs did not act) matrix (see also McBroom and Reid 1992). This decomposition reveals that intention-behaviour consistency is attributable to participants with positive intentions who subsequently act (termed 'inclined actors') and to participants with negative intentions who do not act ('disinclined abstainers'). Discrepancies between intentions and behaviour, on the other hand, can be attributed to participants with positive intentions who do not act ('inclined abstainers') and participants with negative intentions who ultimately perform the behaviour ('disinclined actors'). Orbell and Sheeran (1998) found that inclined abstainers – rather than disinclined actors – are principally responsible for the intention-behaviour 'gap'. This conclusion was confirmed in a review of health behaviours by Sheeran (2002). Across studies of exercise, condom use and cancer screening, the median proportion of participants with positive intentions who did not perform the behaviour was 47 per cent whereas the median proportion of participants with negative intentions who acted was only 7 per cent. These findings indicate that barely more than one-half of people with positive intentions to engage in health behaviours successfully translate those intentions into action.

1.2 Explaining intention-behaviour discrepancies

Why is it so difficult for people to enact their intentions? We suspect that three processes underlie intention-behaviour discrepancies. The first process is *intention viability* which refers to the idea that it is impossible for most decisions to find expression in the absence of particular abilities, resources or opportunities. That is, a behavioural intention can only be realized if the person possesses actual control over the behavioural performance (Ajzen 1991). Sheeran *et al.* (2003) tested this idea by developing

a proxy measure of actual control (PMAC) using participants' post-behavioural attempt assessments of control (e.g. 'How difficult was it for you to exercise twice in the last week?'). Validity of the PMAC was established by demonstrations that (a) PMAC scores did not reflect self-serving attributions for failures to enact one's intentions, and (b) a measure of accuracy of perceived behavioural control (PBC) derived from the PMAC moderated the PBC-behaviour relation. More important, and consistent with the viability hypothesis, findings from studies of low-fat diet and exercise both showed that intentions were associated with behaviour only when intentions were viable, i.e. when participants possessed actual control over the behaviour according to the PMAC. However, because intention viability refers to actual – and not to perceived – control, initiatives to promote intention-behaviour consistency by this route are likely to prove resource-intensive (e.g. in terms of provision of appropriate training, facilities and compensation to make people's intention to exercise viable). Thus, economic and policy interventions may be more appropriate for increasing intention viability whereas psychological interventions may be more appropriate in relation to the other processes.

The second process that is relevant to discriminating between disinclined actors and inclined abstainers concerns *intention activation*. The activation level of an intention refers to the extent to which contextual demands alter the salience, direction or intensity of a focal intention relative to other intentions. To see the importance of situational demands on cognitive and motivational resources, consider that for any particular time and context that a researcher chooses to specify in a measure of a health behaviour intention (e.g. 'Do you intend to exercise at the gym twice in the next week?'), research participants are likely to have multiple, and often conflicting, goals pertaining to the same point in time (e.g. 'Every evening this week is going to be spent writing that report for work') and context ('I must ask Ian and Sarah about their trip to Reykjavik when I see them at the gym'). Moreover, accumulated evidence indicates that situational features activate goals and subsequent behavioural pursuit of those goals in a manner that operates outside people's conscious awareness (e.g. Bargh *et al.* 2001; Aarts *et al.* 2004). Relatedly, when particular goals involve short-term affective costs (e.g. foregoing a tempting dessert) or require mobilization of effort (e.g. bringing a change of clothes to work), then people may be especially vulnerable to more enjoyable or pressing alternatives. Thus, the relative activation level of any particular goal intention may be reduced by environmental activation of alternative goal representations.

Diminution of the activation level of a focal intention can have two important consequences – *prospective memory failure* and *goal reprioritization*. Prospective memory failure occurs when people forget to perform the behaviour. Empirical support for this explanation of intention-behaviour discrepancies comes from retrospective reports by inclined abstainers. For example, Orbell *et al.* (1997) found that 70 per cent of participants who intended to perform a breast self-examination but did not do so offered 'forgetting' as their reason for non-performance (see also

Milne *et al.* 2002). Goal reprioritization occurs when an intention fails to attract sufficient activation to permit its realization and is postponed or abandoned (at least temporarily). Consistent with this idea, Milne *et al.* (2002) found that 45 per cent of participants who failed to enact their intention to exercise said that they were 'too busy', while Abraham *et al.* (1999) found that intentions to use a condom were not enacted because the goal of having sex was more important at the time than was the goal of protecting oneself against HIV/AIDS. Similarly, numerous studies attest to the lack of salience of pregnancy prevention *in situ* (reflected in statements such as 'I could not be bothered at the time' or 'We were carried away in the heat of the moment') as explanations of contraceptive non-use (see Sheeran *et al.* 1991 for a review).

The third process that can help to explain the intention-behaviour gap concerns *intention elaboration*. People may fail to engage in, or to elaborate in sufficient detail, an analysis of the particular actions and contextual opportunities that would permit realization of their intention. Most of the behaviours of interest to health psychologists are goals that can be achieved by performing a variety of behaviours (e.g. the goal or outcome 'losing weight' can be achieved by performing exercise behaviours, dietary behaviours or both, cf. Bagozzi and Kimmel 1995) or – equivalently – behavioural categories such as exercising or dieting that may be indexed by a variety of specific actions (Abraham and Sheeran 2004; see Sewacj *et al.* 1980 for an empirical example). Moreover, health behaviours, may involve complex action sequences wherein the failure to initiate relevant preparatory behaviours is likely to undermine goal pursuit. For example, the intention to use a condom might only be realized if the person has (a) bought, stored or carried condoms, (b) suggested using one to a sexual partner, and (c) thought of ways of overcoming a partner's reluctance to use a condom (Abraham *et al.* 1998; Sheeran *et al.* 1999). Understanding that health goals involve hierarchies of single acts undertaken in specific situational contexts clarifies how important it is to identify both the means (action) and the context (internal or external cue) that will permit intention realization – especially in the case of behaviours that involve deadlines or windows of opportunity (e.g. a health check appointment). In the absence of such elaboration, the person is likely to miss opportunities to act, or not know how to act even if an opportunity presents itself.

1.3 Theoretical background to implementation intentions

The strategy of forming implementation intentions has been proposed as an effective tool for handling problems with sub-optimal activation or elaboration of goal intentions (Gollwitzer 1993, 1996, 1999; Gollwitzer and Schaal 1998; Gollwitzer *et al.* 2005). The theoretical background to the implementation intention construct is the model of action phases (MAP; Heckhausen and Gollwitzer 1987; Gollwitzer 1990). The MAP is a framework for understanding goal achievement that is based on the distinction between the motivational issue of goal setting (intention formation)

and the volitional issue of goal striving (intention realization). The model assumes that the principles that govern intention formation and intention realisation are qualitatively different. Whereas intention formation is guided by people's beliefs about the desirability and feasibility of particular courses of action, intention realization is guided by conscious and unconscious processes that promote the initiation and effective pursuit of the goal. The distinction between intention formation and intention realization is important because it clarifies the distinctiveness of the concept of implementation intentions. Traditional models such as the TPB and PMT focus on the motivational phase of action. The primary concern of these theories is with the specific types of feasibility and desirability considerations that determine intention formation – little attention is paid to how intentions are translated into action (Oettingen and Gollwitzer 2001; Sheeran 2002). Research on implementation intentions, on the other hand, provides an explicit theoretical analysis of processes that govern the enactment of intentions.

2 Description of the model

2.1 *The nature of implementation intentions*

Implementation intentions are if-then plans that connect good opportunities to act with cognitive or behavioural activities that will be effective in accomplishing one's goals. Whereas behavioural or goal intentions specify what one wants to do or achieve (i.e. 'I intend to do/achieve X'), implementation intentions specify the behaviour that one will perform in the service of goal achievement and the situational context in which one will enact it (i.e. 'If situation Y occurs, then I will initiate goal-directed behaviour Z!'). Implementation intentions are subordinate to goal intentions because, whereas a goal intention indicates *what* one will do, an implementation intention specifies the *when*, *where*, and *how* of what one will do.

To form an implementation intention, the person must first identify a response that will lead to goal attainment and, second, anticipate a suitable occasion to initiate that response. For example, the person might specify the behaviour 'go jogging for 20 minutes' and specify a suitable opportunity as 'tomorrow morning before work' in order to enact the goal intention to exercise. Implementation intention formation is the mental act of linking the anticipated critical situation with the effectual goal-directed response. This process involves a conscious act of willing that results in an association in memory between mental representations of the specified opportunities (situations) and the means of attaining goals (cognitive or behavioural responses).

2.2 *Operation of implementation intentions*

Implementation intentions promote intention realization by instigating psychological processes that enhance both the identification of the critical

situation and the execution of the goal-directed response. That is, implementation intentions enable people both to *see* and to *seize* opportunities to achieve their goals.

2.2.1 Identification of the critical situation

Specifying a good opportunity to act in the if-component of an implementation intention means that the critical situation becomes highly accessible. This heightened accessibility enhances information processing related to the specified cue; more particularly, it becomes easy to detect and attend to the critical situation when one encounters it later. Aarts *et al.* (1999) obtained evidence that implementation intentions enhance cue accessibility in an experiment that asked one-half of participants to form an implementation intention about how they would later collect a coupon from a nearby room; the other half of participants (controls) formed an irrelevant implementation intention about how they would spend the coupon. All of the participants then took part in an ostensibly unrelated word recognition task (their task was to indicate as quickly and accurately as possible whether or not letter strings were words or non-words). Among the letter strings presented were words related to the location of room where the coupon should be collected (e.g. 'corridor', 'swing-door'). Analysis of the response latencies indicated that participants who formed if-then plans were much faster at recognizing the words related to the critical situation than were control participants. Implementation intentions increased the accessibility of environmental cues that participants had anticipated in their plans.

Webb and Sheeran (2004a, Experiment 1) used a classic linguistic illusion to test whether the heightened accessibility engendered by implementation intentions could enhance the detection of critical cues – even when detection is extremely difficult. Participants were presented with a short piece of text and simply asked to count the number of instances of the letter 'F'. The illusion resides in the fact that there are six instances of the letter F in the text but most people count only three because they miss the Fs in the word 'of', which occurs three times. Consistent with predictions, almost all control participants who simply familiarized themselves with the letter prior to the task counted only three Fs. Participants who formed an implementation intention (e.g. 'As soon as I see the letter F, I will add one more to my count!'), on the other hand, counted significantly more instances of the letter. Equivalent findings were obtained by Gollwitzer *et al.* (2002b) in a study that examined identification of elements in the embedded figures test (e.g. Witkin *et al.* 1972). Thus, specifying the critical situation in an if-then plan leads to improved detection of that situation even when the setting means that cue identification is highly challenging.

Heightened accessibility should also mean that the specified situational cues attract and focus attention even though the person is occupied by other concerns. Gollwitzer *et al.* (2002b) tested this idea using a dichotic listening task. Participants were instructed to repeat words presented in one ear (the 'shadowing' task) while ignoring words presented in the other ear (the

non-attended channel). In addition, participants had to turn off a light that appeared at irregular intervals as quickly as possible (the secondary task). The key experimental manipulation was the type of words that were presented on the non-attended channel. For one-half of the trials, the words presented to participants represented critical situations that they had earlier specified in implementation intentions to promote the achievement of a personal goal intention; the other half of the trials involved neutral words. Findings indicated that the specified cues were highly disruptive to attention to the focal (shadowing and secondary) tasks. That is, participants were much slower to switch off the light, and repeated the words more slowly and less accurately, when words related to their specified cues were presented on the non-attended channel compared to when neutral words were presented. Thus, words related to the critical situation grabbed participants' attention even though participants were supposed to be concentrating on demanding other tasks. These findings speak to the idea that even though we may be wrapped up in our own thoughts, gripped by powerful emotions, or otherwise absorbed in activities that have nothing to do with an underlying goal intention, the critical situation specified in an if-then plan will penetrate current preoccupations and capture our attention.

2.2.2 Execution of the goal-directed response

Specifying that one will perform a particular goal-directed behaviour in the then-component of a plan, at the moment one has specified in the if-component of the plan, involves a strategic abdication of action control. This is because forming an implementation intention delegates control of behaviour from the self to specified situational cues that directly elicit the behaviour (Gollwitzer 1993). Forming an if-then plan means that the person commits himself or herself in advance to acting as soon as certain contextual constraints are satisfied – nothing needs to be done to ensure action initiation except encounter the specified situation. Action proceeds swiftly and effortlessly, and does not require the person's attention. That is, the execution of a behaviour specified in an implementation intention exhibits features of *automatic* processes.

According to Bargh (1992, 1994), three key features of automatic processes are immediacy, efficiency and lack of awareness. Automaticity characterizes highly over-learned activities such as driving a car or typing. For example, drivers respond quickly to changes in the flow of traffic or road conditions. They can hold a conversation with a passenger despite the demands of so doing while they are driving at the same time (supporting the idea that driving is efficient in terms of cognitive resources). Moreover, drivers need devote little attention to the process of driving itself; they need only be aware of other traffic and their conversation partner. So what evidence is there that action control by implementation intentions exhibits these three features of automaticity?

The *immediacy* of implementation intention effects is supported by several studies that employed speed of responding as the dependent variable.

For example, Webb and Sheeran (2004a, Experiment 3) used a reaction time task to compare whether an implementation intention to respond especially quickly to a critical stimulus (the number 3) led to faster responses compared to a goal intention that had the same aim. Findings indicated that participants who formed if-then plans responded faster to the critical stimulus compared to both non-critical stimuli and participants who only formed goal intentions. A field study by Orbell and Sheeran (2000) afforded a similar conclusion. Patients undergoing joint replacement surgery were asked to form implementation intentions about resuming functional activities upon their discharge from hospital. Despite equivalent goal intentions to resume the activities, behavioural follow-up at three months showed that patients who formed implementation intentions initiated 18 out of 32 activities sooner than did patients who had not formed if-then plans. Implementation intention participants were functionally active 2.5 weeks sooner, on average, than were controls. Gollwitzer and Brandstätter (1997, Experiment 3) measured the time interval between specified opportunities and specified behavioural responses in a study where participants had to make counter-arguments to racist remarks. Findings indicated that participants who formed implementation intentions spoke up in closer temporal proximity to the times they had specified than did participants who only formed goal intentions in relation to the specified opportunities. Thus, participants who make if-then plans are likely to immediately seize the opportunities to act that they have identified – action initiation by implementation intentions is swifter than that generated by goal intentions alone.

The *efficiency* of implementation intention effects is supported by studies that manipulated cognitive load either through selection of the sample (e.g. schizophrenic patients, heroin addicts under withdrawal) or by using a dual task paradigm in experiments with college students (Brandstätter *et al.* 2001; Lengfelder and Gollwitzer 2001). For example, Lengfelder and Gollwitzer (2000, Study 2) found that implementation intentions benefited task performance for schizophrenic patients just as much as for matched controls even though schizophrenic participants are likely to have been preoccupied by unwanted thoughts. Similarly, forming an implementation intention to compose a curriculum vitae increased the likelihood of completing the task by the deadline regardless of whether or not addicts were still experiencing symptoms of opiate withdrawal (Brandstätter *et al.* 2001, Study 1). Finally, two experiments manipulated the amount of mental load participants were experiencing by having them perform two tasks at once (Brandstätter *et al.* 2001). Consistent with the idea that implementation intentions do not require much in the way of cognitive resources, the benefits of if-then plans on task performance did not compromise performance on a secondary task (Study 3) and did not show evidence of task interference even when the task was very difficult (Study 4).

Efficiency is usually construed in terms of the cognitive demands that are placed on participants (e.g. Bargh 1992). However, Webb and Sheeran (2003) also wished to examine how effective were implementation

intentions in promoting goal achievement when people's overall capacity for self-control (i.e. 'willpower') was diminished. Their experiment drew upon Baumeister and colleagues' research on 'ego-depletion' (e.g. Baumeister *et al.* 1998; see Muraven and Baumeister 2000, for a review). Ego-depletion refers to the temporary depletion of self-regulatory capacity brought about by an initial act of self-control. For example, Baumeister *et al.* (1998, Experiment 1) showed that participants who had to eat radishes instead of tempting chocolate during an initial task persisted for less time on a subsequent unsolvable puzzle task than did participants who did not have to exert self-control during the initial task (participants were allowed to eat the chocolate). Webb and Sheeran (2003, Experiment 2) induced ego-depletion by asking participants to perform a dual balance-and-maths task that required considerable self-control (or not). Participants then either formed or did not form an implementation intention in relation to a subsequent Stroop colour-naming task. Consistent with previous research, ego-depleted participants performed worse on the Stroop task than did non-depleted controls. However, the effect of ego-depletion was eliminated when participants had formed implementation intentions. Participants who formed if-then plans were as fast and accurate in their Stroop performance as were participants who had not been ego-depleted. These findings are consistent with the idea that implementation intentions are 'efficient' in terms of people's willpower. Even when participants' capacity for self-control was substantially diminished, forming an implementation intention still benefited task performance: 'Ego-fatigo'¹ is no barrier to implementation intention effects.

The third feature of automaticity relevant to the operation of implementation intentions concerns *lack of awareness*. Two aspects of this feature have been investigated, one related to the anticipated situation and the other related to the underlying goal intention. Bayer *et al.* (2002) obtained evidence that awareness of the specified cue is not required for implementation intention effects. Study 1 used a retaliation paradigm wherein participants who had been insulted by an experimenter during an initial study were encouraged to form a goal intention to complain to the rude experimenter. In addition, a subset of participants formed implementation intentions ('As soon as I see this person again, I'll tell her what an unfriendly person she is!'). In a second ostensibly unrelated study, participants had to read a series of positive and negative adjectives used to describe people as quickly as possible. However, 100 milliseconds before each adjective, either the face of the unfriendly experimenter or a neutral face was presented subliminally (participants were not consciously aware of the presentation because the face was pattern masked and appeared for only 10 milliseconds). Findings indicated that participants who formed implementation intentions to tell the unfriendly experimenter what they thought of her exhibited slower responses to positive adjectives and faster responses to negative adjectives following subliminal presentation of a picture of the unfriendly experimenter compared to the neutral face. These findings were not obtained among participants who only formed goal

intentions or a second control group who had not been insulted. Thus, awareness of the critical cue is not needed for that specified situation directly to elicit cognitive responses that are consistent with the intended action. Moreover, Bayer *et al.*'s (2002) second study went beyond the activation of relevant cognitive responses, and demonstrated that the specified behavioural responses were initiated even though participants were not aware of the critical situation. Participants who formed an implementation intention to respond especially quickly to triangles in a classification task involving geometric figures showed enhanced performance following subliminal presentation of a triangle but not following subliminal presentation of another symbol.

Sheeran *et al.* (2005, Study 2) examined whether participants need be consciously aware of the goal underlying implementation intentions. Participants were given the conscious task goal to solve a series of puzzles as accurately as possible and they formed either an implementation intention to solve the puzzles quickly (relevant implementation intention condition) or they formed an irrelevant implementation intention. In addition, the goal to respond quickly was primed outside participants' awareness (using a word-recognition task that contained words related to being quick such as 'fast' and 'rapid', cf. Bargh *et al.* 2001), or a neutral goal was primed. Debriefing indicated that participants were not aware of the situational activation of the goal to respond quickly; participants did not recognize a theme to the words in the priming task, nor did they believe that the priming task could have affected their performance on the puzzles. However, despite this lack of awareness of the respective goal, implementation intentions effects were contingent upon the presence of that goal. There was a significant interaction effect on how quickly the puzzles were solved such that solution times were fastest when participants had been primed with the goal to respond quickly and had formed the relevant implementation intention to respond quickly. Participants did not have to be consciously aware of the superordinate goal intention for implementation intentions to affect behavioural performance. In sum, these findings indicate that action initiation by implementation intentions is immediate, efficient, and does not require conscious intent. Forming an if-then plan automates the specified goal-directed response.

2.3 Implementation intentions and overcoming volitional problems in goal pursuit

When people have only formed goal intentions, inadequate activation or elaboration of those intentions can generate volitional problems that undermine goal pursuit – and give rise to inclined abstainers rather than inclined actors. However, these problems can be overcome by the enhanced cue accessibility and automaticity of action initiation engendered by implementation intentions. Forming an implementation intention promotes goal achievement because the person is perceptually ready to encounter the situational cues specified in the if-component of the plan, and because these

cues evoke the specified *then* response swiftly and without the need for conscious awareness or effort.

2.3.1 Problems of intention elaboration

Forming an implementation intention elaborates a goal intention because if-then plans specify the behaviour that one will perform in the service of the goal and the situational context in which one will perform it. Whereas the person who has only formed a goal intention still has to identify the specific action(s) that will be effective in achieving their goal *and* identify a good opportunity in which to enact it, all of this work is finished when the person has formed an implementation intention: the plan specifies the *when*, *where*, and *how* of goal achievement in advance. This means that good opportunities to initiate a behaviour that leads to goal attainment are recognized swiftly and precisely, rather than missed. Moreover, encountering a good opportunity instigates action in an immediate and effortless fashion instead of generating deliberation about what behaviour one should perform and/or the need to energize oneself to perform it.

2.3.2 Problems of intention activation

Implementation intentions also help to circumvent problems associated with the activation level of the superordinate goal intention. This is because if-then plans delegate control of behaviour to specified situational cues that serve to elicit action directly. People do not have to devote conscious efforts to being watchful for the critical situation or to remembering their goal intention; the specified cues attract and focus attention (e.g. Gollwitzer *et al.* 2002b; Webb and Sheeran 2004a) even when the goal is not available to conscious awareness (Sheeran *et al.* 2005). This contrasts with the predicament of the person who has only formed goal intentions who must maintain the activation level of the intention in the face of multiple and often competing goals (and is vulnerable to prospective memory failure and goal reprioritization). Although recent research indicates that constructs such as anticipated regret (e.g. Abraham and Sheeran 2003) and temporal stability of intention (e.g. Conner *et al.* 2000; Sheeran and Abraham 2003; see Sheeran 2002 and Cooke and Sheeran 2004 for reviews) provide reliable moderation of the intention-behaviour relation, studies to date suggest little that the person could *deliberately* or strategically do to maintain the activation level of his/her intention (over and above cognitive rehearsal of that self-instruction and/or deployment of mnemonic devices such as diaries or knotted handkerchiefs).

Interestingly, however, recent research has explicitly tested whether implementation intentions can be used to help people overcome contextual threats that usually undermine intention activation and obstruct goal achievement. Three particular contextual threats warrant discussion, namely, situational priming of goals that are antithetical to focal goal pursuit, the presence of attractive distractions, and detrimental self-states such as tiredness or boredom. Sheeran and Webb (2003) tested whether forming an implementation intention to respond quickly to a critical target

in a lexical decision task could withstand non-conscious activation of the antithetical goal of responding slowly. Findings showed that whereas performance on non-critical targets was significantly affected by the priming procedure (i.e. participants who had been primed with slowness responded more slowly to non-critical targets than did control participants), the prime had no impact on targets specified in participants' implementation intentions. Equivalent findings were obtained by Gollwitzer (1998) in two studies. The first study showed that participants who had only formed goal intentions in relation to a focal task were susceptible to priming of the goal of cooperation (the prime caused participants to spend time away from the task being helpful). However, when participants had formed an implementation intention in relation to task performance, goal priming had no impact on the amount of time spent helping another person. The second study showed that forming an implementation intention to drive both quickly and accurately overcame situational activation of the goal of 'moving fast' on speed and error rate in a driving simulator. Thus, implementation intentions may be used to offset the impact of situations that activate task-inhibiting or alternative goals – the strategic automaticity of if-then plans can overcome the automatic activation of antithetical goals.

Gollwitzer and Schaal (1998) examined whether implementation intentions could overcome the impact of attractive distractions on the time it took to solve boring arithmetic problems. The arithmetic problems were presented on a computer upon which was mounted a video monitor that played award-winning commercials at particular intervals. All of the participants formed goal intentions to deal with the distractions; in addition, subsets of participants formed implementation intentions either to concentrate on the maths task whenever the commercials were playing (task-facilitating plan) or to ignore the commercials when they played (temptation-inhibiting plan). Inspection of the mean time needed to solve each problem revealed that the temptation-inhibiting implementation intention, in particular, was very effective in overcoming the detrimental effects of distraction. Similar findings were obtained in a study by Milne and Sheeran (2003) that examined the impact of tiredness and boredom on task persistence. Participants worked on a very tedious task that involved clicking a computer mouse each time a circle did not illuminate in sequence. Participants worked on this task for 20 minutes under three conditions; no implementation intention (control), a task-facilitating implementation intention ('When I feel bored or tired, then I will get on with my work'), or a temptation-inhibiting implementation intention ('When I feel bored or tired, then I will ignore it'). Persistence was indexed by the time it took participants to miss two sequences in a row. Findings indicated that participants who formed temptation-inhibiting plans persisted for almost the full 20 minutes on average, whereas control and task-facilitating participants both persisted for only 15 minutes.

In sum, there is good evidence that implementation intentions provide an effective strategy for overcoming contextual threats to intention activation that may undermine the realization of one's goal intentions. If-then plans

prove useful (a) whether the threat is within, or outside, conscious awareness and (b) whether the threat resides in the environment or is an internal self-state.

3 Summary of research

3.1 Meta-analytic reviews

Because implementation intentions facilitate identification of good opportunities to act, and initiate action automatically when those opportunities are encountered, forming an implementation intention should make it more likely that decisions become a reality compared to only forming a goal intention. The overall impact of implementation intentions on behavioural performance and goal achievement has been tested in three meta-analyses (Koestner *et al.* 2002; Sheeran 2002; Gollwitzer and Sheeran 2003). The effect size estimate used in each case was d_+ which is the sample-weighted difference between means for an implementation intention condition versus a control condition divided by the within-group standard deviations. According to Cohen's (1992) power primer, $d_+ = 0.20$ should be considered a 'small' effect size, $d_+ = 0.50$ is a 'medium' effect size, whereas $d_+ = 0.80$ is a 'large' effect size (these values equate to sample-weighted average correlations of 0.10, 0.30, and 0.50, respectively). Figure 7.1 presents the effect sizes obtained in the three reviews.

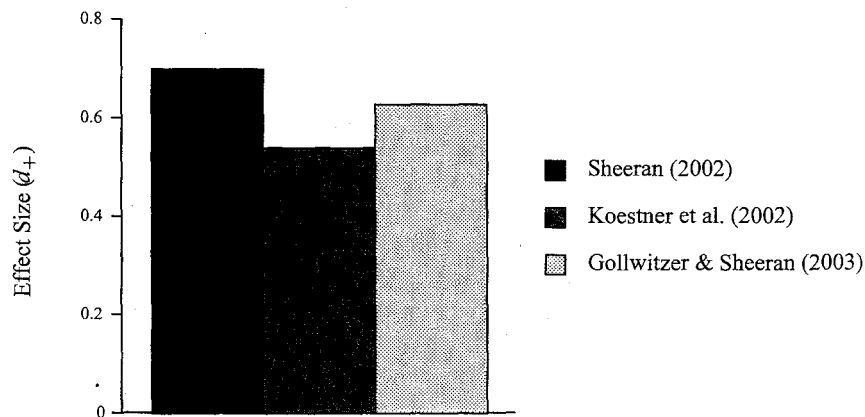


Figure 7.1 Effect sizes in three meta-analyses of the impact of implementation intentions on goal achievement

Sheeran (2002) meta-analysed the first 15 studies of implementation intentions ($n = 1611$) and obtained an effect size of medium-to-large magnitude, $d_+ = 0.70$. Koestner *et al.* (2002) reviewed 13 studies ($n = 826$) and obtained $d_+ = 0.54$. However, the most comprehensive review was conducted by Gollwitzer and Sheeran (2003) and involved 85 studies and a total of sample of 8155 participants. This meta-analysis showed that

implementation intentions have an effect of medium size on behavioural enactment and goal attainment, $d_+ = 0.63$. Thus, forming an implementation intention makes an important difference to whether or not desired outcomes are obtained compared to the formation of a goal intention on its own.

Several features of Gollwitzer and Sheeran's (2003) analysis serve to underline the efficacy of implementation intentions in promoting goal achievement. First, the review does not suffer from publication bias. Sixty per cent of the studies reviewed were unpublished; moreover, publication status had no impact on the effect size obtained for implementation intentions. Second, 91 per cent of studies involved experimental designs (i.e. random assignment of participants to implementation intention versus control conditions), which increases confidence in the findings. It was also the case that the effect sizes obtained in correlational and experimental studies were equivalent. Third, the composition of the sample did not moderate implementation intention effects. If-then plans were similarly effective in promoting goal achievement among students, members of the general public and people with physical illness. Finally, the efficacy of implementation intentions was not exaggerated by over-reliance on self-report measures of behaviour. In fact, the effect size for implementation intentions increased to $d_+ = 0.72$ in the 52 studies where objective measures of performance were employed. In sum, implementation intentions benefited performance no matter how one looks at the data.

3.2 Narrative review of health behaviours

Relatively little research has used implementation intentions to understand or promote health behaviour change. Only 12 health behaviour studies were published or in press at the time of writing (July 2004). Research to date has examined both health-protective behaviours (exercise, diet, vitamin intake, safety training, and cancer screening) and health-risk behaviours (binge drinking and smoking) and used a variety of samples and measures of behaviour (see Table 7.1). Empirical tests of the benefits of implementation intentions in promoting health behaviours generally have adopted a paradigm wherein all participants complete questionnaire items designed to measure constructs from motivational theories such as the TPB and PMT and are then randomized to conditions where participants complete questions designed to induce implementation intention formation (or they do not complete these questions). Performance of the health behaviour is measured at a later time-point.

3.2.1 Exercise

Three studies examined the impact of implementation intentions on exercise behaviour. Milne *et al.* (2002) randomized $n = 248$ student participants to three conditions: a no-intervention control group, an intervention based on PMT, and the PMT intervention augmented by implementation intentions. Participants in the implementation intention condition were

Table 7.1 Applications of implementation intentions to health goals

<i>Research area</i>	<i>Researchers</i>
<i>Promoting health-protective behaviours</i>	
Exercise	Milne, Orbell, and Sheeran (2002), Prestwich, Lawton, Conner (2003a), Rise, Thompson, and Verplanken (2003)
Diet	Kellar and Abraham (2003), Armitage (2004) Verplanken and Faes (1999)
Cancer screening	
Breast self-examination	Orbell, Hodgkins, and Sheeran (1997)
Testicular self-examination	Milne and Sheeran (2002a)
Attendance for breast screening	Steadman, Rutter and Quine (2003)
Attendance for cervical screening	Sheeran and Orbell (2000)
Pill intake	Sheeran and Orbell (1999), Steadman and Quine (2000)
<i>Reducing health-risk behaviours</i>	
Smoking	Higgins and Conner (2003, 2004)
Alcohol consumption	Murgraff, White and Phillips (1996), Webb and Sheeran (2004b)

instructed to complete the following statement: 'During the next week I will partake in at least 20 minutes of vigorous exercise on _____ (day or days) at _____] (time of day) at or in _____ (place)'. Measures of PMT cognitions and behaviour were taken at three time-points over a two-week period. The two PMT groups both showed significant differences in threat appraisal, coping appraisal and goal intention compared to controls following the intervention. However, despite the fact that the PMT intervention-only group exhibited a substantial difference in intention to exercise compared to the control group, there were no differences between the groups in self-reported exercise during the final week of the study. In contrast, participants who had received the PMT intervention and had formed an implementation intention exercised significantly more often compared to both the PMT-only and control groups – even though intention scores among this group were the same as the PMT-only condition. Differences between conditions were much more dramatic when the exercise data were analysed in terms of the percentage of participants who exercised at least once. Whereas only 38 per cent of the control group and 35 per cent of the PMT-only group exercised at least once, fully 91 per cent of participants who formed if-then plans did so.

Prestwich *et al.* (2003a) conducted a similar study but with two important refinements. First, their study involved a full 2 (motivational intervention: decision balance sheet vs control) \times 2 (implementation intentions: formed vs not formed) design. Second, Prestwich *et al.* employed an

objective measure of fitness (average heart rate while jogging over a fixed distance) as well as two self-reports of exercise behaviour (frequency and duration). The motivational intervention involved completing a decision balance sheet that reflected anticipated gains and losses to self and others that would accrue from increasing exercise by two sessions per week. The implementation intention manipulation asked participants to specify the time, place and type of exercise they would undertake. Findings from the behavioural follow-up taken two weeks post-baseline indicated that participants who had both completed the decision balance sheet and formed an implementation intention exhibited significantly greater change in frequency of exercise, duration of exercise, and fitness level compared to controls (see also Rise *et al.* 2003, for a similar conclusion).

3.2.2 Diet

Verplanken and Faes (1999) conducted the first test of the efficacy of implementation intentions in promoting a healthy diet. Student participants ($n = 100$) were asked to form implementation intentions to eat healthily on one particular day in the next five days (i.e. plan exactly what they would eat and drink during the specified day). Participants in the control condition did not form this plan. All of the participants were asked to keep a diary for five days in which they recorded everything they ate and drank. As expected, ratings by a dietician (who was blind to the purpose of the study) indicated that participants who formed implementation intentions ate significantly more healthily than did participants who had not planned when and how to eat healthily. Kellar and Abraham (2003) obtained similar findings with respect to students' recommended daily intake of fruit and vegetables over a one-week period.

Armitage (2004) tested the efficacy of implementation intentions in promoting a low-fat diet among a sample of 264 company employees. A well-validated food frequency index was used to assess behaviour over a one-month period (Margetts *et al.* 1989). Participants in the experimental (implementation intention) group received the following instruction at the end of a TPB questionnaire about eating a low-fat diet: 'We want you to plan to eat a low-fat diet during the next month. You are free to choose *how* you will do this, but we want you to formulate your plans in as much detail as possible. Pay particular attention to the situations in which you will implement these plans.' (Blank lines were presented so that participants could write in their plans.) The food frequency measure was used to compute three indices of dietary intake: total fat intake, saturated fat intake, and fat intake as a proportion of total energy intake. Within-participants analyses indicated that participants who formed implementation intentions showed significant reductions in fat intake at follow-up compared to baseline according to all three indices. Participants who had not formed implementation intentions, on the other hand, exhibited no change over the one-month period. Moreover, between-participants analyses indicated that although there were no differences between the groups at baseline, the diet of participants in the experimental group was

significantly lower in fat (according to all three indices) than was the diet of control participants. These findings indicate that a simple instruction to form an implementation intention can be effective in promoting a healthy diet among representative samples.

Sheeran and Milne (2002) took a different approach to using implementation intentions to promote healthy eating. Instead of asking participants to plan what healthy foods they would eat, participants were asked to halve their consumption of an unhealthy snack food by planning to consume the foodstuff only on particular occasions. The idea was that participants would probably be unwilling to try to eliminate the foodstuff from their diet and, therefore, an effectual implementation intention would need to respect participants' pre-commitment to indulgence. All of the participants nominated foodstuffs (e.g. burgers, chips, chocolate) and completed a TPB questionnaire concerning their beliefs about halving their consumption of the nominated foodstuff over the following week; in addition, a subset formed implementation intentions. Findings from two studies indicated that forming if-then plans to engage in moderate indulgence significantly reduced self-reported snack food consumption over a one-week period.

3.2.3 Cancer screening

The first test of the efficacy of implementation intentions in promoting health-protective behaviour concerned breast self-examination (BSE; Orbell *et al.* 1997). Orbell *et al.* asked one-half of their sample ($n = 155$) to specify when and where they would perform a BSE in the next month; the other half did not form an if-then plan. Findings indicated that implementation intention participants were significantly more likely to perform an exam than were control participants (rates were 64 per cent and 14 per cent, respectively). This group difference was even greater when data from participants with strong goal intentions were analysed separately ($n = 33$); here 100 per cent of participants who formed implementation intentions conducted a BSE compared to just 53 per cent of the control participants.

Two studies investigated whether implementation intentions could be used to increase attendance at cancer screening appointments provided by the health service. Sheeran and Orbell (2000) asked half of their sample ($n = 114$) to form an implementation intention that specified when, where and how they would make an appointment to attend for cervical cancer screening. Screening attendance was determined from medical records three months later. Findings indicated that whereas 68 per cent of the women who did not form an implementation intention attended, this figure rose to 92 per cent among women who formed if-then plans. Steadman *et al.* (2004) examined attendance at breast screening (mammography) clinics ($n = 1894$). Participants were randomly allocated to one of three conditions: (a) an intervention condition where participants were asked to form implementation intentions designed to overcome three barriers to attendance (i.e. arranging time off work, travelling to the clinic, or changing the appointment), (b) a no-intervention control condition, and (c) a second control condition that did not receive a questionnaire. Medical records

indicated that the intervention had no overall impact on attendance rates; rates were approximately 80 per cent in all three groups. However, when findings were analysed separately for participants who had completed the section of the questionnaires designed to induce implementation intentions (i.e. participants who had formed if-then plans), the rate increased from 80 per cent to 92-96 per cent depending on the barrier for which the implementation intention was formed.

3.2.4 Pill intake

Three studies examined regular intake of vitamin pills among college students as a behavioural analogue for medication adherence. Sheeran and Orbell (1999, Study 1) gave participants bottles of vitamin pills and asked them to complete questionnaires based on the TPB about taking vitamins. The implementation intention manipulation asked participants to write down when and where they would take a pill each day. Behaviour was measured by self-report and pill count at 10 days and three weeks post-baseline. Findings indicated that implementation intentions had no discernible impact on the number of missed pills at 10 days - consistent with the idea that motivation can satisfactorily promote behaviour in the short term. However, by three weeks, participants who had formed implementation intentions missed significantly fewer pills than did controls. A second study confirmed the significance of this difference between implementation intention and control groups at three weeks. Moreover, this finding was replicated in an independent study (Steadman and Quine 2000). These results suggest that implementation intentions represent a promising means of helping people with physical illness to take their medication regularly and on time.

3.2.5 Binge drinking

Murgraff *et al.* (1996) used implementation intentions to try to reduce binge drinking among college students. Participants were presented with six possible statements that they could use to refuse a drink (e.g. 'No thanks. I do not want to get drunk. I would rather have just a few tonight') and were asked to choose which one they would use. In addition, participants were asked to 'specify the appropriate time and place in which [their] chosen response would be executed'. Compared to a control group who did not form this plan, the experimental group reported drinking significantly less frequently and showed a significantly greater reduction in drinking frequency over a two-week period. Webb and Sheeran (2004b) obtained equivalent findings in a study that used accessibility of drinking behaviour (assessed by response latencies to the action word *drinking* in a verb verification task) as the dependent variable. Participants formed an implementation intention to distract themselves every time they thought about drinking (or did not). In addition, the goal of socializing was activated by asking participants questions about their social lives or an irrelevant goal was activated. Despite the fact that participants were unaware of the activation of the goal and did not believe goal activation could have

influenced their performance on the verb verification task, findings indicated that implementation intentions significantly reduced mental readiness to drink when participants had been primed with the goal to socialize.

3.2.6 *Smoking*

Two studies have examined the power of implementation intentions to prevent smoking initiation in adolescents. A pilot study by Higgins and Conner (2003) examined smoking initiation over an eight-week period. The experimental group formed an implementation intention about how to refuse an offer of a cigarette while the control group formed an implementation intention in relation to schoolwork. Both groups received a persuasive message against smoking. Results indicated that none of the non-smokers (0 per cent) in the experimental condition ($n = 51$) went on to try smoking during the eight weeks whereas 6 per cent of non-smokers in the control condition ($n = 53$), tried smoking in this period. Although these findings are suggestive, the modest sample size precluded statistically significant differences. Higgins and Conner (2004) used a similar design to examine smoking initiation in a larger sample over a period of two years. Adolescents completed questionnaires, read a persuasive message against smoking, and formed an implementation intention to avoid smoking or complete their schoolwork every six months. Findings showed lower levels of self-reported and objectively measured smoking in the relevant implementation intention group across time.

4 **Developments**

The first question that should be asked about the concept of implementation intentions is: *do* implementation intentions facilitate the translation of intentions into action? Findings from studies in social and health psychology and meta-analyses of those studies would seem to indicate that the answer to this first question is 'yes'. Strategic automatization of goal-directed responses appears to be of considerable benefit in helping people achieve intended performances and outcomes. However, two other questions also should be asked of the concept in order to gain a more complete understanding of how implementation intentions can be used to promote health behaviours, namely, *why* do implementation intentions facilitate translation of intentions into action, and *when* do implementation intentions facilitate translation of intentions into action? Answers to these questions can be gleaned from recent research on mediators and moderators of implementation intention effects, respectively.

4.2 *Mediators of implementation intention effects*

Two processes are thought to explain the efficacy of forming if-then plans in improving the likelihood of goal attainment compared to only forming a respective goal intention (Gollwitzer, 1993, 1996, 1999; see Section 2). First, implementation intentions promote identification of good

opportunities to act. This is supported by demonstrations that implementation intentions increase the accessibility of situational cues (specified in the *if* component of the plan) and that detection of, and attention to, the critical situation is thereby facilitated (Aarts *et al.* 1999; Gollwitzer *et al.* 2002b; Webb and Sheeran 2004a). Second, implementation intentions automate the execution of the goal-directed response (specified in the *then* component of the plan). This is supported by demonstrations that initiation of behaviour in the presence of the critical situation is immediate, efficient, and does not require conscious awareness (Gollwitzer and Brandstätter 1997; Lengfelder and Gollwitzer 2001; Brandstätter *et al.* 2001; Bayer *et al.* 2002; Webb and Sheeran, 2004a, Sheeran *et al.* 2005). The mere formation of a goal intention is not sufficient to produce these effects – the person still has to identify appropriate opportunities and goal-directed behaviours and then mobilize the self to act. Action control in this mode is slow by comparison and requires conscious attention and effort.

Implementation intentions seem to operate in a similar manner to habits and, in fact, the automaticity of implementation intention effects is echoed by demonstrations that habitual behaviour is immediate, efficient, and occurs outside awareness (Aarts and Dijksterhuis 2000a, 2000b; Sheeran *et al.* in press). There are also important parallels between implementation intentions and habits in terms of their underlying mechanism. In both cases, strong associations have developed between particular situational cues and particular goal-directed responses. However, the origins of these strong associations are different. In the case of habits, frequent and consistent performance of a behaviour in a particular context means that strong links develop between the context and the behaviour. In the case of implementation intentions, the same linkage is achieved by getting participants to form this association mentally in an act of will. Hence, the automaticity of implementation intentions is *strategic* and serves the person's current goals whereas the automaticity in habits may be counter-intentional (Gollwitzer and Schaal 1998; Sheeran *et al.* 2005).

Similar to habits, there are two potential mediators of the implementation intention-behaviour relation, namely, the accessibility of the situational cues (opportunities) and the strength of the cue-response associations (opportunity-action links). To demonstrate mediation, the following four conditions need to be satisfied (Baron and Kenny 1986; Kenny *et al.* 1998): first, participants who form implementation intentions should exhibit greater accessibility of situational cues and cue-behaviour associations compared to participants who only form goal intentions. Second, implementation intentions should affect goal achievement. Third, the proposed mediators should be associated with goal achievement. Finally, in a simultaneous regression, the impact of implementation intentions on goal achievement should be attenuated whereas the effect of cue accessibility and cue-behaviour associative strength should remain significant.

The following two studies have tested mediation. Aarts *et al.* (1999) tested whether participants who formed an implementation intention in relation to collecting a coupon later in the experiment showed greater

accessibility of situational cues relevant to the location of the room where the coupon should be collected (i.e. faster responses to cues in a lexical decision task). Consistent with predictions, words related to the critical situation (e.g. 'corridor') were more accessible among participants who formed if-then plans (see Section 2.2.1). Importantly, however, Aarts *et al.* also tested whether or not participants collected the coupon. Two aspects of the procedure made collection difficult: (a) collection of the coupon was delayed while participants completed other tasks (such as the lexical decision task) which meant that participants could forget about coupon collection, and (b) participants were instructed to hurry to a location to complete another task in a manner that meant participants had to interrupt pursuit of this goal in order to go to the room where the coupon was located. These procedures seemed to have been effective in obstructing goal achievement. Whereas only 50 per cent of controls who had only formed goal intentions collected a coupon, 80 per cent of participants who formed implementation intentions did so. Thus, implementation intentions affected both cue accessibility (the mediator) and goal achievement. Further analyses indicated that there was a strong relationship between cue accessibility and whether or not participants collected the coupon. Finally, a simultaneous regression of goal achievement on both the mediator and condition indicated that the beta for cue accessibility was significant whereas the effect of forming an implementation intention was reduced to non-significance. In sum, Aarts *et al.*'s (1999) study provides good evidence that the accessibility of situational cues mediates (explains) the impact of implementation intentions on goal achievement.

However, Aarts *et al.*'s experiment did not test the potential mediating role of the strength of cue-response associations. These associations constitute a key parallel between how implementation intentions operate and how habits operate (i.e. situational activation of goal-directed behaviours). Webb and Sheeran (2004c) therefore conducted a replication and refinement of Aarts *et al.* (1999) to provide a simultaneous test of the importance of the accessibility of situational cues and the strength of cue-behaviour links in mediating action control by implementation intentions. The study replicated the key features of the coupon collection paradigm; the main innovation was using a sequential priming procedure in the lexical decision task. This procedure involved the following sequence. Participants were presented with a fixation dot for 1500 milliseconds followed by a priming word for 17 milliseconds. Then a mask was presented immediately to prevent participants from recognizing the priming word. Finally, the target word was presented (participants responded 'yes' or 'no' to whether the target was a word using a button box). The priming words were related to the location of the coupon (e.g. 'corridor', 'right') or were matched neutral words. The target words were the specified behaviour ('collect'), an unrelated behaviour ('confirm'), the location words (cues), and filler words. In this way, it was possible to determine the impact of implementation intentions on both cue accessibility (response latencies to *neutral prime-location cue* targets) and the strength of cue-behaviour links (response

latencies to *location prime-specified behaviour* targets) and all other prime-target combinations.

Findings showed, first, that participants who formed implementation intentions were significantly more likely to collect the coupon than were participants who only formed goal intentions (64 per cent versus 39 per cent). Second, participants who formed if-then plans exhibited faster responses both to specified situational cues and to the specified behaviour primed by the respective critical situations in the lexical decision task compared to control participants (there were no differences between the groups on any of the other targets). Third, accessibility of situational cues and the strength of cue-response associations were both strongly associated with coupon collection. Finally, simultaneous regression analyses showed that cue accessibility and cue-behaviour associative strength both reduced the effect of forming implementation intentions on behaviour to non-significance. Thus, both heightened accessibility of the specified opportunity and strong opportunity-action links mediated the impact of if-then plans on coupon collection. These findings support theoretical predictions about the processes underlying action control by implementation intention (Gollwitzer 1993), and provide the best evidence to date that enhanced identification of critical cues and automated execution of behaviour are the mechanisms by which implementation intentions promote goal achievement.

Webb and Sheeran's (2004c) findings also serve to undermine the idea that implementation intention effects can be explained in terms of motivational processes. In fact, there are four lines of evidence that indicate that goal intentions, self-efficacy or other motivational constructs are not responsible for this mode of action control. First, there is no empirical support for the idea that forming if-then plans increases goal intentions or self-efficacy/perceived behavioural control. Several studies measured motivational variables specified by the TPB or PMT both prior to, and after, the formation of an implementation intention – either before the measure of behaviour (Sheeran and Orbell 1999) or at the same time as the measure of behaviour (Orbell *et al.* 1997; Milne *et al.* 2002; Sheeran *et al.* in press). Regardless of when the second measurement of motivation was taken, there were no differences in goal intentions or other motivational constructs either within the implementation intention group or between the implementation intention and control groups. Second, implementation intentions significantly affected the likelihood of goal achievement even when almost all of the participants scored at the top of the scale measuring goal intentions (e.g. Verplanken and Faes 1999; Sheeran and Orbell 2000). Clearly, these findings would be impossible if goal intentions and implementation intentions referred to the same concept. Third, it is well established that the relationship between goal intentions and behaviour is substantially reduced when the time interval between the measurement of intentions and behaviour increases. For example, a meta-analysis by Sheeran and Orbell (1998) found that the correlation between intention and condom use was significantly smaller when the time interval was less than versus greater than

one month (r s were 0.33 and 0.44, respectively). However, Sheeran and Silverman (2003) found no difference in the effectiveness of implementation intentions whether or not the specified behaviour was to be performed within or after one month. Indeed, Sheeran and Orbell (1999, Study 1) found that the effectiveness of implementation intentions increased over time while Milne and Sheeran (2002a) showed significant implementation intention effects after one year. Thus, implementation intentions do not follow the temporal trajectory of goal intention effects. Finally, a reanalysis of data from Webb and Sheeran (2003, Experiment 1) indicated that participants who formed implementation intentions exhibited greater task persistence than ego-depleted participants even though both groups had equivalent low scores on the 'Reduced Motivation' subscale of the Multi-dimensional Fatigue Inventory (MFI-20; Smets *et al.* 1995). In sum, motivation is not the mechanism by which implementation intentions promote goal achievement. Instead, as Webb and Sheeran (2004c) have shown, accessibility of situational cues and the strength of cue-response links are the explanatory processes.

4.2 Moderators of implementation intention effects

Several factors are likely to determine how strongly implementation intentions affect goal achievement. The first key moderator of implementation intentions effects concerns the presence of a self-regulatory problem. If enacting a behaviour is easy and there are few obstacles to performance, then motivational factors (e.g. goal intentions, self-efficacy) should satisfactorily promote action; little additional benefit can be obtained from forming an implementation intention. A good example is Webb and Sheeran's (2003, Experiment 2) analysis of the impact of ego-depletion and implementation intention formation on Stroop performance. Webb and Sheeran found that implementation intentions had a strong effect on task speed and accuracy when participants were ego-depleted. However, when participants were not ego-depleted, implementation intentions did not affect performance – because participants possessed sufficient self-regulatory capacity to perform the task well (see also Lengfelder and Gollwitzer 2001). Similarly, Prestwich *et al.* (2003b, Study 2) found that implementation intentions were least effective in promoting performance among participants who scored high on conscientiousness as a personality trait. Finally, Gollwitzer and Brändstatter (1997, Study 1) used participants' ratings to divide goals into 'easy' versus 'difficult' categories and found that implementation intentions only affected the achievement of difficult goals. These findings all seem to indicate that implementation intention effects are only likely to emerge when the focal behaviour presents a volitional challenge. However, these findings also imply that implementation intentions are most likely to benefit behavioural performance when the task is difficult or when people have difficulty regulating their behaviour.

A second important moderator of action control by implementation intentions is the activation and the strength of the superordinate goal

intention. Goal intentions should affect the relationship between if-then plans and goal achievement for three reasons. First, goal intentions are likely to determine the availability, accessibility and elaboration of situational cues and cue-behaviour associations that underlie action control by implementation intentions. Availability will be affected because people who do not intend to perform a health behaviour are unlikely to form an implementation intention that promotes behavioural performance even when they are asked to do so; hence, the relevant opportunity and opportunity-action link will not be present or *available* in memory (cf. Higgins 1996). This availability hypothesis is supported by a reanalysis of Sheeran and Silverman (2003) that showed that 89 per cent of participants who did not intend to go to a health and safety training session failed to formulate an implementation intention despite being instructed to do so. Accessibility of situational cues and cue-behaviour associations is likely to be affected because intention strength should influence how well people encode both the specified situational cue and the link between the cue and response. Depth of encoding of the specified cue and cue-behaviour association should affect the accessibility of these constructs and, thereby, the strength of implementation intention effects. Finally, goal intentions should affect the degree of elaboration of the implementation intention because people with strong goal intentions are likely to give greater time and consideration to ensuring that the specified opportunity is a good one and to ensuring that the response will be effective in achieving the superordinate goal. Consistent with this idea, Sheeran and Armitage (2003) found that the strength of respective goal intentions predicted how well specified were participants' implementation intentions with respect to the *when*, *where*, and *how* of goal achievement while Rise *et al.* (2003) demonstrated that the degree of specification in the implementation intention predicted the extent to which people performed the target behaviour.

The second reason for believing that action control by implementation intentions depends upon activated and strong goal intentions derives from Aarts and Dijksterhuis's (2000a, 2000b) demonstrations that the cue-response associations that characterize the operation of habits depend upon the activation of a relevant goal. Their studies showed that the automaticity in travel habits was not a mechanistic elicitation of behaviour in the presence of relevant environmental cues. Rather, automaticity of habitual responding was only observed when participants had been primed with the goal to travel (see also Sheeran *et al.* in press). Given the strong parallels between implementation intentions and habits, there are, therefore, good grounds for believing that the situational cues specified in implementation intentions will only elicit goal-directed behaviour as long as the goal that the behaviour serves is activated and strong, i.e. the automaticity in if-then plans should be goal-dependent (cf. Bargh, 1992, 1994).

This brings up the third reason why goal intentions are important. Implementation intention effects could be dysfunctional if this mode of action control did not respect people's goal intentions in a flexible manner. For example, forming an implementation intention to be witty at specified

opportunities during a future conversation could prove socially disastrous if one stuck to the plan despite learning that a tragedy has befallen one's companion. Clearly, for implementation intentions to be functional, this form of planning must be able to account for the state (activation, strength) of the respective goal intention.

In fact, empirical findings indicate that strong effects of implementation intentions are contingent upon the presence of strong superordinate goal intentions. For example, Orbell *et al.*'s (1997) study of BSE indicated that implementation intentions were especially effective in promoting performance among participants with positive intentions who formed if-then plans compared to all participants who formed if-then plans (rates were 100 per cent vs 64 per cent, respectively). Sheeran *et al.* (2005) conducted formal moderator analyses and found significant interactions between intention strength and implementation intentions in two studies. Simple slopes analyses for high, medium, and low levels of goal intentions indicated that implementation intentions only affected attendance at workplace health and safety training sessions or the amount of independent study students undertook when participants' goal intentions strongly favoured the behavioural performance. Similarly, Koestner *et al.* (2002) obtained evidence consistent with the idea that implementation effects were especially effective when participants' goal intentions were more self-concordant compared to less self-concordant.

Two studies either activated or deactivated the respective goal intention in order to test the goal-dependency of implementation intentions. An unpublished study by Seehausen, Bayer and Gollwitzer (1994, cited in Gollwitzer 1996) tested participants' memory for situational cues specified in their implementation intentions after a short (15 minutes), or long (48 hours) delay. Findings showed good recall for the specified cues at both follow-ups – consistent with the idea that implementation intentions heighten the accessibility of those cues (Gollwitzer 1993). However, participants who were told that the goal intention would no longer have to be implemented (because other participants had supposedly taken on the task) showed poorer recall after the short delay and virtually no recall after 48 hours. Thus, the effect of implementation intentions on cue accessibility was no longer evident when the goal intention had been abolished by the experimenter. Sheeran *et al.* (in press, Study 2) obtained equivalent findings regarding the importance of goal activation using an objective measure of performance on a puzzle task. Formation of an implementation intention to respond quickly only affected response times when the goal to respond quickly had been activated by a priming procedure. When the conscious task goal to be accurate was active, implementation intentions had no impact on speed of performance. In sum, the state of the respective superordinate goal intention is an important moderator of action control by implementation intentions. Implementation intentions do not involve mechanistic elicitation of action by environmental cues – the superordinate goal must be activated and strong to engender automation of goal-directed responses. If-then plans, therefore, adjust to the goal adaptations that people make in response to

changing environmental circumstances. In this way, implementation intentions afford flexible, as well as tenacious, goal pursuit.

A third potential moderator of implementation intention effects is degree of implementation intention formation. Degree of implementation intention formation refers to processes related to formulating one's if-then plans that serve to enhance the accessibility of situational cues and the strength of cue-response links – and should thereby fortify implementation intention effects. Several factors relevant to this idea have been found to moderate the implementation intention-action relation. For example, Gollwitzer *et al.* (2002a) manipulated the strength of participants' commitment to their implementation intention by providing feedback from extensive personality tests that supposedly indicated that participants would benefit from sticking closely to their plans (high commitment) or would benefit from not rigidly adhering to the plan (low commitment). Findings from a cued recall paradigm indicated that the high-commitment group had superior memory for selected opportunities compared to the low-commitment group. Prestwich *et al.* (2003b) examined the efficacy of augmenting implementation intentions with (a) a positive statement about the benefits of planning, (b) cognitive rehearsal of the plan, or (c) the use of environmental cues (a reminder note). Findings indicated that cognitive rehearsal and environmental cues both enhanced the behavioural impact of implementation intentions compared to the positive statement manipulation. Milne and Sheeran (2002b) obtained evidence that rehearsal of the link between the specified cue and the specified response may be crucial. Participants who were instructed to concentrate on the cue-behaviour link when formulating their plan were much more likely to visit a target website than were participants who wrote their implementation intention on a reminder note and put it in a prominent place at home (rates were 87 per cent versus 40 per cent, respectively). Thus, although relatively few studies have tested indicators of degree of implementation intention formation, there is evidence that commitment and cognitive rehearsal both moderate the impact of if-then plans on goal achievement.

5 Operationalization of the model

5.1 Preliminary considerations

The paradigm adopted in most applications of implementation intentions to health goals has involved questionnaire measures of TPB/PMT constructs and past behaviour followed by random assignment to an experimental condition that contains questions designed to induce implementation intention formation or to a control condition that does not contain these questions. Of course, random assignment should ensure that participants in both conditions have equivalent previous experience with, and motivation to achieve, the goal. However, an advantage of taking measures of experience and motivation is that randomization checks can be conducted and any differences on these variables can be controlled in statistical

analyses. Relatedly, if the behavioural follow-up involves further direct contact with participants then measures of motivational variables could be taken at the same time as the measure of behaviour. These procedures allow researchers to conduct statistical analyses to ensure that the impact of implementation intentions on goal attainment is not attributable to pre-intervention differences in motivation or past behaviour or to potential differences in motivation accruing from the formation of the if-then plan.

Most health psychology studies have involved passive control conditions, i.e. participants in the no-implementation intention group have not been asked to complete questionnaire items of similar content or duration as participants in the experimental and control group. Strictly speaking, this procedure confounds the impact of the experimental manipulation with potential differences in expectancies and attentional demands between conditions. However, it is worth noting that studies that employed active control conditions wherein participants formed implementation intentions about what to do after they have accomplished their goal (e.g. Aarts *et al.* 1999) or formed plans regarding an irrelevant goal (e.g. Sheeran *et al.* 2005) obtained strong implementation intention effects as well. Nevertheless, it seems wise to employ an active control condition whenever possible in order to rule out alternative explanations of differences in behavioural performance or attained outcomes.

Not surprisingly, implementation intentions have greater impact on the achievement of health goals when participants complete the relevant section of the questionnaire designed to induce their formation than when participants omit that section (e.g. Sheeran *et al.* 2003; Steadman *et al.* 2003). Because implementation intention inductions usually ask participants to specify an appropriate opportunity and goal-directed response in an open-ended format, considerable care must be taken to ensure that participants do not skip relevant items. Answering open-ended questions can be perceived as onerous when participants have already completed a long questionnaire and have become used to ticking a box to indicate their response. To alleviate this potential problem, some studies have hinted at the benefits of forming an implementation intention in order to get participants to complete the respective section of the questionnaire (e.g. Orbell *et al.* 1997; Sheeran and Orbell 1999; Milne *et al.* 2002; Milne and Sheeran 2002a). Even though this procedure seemed likely to generate expectancies about the impact of planning, interestingly, none of these studies observed significant effects on subsequent motivation to perform the behaviour. In sum, careful consideration needs to be given to features of the overall questionnaire (e.g. length, order) and to the wording and layout of the implementation intention induction to ensure that participants engage with the process of forming an if-then plan.

5.2 The format of implementation intentions

Implementation intentions have the format 'If situation Y occurs, then I will initiate goal-directed behaviour Z!' The importance of using an if-then

format in wording the plan was demonstrated by Oettingen, Hönig, and Gollwitzer (2000, Study 3). All participants were provided with diskettes containing four concentration tasks and were asked to perform these tasks on their computers each Wednesday morning for the next four weeks. Participants in the control condition were asked to indicate what time they would perform the task by responding to the statement 'I will perform as many arithmetic tasks as possible each Wednesday at ____ (self-chosen time before noon)'. Participants in the implementation intention condition, on the other hand, indicated their chosen time by responding to the statement 'If it is Wednesday at ____ (self-chosen time before noon), then I will perform as many arithmetic tasks as possible!' The programme on the diskette recorded the time that participants started to work on the task from the clock on participants' computers.

Despite the apparent similarity between the control and implementation intention instructions, the conditional structure of the implementation intention had a dramatic impact on how closely participants performed the task to their intended time: the mean deviation from the intended start time was five times greater in the control condition (8 hours) compared to the implementation intention condition (1.5 hours). These findings indicate that using the defining if-then format in implementation intention inductions is important to ensure strong implementation intention effects.

5.3 A framework for operationalizing implementation intentions in relation to particular volitional problems

Implementation intention inductions invite people to specify a good opportunity to act in the *if* component of the plan and to specify an effective goal-directed response in the *then* component. The assumption is that people do not require a great deal of knowledge or insight to identify effective goal-directed behaviours or suitable moments to initiate that behaviour (Gollwitzer *et al.* 2005). Indeed, problems are likely to arise if opportunities or actions are imposed on the person forming an implementation intention because (a) imposed responses may be negatively evaluated, (b) imposed opportunities may not be perceived as suitable, and (c) the imposition may be resented such that motivation to pursue the goal is reduced or the person does not devote time or attention to formulating the plan; each of these considerations could diminish the impact of implementation intentions on goal pursuit.

It is useful, nonetheless, to draw together operationalizations of implementation intentions used in previous research to develop a broad framework for specifying what opportunities and goal-directed responses in if-then plans may help to overcome particular problems in translating intentions into action. Because it is difficult to anticipate the varieties of goals and associated self-regulatory problems researchers might wish to examine, this framework is not exhaustive. Rather, the framework tries to bring together the contents (opportunities, responses) in implementation intentions that proved useful in overcoming particular volitional problems

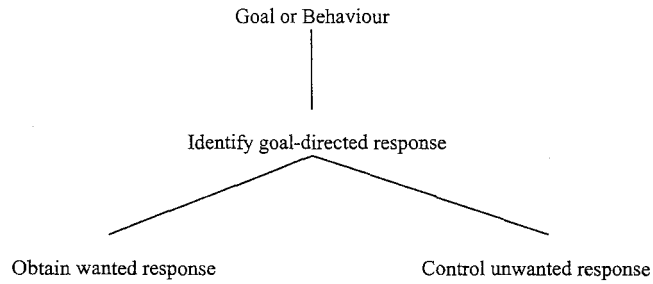
in previous research (see Sections 1.3 and 2.3; see also Gollwitzer, 1993, 1996, 1999; Sheeran 2002; Gollwitzer *et al.* 2005).

Figure 7.2 presents a schematization of the framework. Decisions about what opportunities and goal-directed responses might be specified in an implementation intention begin with consideration of whether the dependent variable is a goal (a desired outcome that can be achieved by performing a variety of behaviours) or a behaviour (single action) (see Panel A). If the dependent variable is a goal then an effective goal-directed response must be identified. For example, if the goal is to lose weight then one could specify a particular form of exercise (e.g. jogging) as one goal-directed response and/or controlling one's consumption of high-fat food (e.g. pizza) as another goal-directed response. Specifying an effective goal-directed response in an implementation intention is vital to goal attainment because implementation intentions only promote performance of the goal-directed response; if that response is not effective, then by definition, implementation intentions will not promote achievement of the goal. There are good grounds for supposing that if the person jogs at particular intensity and refrains from eating high-fat foods then weight loss will result (cf. Sewacj *et al.* 1980). However, in many domains pilot studies may be needed to identify what responses that are strongly linked to goal attainment should be specified in the then-component of participants' plans.

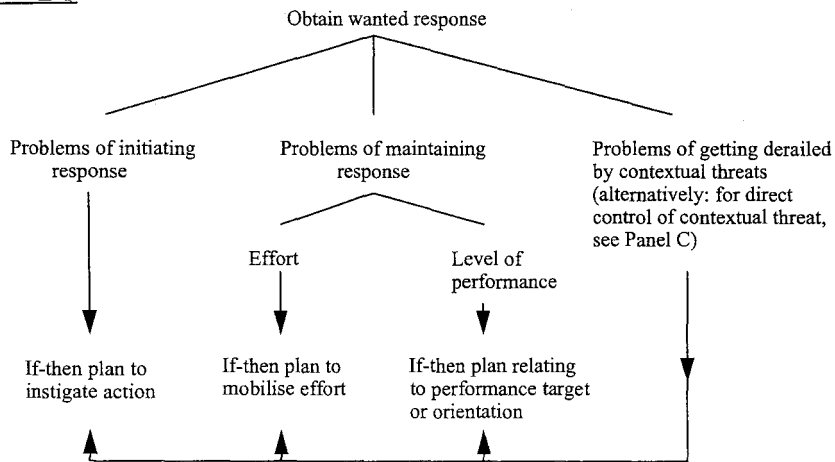
The next juncture in the framework is whether the goal-directed response is wanted or unwanted, and consequently, whether the volitional issue involves obtaining a wanted response versus controlling an unwanted response. In the example of weight loss, jogging constitutes a wanted response (one wishes to exhibit this response) whereas eating pizza is an unwanted response (one wishes not to exhibit this response). Figure 7.2 shows that obtaining wanted responses and controlling unwanted responses are not entirely separate issues. However, wanted and unwanted responses also embrace distinctive volitional problems that are considered separately in Panels B and C.

The first volitional problem to do with obtaining a wanted response is getting started. Recall that the formation of a goal intention on its own may mean that the person forgets her intention or misses suitable opportunities to act and, therefore, does not initiate the behaviour. The appropriate implementation intention to overcome this problem is an if-then plan to instigate action, i.e. to specify a suitable opportunity to start to perform the behaviour. For example, in order to instigate jogging, the if-then instigation plan might be 'If it is Wednesday at 5.30 p.m., then I will jog home from work'. Studies by Sheeran and Silverman (2003) and Sheeran and Orbell (2000) both employed this type of plan. The implementation intention induction in the former study asked participants to write down the date, time and location of the health and safety training course they would attend (from a list provided) in order to increase attendance. In the latter study, the implementation intention induction invited participants to write down when (day, date, time), where and how (e.g. by telephone) they would make an appointment to attend for cervical cancer screening. Findings indicated

PANEL A



PANEL B



PANEL C

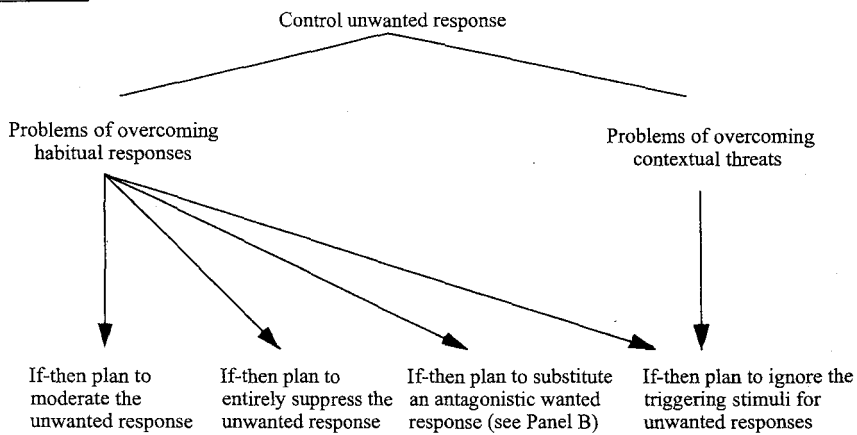


Figure 7.2 A framework for operationalizing implementation intentions in relation to particular volitional problems

that making an appointment was an effective goal-directed response in helping participants attend for cervical cancer screening (all of the women who made an appointment subsequently attended for screening).

A second volitional problem pertaining to wanted responses concerns the tenacity of goal pursuit and difficulties maintaining performance. Response maintenance seems to involve two issues, namely effort and performance orientation. For example, effort must be devoted to jogging, and jogging must be undertaken for particular durations and frequencies for weight loss to accrue. However, people may find it hard to devote requisite effort to the behaviour or orient themselves towards its performance in the manner required to achieve weight loss goals – despite successful initiation of the behaviour. In these instances, the appropriate if-then plans could either mobilize effort (e.g. 'If I feel I am flagging, then I will immediately put more effort into my jogging') or set particular ways of going about performing the behaviour (e.g. 'If I have jogged as far as my home, then I will jog around the block twice more before going inside').

Gollwitzer and Schaal (1998) demonstrated that an if-then plan to mobilize effort ('If a distraction arises, then I will increase my effort at the task at hand') increased performance on boring arithmetic problems. However, this effort mobilization implementation intention only affected task performance when participants had relatively low motivation to solve the problems to begin with; when motivation was high, plans to mobilize effort actually reduced performance – because participants became over-motivated which diminished their ability to solve the problems (see also Milne and Sheeran 2003). Thus, the utility of specifying effort mobilization in the *then* component of an implementation intention depends upon task motivation.

The efficacy of specifying a particular orientation towards a task in one's plan has been demonstrated in several studies. For example, Sheeran *et al.* (2003, Study 3) found that an implementation intention to respond quickly instead of deliberating about one's answer (i.e. 'As soon as I think I have the answer, I will not deliberate but press the corresponding number key as quickly as possible!') increased speed of performance on a puzzle task, without compromising accuracy of responding. Similarly, Endress (2001, cited in Gollwitzer *et al.* 2005) showed that an implementation intention to proceed immediately to generating another use for a household object in a creativity task ('And if I have generated a certain use, then I will immediately turn to generating a further possible use') increased the number of uses generated. Finally, Trötschel and Gollwitzer (2002) demonstrated that supplementing a goal intention to be fair in a cooperation game involving the distribution of a disputed island with an if-then plan about how to respond to specific proposals ('And if I receive a proposal on how to share the island, then I will offer a fair counter proposal!') led to objectively fairer distribution of the island. In sum, specifying the mobilization of effort or task orientations that promote persistence in the *then* component of an implementation intention and specifying appropriate opportunities to deploy these strategies in the *if* component should

make it more likely that wanted responses will be pursued tenaciously and maintained over time.

The third volitional problem to do with obtaining wanted responses is ensuring that goal pursuit is not derailed by contextual threats. For example, the goal intention to jog might not be realized because sitting in front of the TV seems more attractive, because there is work that has to be finished, or because one has been invited for a drink with colleagues. That is, jogging may be overwhelmed by personal or environmental influences to do other things. In these instances, successful goal attainment depends upon keeping goal pursuit on track.

Importantly, however, it has been demonstrated that strategically automating the performance of a wanted response can overcome such influences. In other words, the formation of if-then plans to instigate action, mobilize effort or orient oneself towards behavioural performance can overcome contextual threats such as temptations, detrimental self-states and the activation of antithetical goals. Controlling wanted responses in this manner was demonstrated in several of the studies cited above. For example, in Endress's (2001, cited in Gollwitzer *et al.* 2005) study, participants who formed implementation intention to generate uses in the creativity task were not affected by a social loafing manipulation whereas participants who only formed goal intentions were strongly affected by this manipulation. Similarly, participants who formed implementation intentions to behave cooperatively in Trötschel and Gollwitzer's (2002) research were immune to influence by whether the negotiation was loss-framed versus gain-framed, unlike control participants. Finally, studies by Gollwitzer (1998) and Sheeran and Webb (2003) demonstrated that forming an implementation intention with respect to wanted goal-directed responses overcame the impact of primed antagonistic goals that were detrimental to the performance. In sum, strategic automatization of wanted responses can prevent ongoing goal pursuit from being derailed.

The key volitional problem that arises when trying to control an unwanted response such as eating pizza is overcoming habitual responding (see Panel C). A habit involves the automatic activation of a goal and goal-directed response by particular environmental cues and is established through (a) frequent and consistent activation of a particular goal in the presence of those cues, (b) frequent and consistent initiation of a particular action in response to that goal activation, as well as (c) satisfactory reinforcement of both cue-goal and goal-behaviour relations. The problem of overcoming habits is, of course, that habitual responses are reinforced by satisfying experiences – pizza tastes great, improves mood and/or constitutes a treat at the end of the day for many people. In the light of these considerations, the first issue to do with controlling unwanted responses concerns whether people are motivated only to reduce, but not to eliminate, the unwanted response. That is, people may have low motivation to eliminate a behaviour but might be willing to curb its performance. For example, setting up a goal intention never to eat pizza in an empirical study could be unacceptable to participants, whereas the same participants might

endorse a goal intention to limit pizza consumption. In such instances, the appropriate if-then plan involves moderating the unwanted response. Thus, the person could attempt to control unwanted pizza consumption by specifying that particular quantities of pizza are consumed only on particular occasions (e.g. 'If it is Saturday evening, then it is OK to eat one small pizza'). Sheeran and Milne (2003) found that participants who specified limiting their consumption of high-fat foodstuffs using this type of implementation intention were successful in reducing intake compared to participants who only formed goal intentions.

Often, of course, people will want to reduce an unwanted response as much as possible and to abolish the response entirely if at all possible. Gollwitzer *et al.* (2005) pointed to the efficacy of specifying three types of if-then plans in facilitating this goal. First, the if-then plan could specify the suppression of the unwanted response (e.g. 'If I feel like ordering pizza at a restaurant, then I will not order it'). Second, the if-then plan could specify the substitution of an antagonistic wanted response (e.g. 'If I feel like ordering pizza at a restaurant, then I will order a salad instead'). Third, the if-then plan could specify an 'ignore' response (e.g. 'If I feel like ordering pizza at a restaurant, then I will ignore that feeling'). Support for utility of specifying suppression and ignore responses in the *then* component of an implementation intention was obtained in studies designed to overcome the automatic activation of stereotypical beliefs (Achtziger 2002; Gollwitzer *et al.* 2002a). For example, the implementation intentions to suppress stereotyping of older people, or prejudice towards homeless people and soccer fans ('And if I see an old person, then I tell myself: Don't stereotype!', 'And if I see a homeless person, then I will tell myself: No prejudice!', and 'And if I see a soccer fan, then I'll not be prejudiced against him!', respectively) were successful in attenuating stereotypical responses – even using priming paradigms where participants typically find it extremely difficult to control their responses (Bargh 1999). Implementation intentions that specified ignoring individuals' group memberships were similarly effective (i.e. 'If I see a homeless person, then I will ignore the fact that she is homeless!' and 'If I see this person, then I will ignore her gender!'). Whether an implementation intention that substitutes unwanted stereotypic responses with wanted egalitarian or fair responses (e.g. 'If I see a soccer fan, then I will judge him on his merits as an individual!', 'If I see a homeless person, then I will treat this person especially fairly!') is also effective in reducing stereotyping – or leads to over-motivation and thereby greater stereotyping – remains to be determined.

The second problem to do with controlling unwanted responses is overcoming contextual threats. Contextual threats can be internal (thoughts or feelings that increase desire for the unwanted response) or external (environments that promote temptation). People can be highly aware of the critical cues that make it difficult to keep sight of one's good intentions (e.g. feelings of agitation or the taste of coffee could be cues for smokers to light up). Moreover, people may be willing to relinquish control over unwanted responses if conducive circumstances make it possible to generate an external attribution for a lapse (Gibbons *et al.* 2003). In these

instances, the appropriate if-then plan might be an 'ignore' response to internal ('If I start to think that I deserve pizza because I've had a hard day, then I will ignore that thought!') or external cues ('If there is a smell of baking pizza in the restaurant, then I will ignore it!'). Gollwitzer and Schaal (1998) demonstrated that an implementation intention that specified ignoring attractive distractions enhanced task performance whereas Milne and Sheeran (2003) found that an implementation to ignore detrimental self-states ('As soon as I feel tired or bored, I will ignore that feeling!') promoted task persistence. Similarly, Sheeran *et al.* (2003) found that ignoring feelings of concern about attending clinical psychology appointments ('As soon as I feel concerned about attending my appointment, I will ignore that feeling and tell myself this is perfectly understandable!') was highly effective in promoting attendance. Of course, in all of these studies, the efficacy of specifying ignore responses to deal with contextual threats must be inferred from performance of the focal behaviour, rather than performance of the response *per se*. Further research is required to demonstrate mediation of the implementation intention-goal achievement relation by then-I-will-ignore-it specifications.

6 Application of the model

6.1 Background and design

The present study (Milne and Sheeran 2002a) uses the concept of implementation intentions to try to promote performance of testicular self-examination (TSE) in a longitudinal study among undergraduate men. Testicular cancer is the most common form of cancer among men aged 19–44 years (Imperial Cancer Research Fund 1998). Successful treatment of testicular cancer depends upon confinement of disease to testicular tissue with the consequence that early detection benefits survival rates. For this reason, men are advised to examine their testicles for small hard swellings from puberty onwards. However, evidence shows that very few men perform TSE at the recommended frequency of one month (e.g. Wardle *et al.* 1994), often because of lack of motivation to perform TSE, prospective memory failure, and embarrassment about touching oneself intimately (Steffen and Gruber 1991; Steffen *et al.* 1994).

Because men may not be motivated to perform TSE, and because implementation intentions effects are only obtained when the respective goal intention is strong (Sheeran *et al.* 2005), the study began with a protection motivation theory (PMT) intervention to increase goal intentions to perform TSE before having participants form implementation intentions to promote the realization of their goal. The design adopted was 2 (motivational intervention: PMT vs control) \times 2 (implementation intention: formed vs not formed); participants were randomly assigned to one of the four conditions. The motivational intervention was based on PMT because this model has been used successfully to promote goal intentions in previous research (e.g. Milne *et al.* 2002; see Milne *et al.* 2000, and Norman *et al.*, Chapter 3 in this

volume, for reviews). The implementation intention manipulation specified the instigation of performance in the *then* component of the plan. This specification should automate performance of TSE and, thereby, alleviate problems with remembering to perform the behaviour and short-term affective costs. Moreover, the if-then plan should facilitate the establishment of TSE performance as part of respondents' routines.

The study had the following hypotheses:

- 1 the PMT intervention will increase threat and coping appraisal in relation to TSE as well as goal intentions to perform TSE;
- 2 forming an implementation intention to promote TSE will increase the likelihood of both the performance one month later and the establishment of routine TSE performance over one year; and
- 3 there will be a significant interaction between the PMT intervention and manipulation of implementation intentions such that the initiation and maintenance of TSE will be greatest when both motivation is enhanced and an if-then plan is formed.

6.2 Method

6.2.1 Participants and procedure

Participants were undergraduate men aged 18 to 42 years at the University of Bath, UK who took part in three waves of data collection over a one-year period. At time 1, a questionnaire containing the motivational and implementation intention manipulations as well as measures of PMT constructs was completed by $n = 642$ participants. One month later (time 2), $n = 432$ participants completed a behavioural follow-up by email. At time 3 (one year later), $n = 254$ participants who still had a university email address were contacted (i.e. participants who had not graduated or were not on placements). Responses were obtained from 173 participants. Representativeness checks showed no significant differences on background or PMT variables, which suggests that the samples at time 2 and time 3 adequately represent the population from which they were drawn.

The time 1 questionnaire contained standard multi-item measures of PMT variables, i.e. measures of goal intentions, perceived vulnerability, perceived severity, fear, response efficacy, self-efficacy, and perceived costs (see Norman *et al.*, Chapter 3 in this volume) as well as measures of background characteristics and past behaviour. Reliabilities proved satisfactory for goal intentions ($\alpha = 0.72$) and other variables (α s = 0.68 to 0.87) with the exception of perceived severity and response efficacy (single items were analysed). TSE performance at time 2 was measured by one item that asked participants whether or not they had performed a TSE in the previous month (*yes/no*). TSE performance at time 3 was measured by an item that asked whether or not participants had established a routine of performing TSE every month (*yes/no*).

6.2.2 Manipulations

The PMT intervention was presented after the questionnaire measures of

background characteristics and past behaviour but before the measures of PMT variables. The intervention comprised a health education leaflet entitled *A Whole New Ball Game* (Imperial Cancer Research Fund 1998) that provided information and persuasive messages about testicular cancer and TSE. Content analysis indicated that the text addressed all of the variables specified by PMT. Control participants did not receive this leaflet.

The implementation intention manipulation was presented as a supplement to the health education leaflet and comprised the following passage:

Many people find that when they intend to adopt a new health behaviour such as TSE, they then forget to do it or 'never get round to it'. It has been found that when you form a specific plan of exactly how, when and where you will carry out the behaviour you are less likely to forget about it or find you don't get round to doing it. It would be useful for you to make such a plan of when and where you intend to conduct TSE over the next month. Fill in the following statement providing as much contextual information as you can, e.g. on Monday next week, at 8.00 in the morning, in my bathroom, after I have had a shower.

During the next month I will perform TSE on _____ (day)
at _____ (time) at/in _____ (place)
add any further contextual information, e.g. after a shower, after
breakfast, etc. _____

To ensure you have made a link in your mind between the situation you have outlined above and performing TSE, imagine the situation and tell yourself 'If I find myself *in this situation*, then I will perform TSE.'

6.3 Results

The findings at time 1 were consistent with previous reports of non-performance of TSE (e.g. Wardle *et al.* 1994). Only 8 per cent of the sample reported that they examined their testicles once a month and 62 per cent had never done so. In fact, 45 per cent of participants reported that they had never thought about testicular cancer prior to taking part in the study. Thus, the present study can be construed as an attempt to initiate and maintain a new health behaviour.

Multivariate analysis of variance appropriate to the design supported the first hypothesis. The PMT intervention had a significant positive impact on goal intentions to perform TSE ($M_s = 5.41$ and 4.96 , for PMT and control conditions, respectively), $p < 0.05$. This increase in goal intentions appeared to be due to higher perceived self-efficacy and lower perceived costs among the PMT group compared to the control group ($M_s = 5.30$ vs 4.85 , and 2.04 vs 2.42 , respectively), $ps < 0.05$. The PMT intervention had no significant effects on perceived vulnerability, perceived severity, fear, or

response efficacy. Thus, the health education leaflet affected protection motivation (goal intentions) and coping appraisal, but not threat appraisal.

The second hypothesis concerned the impact of implementation intention formation on initiation of TSE performance (measured at one month) and the development of routine TSE performance (measured over one year). Chi-square analyses indicated that if-then plans produced significant and substantive differences in performance at both time-points. Whereas only 22 per cent of control participants initiated TSE performance, 44 per cent of participants who formed implementation intentions did so (see Figure 7.3). Similarly, 15 per cent of the control group reported routine performance of TSE compared to 37 per cent of the planning group. These findings support Hypothesis 2. Forming an implementation intention doubled the rates of initiation and routinization of TSE.

The final hypothesis concerned the potential interaction between the PMT intervention and implementation intention manipulation. As predicted, the interactions turned out to be significant at both one month and one year. Whereas 62 per cent of participants who received both the PMT and implementation intention interventions initiated TSE, only 28 per cent of the PMT-only group, 21 per cent of the plan-only group, and 18 per cent of the combined control group, did so (see Figure 7.4). Importantly, the percentage of participants who received both the PMT and implementation intention interventions that showed routinized TSE performance at one year (64 per cent) was virtually identical to the percentage that initiated performance (62 per cent). These findings contrast with the other conditions where the levels of performance declined (rates were 21 per cent, 11

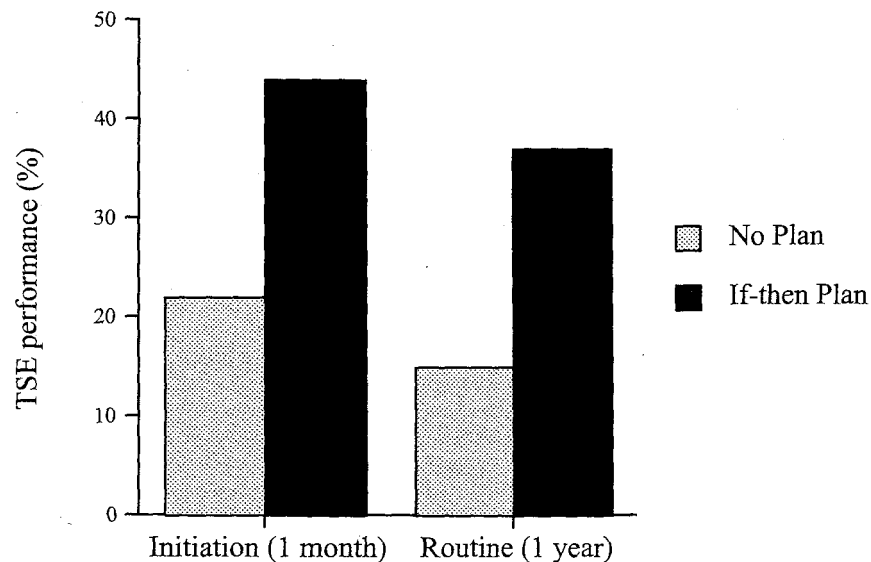


Figure 7.3 Main effects of implementation intention formation on the initiation and maintenance of TSE performance

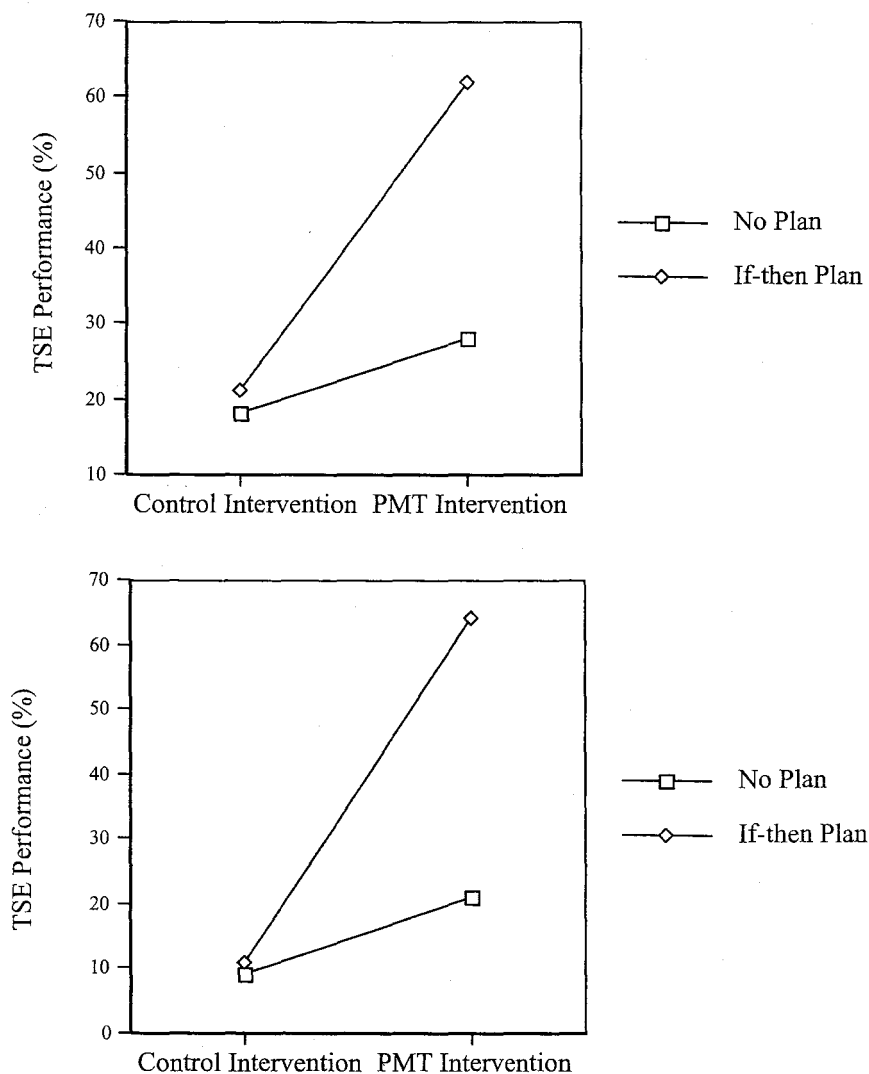


Figure 7.4 Interaction between PMT intervention and implementation intention formation on the initiation and maintenance of TSE performance

Note: Top panel refers to findings at one month and the bottom panel to findings at one year.

per cent, and 9 per cent for the PMT-only, plan-only, and control groups, respectively). Thus, Hypothesis 3 is supported. Initiation and maintenance of TSE was greatest when both motivation was enhanced and an if-then plan was formed.

6.4 Discussion

The contribution of the present research can be summarized as follows. This is the first study to combine a motivational intervention based on PMT with an implementation intention induction in a 2×2 between-participants design, and the first study to investigate both the initiation and routinization of a health behaviour that was novel for participants. Moreover, the study employed the longest follow-up period in studies of implementation intentions to date (one year). Findings indicated that the PMT intervention was successful in increasing goal intentions to perform TSE and supported the utility of this model in efforts to enhance people's motivation to achieve health goals (Norman *et al.*, Chapter 3 in this volume). The findings also supported the utility of if-then plans to instigate responses in promoting action initiation. Twice as many participants who formed if-then plans undertook a TSE within one month compared to participants who had not formed plans. The automatization of responding engendered by implementation intentions appears to have helped to overcome prospective memory failure and embarrassment about intimate touching that explained TSE non-performance in previous research (Steffen and Gruber 1994; Steffen *et al.* 1994).

The present findings also provided new evidence that behavioural initiation by implementation intentions can become an established part of people's routines. Whereas only 8 per cent of the no-PMT, no-plan control group had routinized TSE performance at one year, 64 per cent of the combined intervention group were performing TSEs each month. This finding underlines the parallels between action control by if-then plans and action control by habits (Gollwitzer 1999); all that is required for maintenance of the response over time is the presence of the respective situation-goal link. Clearly, delegating control of behaviour to specified situational cues is a powerful means of sustaining health goals, even over relatively long time periods. This temporal trajectory of implementation intention effects contrasts with motivational initiatives to promote health behaviour change where the impact of interventions typically diminishes over time (e.g. McCaul *et al.* 1992).

However, the present findings also speak to the importance of undertaking motivational interventions to enhance goal intentions prior to having participants form implementation intentions when participants have relatively low motivation to achieve the goal to begin with. Findings from both follow-ups showed significant interactions between the PMT and implementation intention interventions such that participants were most likely to initiate and maintain TSE performance in the combined PMT-plus-plan condition compared to each of the other conditions. These findings are consistent with previous demonstrations that strong effects of implementation intentions only emerge when the underlying goal intention is strong (e.g. Sheeran *et al.* 2005). Thus, the concept of implementation intentions should not be construed as a substitute for interventions to promote goal intentions among people with low motivation to achieve

health goals. Rather, implementation intention formation is a simple and effective means of overcoming intention-behaviour discrepancies associated with sub-optimal activation or elaboration of goal intentions – when the respective goal intentions strongly favour goal achievement.

7 Future directions

The concept of implementation intentions has a short past and a bright future in health psychology. Accumulated evidence indicates that forming if-then plans makes an important difference to whether or not people realize their goals (Koestner *et al.* 2002; Sheeran 2002; Gollwitzer and Sheeran 2003) – both when goal attainment is contingent upon promoting wanted responses and controlling unwanted responses (Gollwitzer *et al.* 2005; Sheeran 2002). In addition, a good deal of research indicates that implementation intentions promote goal achievement both by facilitating identification of specified opportunities to act and by automating goal-directed responses (Aarts *et al.* 1999; Lengfelder and Gollwitzer 2000; Brandstätter *et al.* 2001; Gollwitzer *et al.* 2002b; Sheeran *et al.* 2003; Webb and Sheeran 2004a, 2004c). Finally, there is evidence that difficulties in behaviour regulation, the state of the respective goal intention, and degree of implementation intention formation all moderate the impact of implementation intention formation on goal achievement. In sum, substantial progress has been made in answering questions about *whether*, *when*, and *why* implementation intentions facilitate the enactment of goal intentions.

Despite this substantial progress, there remains considerable scope for future research in developing new applications, further delineating mediating processes, and identifying additional moderating variables. There have been few applications of the concept of implementation intentions to the promotion of health goals and further rigorous tests of this concept are warranted, especially in relation to controlling unwanted responses (e.g. smoking, excessive alcohol consumption). Most studies to date have also employed undergraduate samples and, consequently, the generalizability of findings need to be determined (cf. Sears 1986). Tailoring the *if* and *then* components of the respective plan and the plan induction, and taking account of social desirability and experimenter biases in measurements of goal intentions constitute important challenges in ensuring that effective goal-directed responses are promoted among clinical samples. Finally, implementation intentions have been deployed virtually exclusively to promote health *actions* in studies to date. However, Milne *et al.* (2003) showed that if-then plans can be used successfully to cope with daily stressors. This finding suggests that using implementation intentions to promote well-being (e.g. quality of life, pain control) among physically ill people constitutes another important avenue for future research.

Only two studies to date formally tested mediators of action control by implementation intentions (Aarts *et al.* 1999; Webb and Sheeran 2004c). Evidence supports the idea that increased accessibility of specified

opportunities and strong associations between these opportunities and specified responses are the mechanisms underlying implementation intention effects (Webb and Sheeran 2004c). Further research is required to replicate these findings in other domains and to rule out alternative explanations of implementation intention effects, e.g. in terms of prospective memory. For example, some early studies mistakenly interpreted the impact of implementation intentions in terms of enhanced memory for goal intentions (e.g. Orbell *et al.* 1997; Sheeran and Orbell 1999). However, there appear to be important differences between remembering one's goal intention and action control by implementation intentions. For instance, prospective memory is highly vulnerable to the cognitive demands of ongoing activity (e.g. Marsh *et al.* 2002a; Smith 2003) whereas implementation intention effects are not (e.g. Brandstätter *et al.* 2001). Similarly, in studies of event-based prospective memory, processing of critical cues (i.e. events associated with intentionality) is slower than is the processing of non-critical cues (Marsh *et al.* 2002b) whereas implementation intention studies show superior processing of critical compared to non-critical cues (e.g. Brandstätter *et al.* 2001; Webb and Sheeran 2004a). Further delineation of the distinctiveness of processes associated with prospective memory compared to implementation intentions will be valuable, not only in theoretical terms, but also in terms of understanding how ideas from the literature on prospective memory might best be used to enhance implementation intention effects in applied settings (e.g. Prestwich *et al.* 2003c).

Relatedly, the role of motivational processes in understanding implementation intention effects requires careful explication. It is easy to imagine how a poorly designed implementation intention induction could engender experimenter demand and thereby inadvertently increase participants' subjective norm, or could increase participants' expectations of success and thereby enhance self-efficacy. Although it might seem desirable to increase participants' motivation to perform a behaviour, it is worth remembering that procedures that give rise to over-motivation or draw participants' attention to the operation of their plans could undermine the automaticity in implementation intentions (Gollwitzer and Schaal 1998), and make goal achievement less likely. The analysis presented earlier proposed that goal intentions and self-efficacy are important factors in determining whether or not participants form implementations and how much care and attention participants devote to identifying appropriate opportunities and goal-directed responses and to encoding their if-then plans. These considerations are important because implementation intentions are not a foolproof self-regulatory strategy (Gollwitzer *et al.* 2005). If people's plans are poorly elaborated, such that deliberation about opportunities or goal-directed responses is required *in situ*, if specified opportunities do not arise or prove unsuitable for initiating goal-directed responses, or if the specified responses are impossible to execute or have limited instrumentality in terms of achieving the respective goal, then implementation intention formation will not benefit goal striving. Future research might profitably be directed

towards testing the accuracy of this analysis and assessing the role of motivation in determining the strength of implementation intention effects.

There is also considerable scope for further moderator analyses of implementation intention effects. Research into degree of implementation intention formation has so far tested only a small number of factors with a view to enhancing the impact of implementation intentions (e.g. cognitive rehearsal, environmental cues). Future studies could usefully examine the efficacy of different strategies for facilitating the encoding if-then plans (e.g. surprise recall tasks or plan reminders) or for increasing people's commitment to the plan (e.g. inducing anticipated regret about not following one's plan or making one's commitment public). A good deal more research is also required about the role of individual differences in action control by implementation intentions. For example, people who are more conscientious, planful, or high in need for cognition might be more likely to form implementation intentions spontaneously and, therefore, less likely to benefit from plan inductions. Conversely, people who are prone to rumination or procrastination may obtain greater benefit from implementation intention formation. Perhaps the most important issue to do with moderation, however, will be to bring the issues of degree of intention formation and individual differences together to understand how implementation intentions can be used to overcome habits and initiate new behaviour patterns. When particular situation-goal-response links have been satisfactorily reinforced in the past, it is no simple matter trying to suppress or substitute those responses. Future research will need to produce a fine-grained analysis of what kinds of goal-directed responses and opportunities should be specified and what kinds of implementation intention inductions should be deployed for particular samples and particular behaviours in order to enhance the efficacy of implementation intentions in helping people realize their intentions. Undertaking further research on implementation intentions to these ends seems a good plan for health psychologists.

Acknowledgements

We thank Ian Kellar, Andrew Prestwich, Liz Steadman, and Andrea Higgins for providing additional information about their research.

Note

- 1 We thank Marie Johnston for this wonderful encapsulation of the concept of ego-depletion.

References

- Aarts, H. and Dijksterhuis, A. (2000a) Habits as knowledge structures: automaticity in goal-directed behavior, *Journal of Personality and Social Psychology* 78, 53-63.

- Aarts, H., and Dijksterhuis, A. (2000b) On the automatic activation of goal-directed behavior: the case of travel habit, *Journal of Environmental Psychology*, 20, 75–82.
- Aarts, H., Dijksterhuis, A. and Midden, C. (1999) To plan or not to plan? Goal achievement or interrupting the performance of mundane behaviors, *European Journal of Social Psychology*, 29, 971–9.
- Aarts, H., Gollwitzer, P. M. and Hassin, R. (2004) Goal contagion: perceiving is for pursuing, *Journal of Personality and Social Psychology*, 87, 23–37.
- Abraham, C. and Sheeran, P. (2003) Anticipated regret and intention-behaviour relations, *British Journal of Social Psychology*, 42, 495–511.
- Abraham, C. and Sheeran, P. (2004) Implications of goal theories for the theories of reasoned action and planned behaviour, *Current Psychology*, 22, 218–33.
- Abraham, C., Sheeran, P. and Johnson, M. (1998) From health beliefs to self-regulation: theoretical advances in the psychology of action control, *Psychology and Health*, 13, 569–92.
- Abraham, C., Sheeran, P., Norman, P., Conner, M., Otten, W. and de Vries, N. (1999) When good intentions are not enough: modelling post-intention cognitive correlates of condom use, *Journal of Applied Social Psychology*, 29, 2591–612.
- Achtziger, A. (2002) Sozial-, kognitions- und motivationspsychologische Determinanten des Eindrucksbildungsprozesses unter besonderer Berücksichtigung der Stereotypisierung. (Social-cognitive and motivational determinants of evaluating and judging others). Unpublished dissertation, University of Konstanz, Germany.
- Ajzen, I. (1991) The theory of planned behavior, *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Armitage, C. J. (2004) Implementation intentions and eating a low-fat diet: a randomized controlled trial, *Health Psychology*, 23, 319–23.
- Bagozzi, R. P. and Kimmel, S. K. (1995) A comparison of leading theories for the prediction of goal-directed behaviour, *British Journal of Social Psychology*, 34, 437–61.
- Bargh, J. A. (1992) The ecology of automaticity: towards establishing the conditions needed to produce automatic processing effects, *American Journal of Psychology*, 105, 181–99.
- Bargh, J. A. (1994) The four horsemen of automaticity: awareness, efficiency, intention, and control in social interaction. In R. S. Wyer Jr. and T. K. Srull (eds) *Handbook of Social Cognition* (2nd edition). Hillsdale, NJ: Erlbaum, 1–40.
- Bargh, J. A. (1999) The cognitive monster: the case against the controllability of automatic stereotype effects. In S. Chaiken and Y. Trope (eds), *Dual-process Theories in Social Psychology*. New York: Guilford, 361–82.
- Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K. and Trötschel, R. (2001) The automated will: nonconscious activation and pursuit of behavioral goals, *Journal of Personality and Social Psychology*, 81, 1014–27.
- Baron, R. M. and Kenny, D. A. (1986) The moderator–mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations, *Journal of Personality and Social Psychology*, 51, 1173–82.
- Baumeister, R. F., Bratlavsky, E., Muraven, M. and Tice, D. M. (1998) Ego-depletion: is the active self a limited resource?, *Journal of Personality and Social Psychology*, 74, 1252–65.
- Bayer, U. C., Moskowitz, G. B. and Gollwitzer, P. M. (2002) Implementation intentions and action initiation without conscious intent. Unpublished manuscript, University of Konstanz, Germany.

- Brandstätter, V., Lengfelder, A. and Gollwitzer, P. M. (2001) Implementation intentions and efficient action initiation, *Journal of Personality and Social Psychology*, 81, 946–60.
- Cohen, J. (1992) A power primer, *Psychological Bulletin*, 112, 155–9.
- Conner, M., Sheeran, P., Norman, P. and Armitage, C.J. (2000) Temporal stability as a moderator of relationships in the theory of planned behaviour, *British Journal of Social Psychology*, 39, 469–93.
- Cooke, R. and Sheeran, P. (2004) Moderation of cognition–intention and cognition–behaviour relations: a meta-analysis of properties of variables from the theory of planned behaviour, *British Journal of Social Psychology*, 43, 159–86.
- Einstein, G. O. and McDaniel, M. A. (1996) Retrieval processes in prospective memory: theoretical approaches and some new empirical findings. In M. Bradimonte, G. O. Einstein and M. A. McDaniel (eds) *Prospective Memory: Theory and Applications*. Mahwah, NJ: Erlbaum, 115–138.
- Gibbons, F. X., Gerrard, M. and Lane, D. J. (2003) A social reaction model of adolescent health risk. In J. Suls and K. A. Wallston (eds) *Social Psychological Foundations of Health and Illness*. Oxford: Blackwell, 107–136.
- Gollwitzer, P. M. (1990) Action phases and mindsets. In E. T. Higgins and J. R. M. Sorrentino (eds) *The Handbook of Motivation and Cognition*, Vol. 2. New York: Guilford, 53–92.
- Gollwitzer, P. M. (1993) Goal achievement: the role of intentions. In W. Strobe and M. Hewstone (eds) *European Review of Social Psychology*, Vol. 4. Chichester: Wiley, 141–85.
- Gollwitzer, P. M. (1996) The volitional benefits of planning. In P. M. Gollwitzer and J. A. Bargh (eds) *The Psychology of Action: Linking Cognition and Motivation to Behavior*. New York: Guilford, 287–312.
- Gollwitzer, P. M. (1998) Implicit and explicit processes in goal pursuit. Paper presented at the symposium ‘Implicit vs explicit processes’ at the Annual Meeting of the Society of Experimental Social Psychology, Atlanta, Georgia.
- Gollwitzer, P. M. (1999) Implementation intentions: strong effects of simple plans, *American Psychologist*, 54, 493–503.
- Gollwitzer, P. M., Achtziger, A., Schaal, B. and Hammelbeck, J. P. (2002a) Intentional control of stereotypical beliefs and prejudicial feelings. Unpublished manuscript, University of Konstanz.
- Gollwitzer, P. M., Bayer, U. C. and McCulluch, K. C. (2005) The control of the unwanted. In R. R. Hassin, J. S. Uleman and J. A. Bargh (eds) *The New Unconscious*. New York: Oxford University Press, 485–515.
- Gollwitzer, P. M., Bayer, U. C., Steller, B. and Bargh, J. A. (2002b) Delegating control to the environment: perception, attention, and memory for pre-selected behavioral cues. Unpublished manuscript, University of Konstanz.
- Gollwitzer, P. M. and Brandstätter, V. (1997) Implementation intentions and effective goal pursuit, *Journal of Personality and Social Psychology*, 73, 186–99.
- Gollwitzer, P. M. and Schaal, B. (1998) Metacognition in action: the importance of implementation intentions, *Personality and Social Psychology Review*, 2, 124–36.
- Gollwitzer, P. M. and Sheeran, P. (2003) Bridging the intention-behaviour ‘gap’ through strategic automatization: meta-analysis of implementation intentions. Manuscript in preparation, New York University.
- Heckhausen, H. and Gollwitzer, P. M. (1987) Thought contents and cognitive functioning in motivational versus volitional states of mind, *Motivation and Emotion*, 11, 101–20.

- Higgins, A. and Conner, M. (2003) Understanding adolescent smoking: the role of the theory of planned behaviour and implementation intentions, *Psychology, Health and Medicine*, 8, 177–90.
- Higgins, A. and Conner, M. (2004) Preventing adolescent smoking using implementation intentions. Manuscript submitted for publication.
- Higgins, E. T. (1996) Knowledge activation: accessibility, applicability, and salience. In E. T. Higgins and A. W. Kruglanski (eds) *Social Psychology: Handbook of Basic Principles*. New York: Guilford, 133–68.
- Kellar, I. and Abraham, C. (2003) Randomised controlled trial of a research-based intervention promoting fruit and vegetable consumption. Manuscript under review.
- Kenny, D. A., Kashy, D. A. and Bolger, N. (1998) Data analysis in social psychology. In D. T. Gilbert, S. T. Fiske and G. Lindzey (eds) *The handbook of Social Psychology*, (4th edition). New York: Oxford University Press, 233–65.
- Koestner, R., Lekes, N., Powers, T. A. and Chicoine, E. (2002) Attaining personal goals: self-concordance plus implementation intentions equals success, *Journal of Personality and Social Psychology*, 83, 231–44.
- Lengfelder, A. and Gollwitzer, P. M. (2001) Reflective and reflexive action control in patients with frontal brain lesions, *Neuropsychology*, 15, 80–100.
- McBroom, W. H. and Reid, F. W. (1992) Towards a reconceptualization of attitude-behavior consistency, *Social Psychology Quarterly*, 55, 205–16.
- McCaul, K. D., Glasgow, R. E. and O'Neill, H. K. (1992) The problem of creating habits: establishing health-protective dental behaviors, *Health Psychology*, 11, 101–10.
- Margetts, B. M., Cade, J. E. and Osmond, C. (1989) Comparison of a food frequency questionnaire with a diet record, *International Journal of Epidemiology*, 18, 868–73.
- Marsh, R. L., Hancock, T. W. and Hicks, J. L. (2002a) The demands of an ongoing activity influence the success of event-based prospective memory, *Psychonomic Bulletin and Review*, 9, 604–10.
- Marsh, R. L., Hicks, J. L. and Watson, V. (2002b) The dynamics of intention retrieval and coordination of action in event-based prospective memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 28, 652–659.
- Milne, S., Gollwitzer, P. M. and Sheeran, P. (2003) Unpublished raw data, University of Bath.
- Milne, S., Orbell, S. and Sheeran, P. (2002) Combining motivational and volitional interventions to promote exercise participation: protection motivation theory and implementation intentions, *British Journal of Health Psychology*, 7, 163–84.
- Milne, S. and Sheeran, P. (2002a) Combining motivational and volitional interventions to prevent testicular cancer. Paper presented to the 13th General Meeting of the European Association of Experimental Social Psychology, San Sebastian, June.
- Milne, S. and Sheeran, P. (2002b) Making good implementation intentions: comparing associative learning and prospective memory in remembering intentions. Paper presented to the 16th Conference of the European Health Psychology Society, Lisbon, October.
- Milne, S. and Sheeran, P. (2003) Unpublished raw data, University of Bath.
- Milne, S., Sheeran, P. and Orbell, S. (2000) Prediction and intervention in health-related behaviour: a meta-analytic review of protection motivation theory, *Journal of Applied Social Psychology*, 30, 106–43.
- Muraven, M. and Baumeister, R. F. (2000) Self-regulation and depletion of limited

- resources. Does self-control resemble a muscle?, *Psychological Bulletin*, 126, 247–59.
- Murgraff, V., White, D. and Phillips, K. (1996) Moderating binge drinking: it is possible to change behaviour if you plan it in advance, *Alcohol and Alcoholism*, 6, 577–82.
- Oettingen, G. and Gollwitzer, P.M. (2001) Goal setting and goal striving. In A. Tesser and N. Schwarz (eds) *Intraindividual processes. Volume 1 of the Blackwell Handbook in Social Psychology*. Editors-in-chief: M. Hewstone and M. Brewer. Oxford: Blackwell, 329–47.
- Oettingen, G., Hönig, G. and Gollwitzer, P. M. (2000) Effective self-regulation of goal attainment, *International Journal of Educational Research*, 33, 705–32.
- Orbell, S., Hodgkins, S. and Sheeran, P. (1997) Implementation intentions and the theory of planned behavior, *Personality and Social Psychology Bulletin*, 23, 945–54.
- Orbell, S. and Sheeran, P. (1998) 'Inclined abstainers': a problem for predicting health-related behavior, *British Journal of Social Psychology*, 37, 151–65.
- Orbell, S. and Sheeran, P. (2000) Motivational and volitional processes in action initiation: a field study of the role of implementation intentions, *Journal of Applied Social Psychology*, 30, 780–97.
- Prestwich, A., Lawton, R. and Conner, M. (2003a) Use of implementation intentions and the decision balance sheet in promoting exercise behaviour, *Psychology and Health*, 18, 707–21.
- Prestwich, A., Lawton, R. and Conner, M. (2003b) Increasing the impact of implementation intentions: the impact of environmental cues, rehearsal and sufficient plans. Unpublished manuscript, University of Leeds.
- Prestwich, A., Lawton, R., Conner, M. and Taylor, S. (2003c) Spontaneous planning: the role of motivation and conscientiousness in the formation of implementation intentions. Unpublished manuscript, University of Leeds.
- Rise, J., Thompson, M. and Verplanken, B. (2003) Measuring implementation intentions in the context of the theory of planned behavior, *Scandinavian Journal of Psychology*, 44, 87–95.
- Rogers, R. W. (1983) Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation. In B. L. Cacioppo and L. L. Petty (eds) *Social Psychophysiology: A Sourcebook*. London: Guildford, 153–76.
- Sears, D. O. (1986) College sophomores in the laboratory: influences of a narrow data base on social psychology's view of human nature, *Journal of Personality and Social Psychology*, 51, 515–30.
- Sewacj, D., Ajzen, I. and Fishbein, M. (1980) Predicting and understanding weight loss: intentions, behaviors, and outcomes. In I. Ajzen and M. Fishbein, *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice-Hall, 101–12.
- Sheeran, P. (2002) Intention–behavior relations: a conceptual and empirical review. In W. Strobe and M. Hewstone (eds) *European Review of Social Psychology*, Vol. 12. Chichester: Wiley, 1–30.
- Sheeran, P., Aarts, H., Custers, R., Ravis, A., Webb, T. L. and Cooke, R. (in press) The goal-dependent automaticity of drinking habits, *British Journal of Social Psychology*.
- Sheeran, P. and Abraham, C. (2003) Mediator of moderators: temporal stability of intention and the intention–behavior relationship, *Personality and Social Psychology Bulletin*, 29, 205–15.

- Sheeran, P., Abraham, C. and Orbell, S. (1999) Psychosocial correlates of heterosexual condom use: a meta-analysis, *Psychological Bulletin*, *125*, 90–132.
- Sheeran, P. and Armitage, C. J. (2003). Unpublished raw data, University of Sheffield.
- Sheeran, P., Aubrey, R. and Kellett, S. (2003) Unpublished raw data, University of Sheffield.
- Sheeran, P. and Milne, S. (2002) Unpublished raw data, University of Sheffield.
- Sheeran, P. and Milne, S. (2003) Unpublished raw data, University of Sheffield.
- Sheeran, P. and Orbell, S. (1998) Do intentions predict condom use? A meta-analysis and examination of six moderator variables, *British Journal of Social Psychology*, *37*, 231–50.
- Sheeran, P. and Orbell, S. (1999) Implementation intentions and repeated behavior: augmenting the predictive validity of the theory of planned behavior, *European Journal of Social Psychology*, *29*, 349–69.
- Sheeran, P. and Orbell, S. (2000) Using implementation intentions to increase attendance for cervical cancer screening, *Health Psychology*, *19*, 283–9.
- Sheeran, P. and Silverman, M. (2003) Evaluation of three interventions to promote workplace health and safety: evidence for the utility of implementation intentions, *Social Science and Medicine*, *56*, 2153–63.
- Sheeran, P., Trafimow, D. and Armitage, C. J. (2003) Predicting behaviour from perceived behavioural control: tests of the accuracy assumption of the theory of planned behaviour, *British Journal of Social Psychology*, *42*, 393–410.
- Sheeran, P., Webb, T. L. and Gollwitzer, P. M. (2005) The interplay between goal intentions and implementation intentions, *Personality and Social Psychology Bulletin*, *31*, 87–98.
- Sheeran, P. and Webb, T. L., (2003) Unpublished raw data, University of Sheffield.
- Sheeran, P., White, D. and Phillips, K. (1991) Premarital contraceptive use: a review of the psychological literature, *Journal of Reproductive and Infant Psychology*, *9*, 253–69.
- Smets, E. M. A., Garssen, B., Bonke, B. and De Haes, J. C. J. M. (1995) The multidimensional fatigue inventory (MFI): psychometric qualities of an instrument to assess fatigue, *Journal of Psychosomatic Research*, *39*, 315.
- Smith, R. E. (2003) The cost of remembering to remember in event-based prospective memory: investigating the capacity demands of delayed intention performance, *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*, 347–61.
- Steadman, L. and Quine, L. (2000) Are implementation intentions useful for bridging the intention–behavior gap in adhering to long-term medication regimens? An attempt to replicate Sheeran and Orbell's (1999) intervention to enhance adherence to daily vitamin C intake. Paper presented to the British Psychological Society Division of Health Psychology Annual Conference, University of Kent at Canterbury, September.
- Steadman, L. and Quine, L. (2004). Encouraging young males to perform testicular self-examination: a simple, but effective, implementation intention intervention, *British Journal of Health Psychology*, *9*, 479–87.
- Steadman, L., Rutter, D. R. and Quine, L. (2004) An implementation intentions intervention to increase uptake of mammography. Manuscript under review.
- Steffen, V. J. and Gruber, V. A. (1991) Direct experience with a cancer self-exam: effects on cognitions and behaviour, *Journal of Social Psychology*, *131*, 165–77.
- Steffen, V. J., Sternberg, L., Teegarden, L. A. and Shepherd, K. (1994) Practice and

- persuasive frame: effects on beliefs, intention and performance of a cancer self-examination, *Journal of Applied Social Psychology*, 24, 897–925.
- Sutton, S. (1998) Predicting and explaining intentions and behaviour: how well are we doing?, *Journal of Applied Social Psychology*, 28, 1317–38.
- Sutton, S. and Sheeran, P. (2003) Meta-analysis of the theory of planned behaviour and past behaviour. Manuscript in preparation, University of Cambridge.
- Triandis, H. C. (1980) Values, attitudes, and interpersonal behaviour. In H. Howe and M. Page (eds) *Nebraska Symposium on Motivation*, Vol. 27. Lincoln, NB: University of Nebraska Press, 195–259.
- Trötschel, R. and Gollwitzer, P. M. (2002) Implementation intentions and the control of framing effects in negotiations. Manuscript under review.
- Verplanken, B. and Faes, S. (1999) Good intentions, bad habits, and effects of forming implementation intentions on healthy eating, *European Journal of Social Psychology*, 29, 591–604.
- Wardle, J., Steptoe, A., Burckhardt, R., Vögele, C., Vila, J., and Zarczynski, I. (1994) Testicular self-examination: attitudes and practices among young men in Europe, *Preventive Medicine*, 23, 206–10.
- Webb, T. L. and Sheeran, P. (2003) Can implementation intentions help to overcome ego-depletion?, *Journal of Experimental Social Psychology*, 39, 279–86.
- Webb, T. L. and Sheeran, P. (2004a) Identifying good opportunities to act: implementation intentions and cue discrimination, *European Journal of Social Psychology*.
- Webb, T. L. and Sheeran, P. (2004b) Unpublished raw data, University of Sheffield.
- Webb, T. L. and Sheeran, P. (2004c) Unpublished raw data, University of Sheffield.
- Webb, T. L. and Sheeran, P. (2005) Integrating goal theories to understand the achievement of personal goals, *European Journal of Social Psychology*, 35, 69–96.
- Witkin, H. A., Lewis, H. B., Hertzman, M., Machover, K., Meissner, P. B. and Wapner, S. (1972) *Personality through Perception: An Experimental and Clinical Study*. Westwood, CT: Greenwood Press.