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Understanding adolescent smoking: the role of the Theory of Planned Behaviour and implementation intentions

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Abstract *This research examined the power of the Theory of Planned Behaviour (TPB) to predict smoking intentions and smoking behaviour in a sample of adolescents (N = 162). In addition, the role of past smoking behaviour and an implementation intention intervention was assessed. TPB variables and smoking behaviour was assessed by self-report questionnaires given to children (11 and 12 years old) at the beginning of the study (time 1) and again 8 weeks later (time 2). All children received information against smoking and either formed an implementation intention about how, where and when they could resist smoking, or in the control condition how, where and when they could finish all their work at school. The TPB provided good predictions of intentions cross-sectionally ($R^2 = 0.27$) and prospectively ($R^2 = 0.23$) and behaviour prospectively (91% correctly classified). Past behaviour was only significant in the prospective analyses. Implementation intentions produced modest reductions in smoking and smoking initiation compared to the control group. These differences were not significant. Implementation intentions increased the power of attitudes and decreased the power of perceived behavioural control to predict intentions prospectively. Implications for furthering our understanding of smoking initiation in this group are discussed.*

Introduction

In the Western world smoking is the largest single cause of preventable death. Most adult smokers start smoking regularly before the age of 18 (The Royal College of Physicians, 1992), and the younger children are when they start smoking the more likely they are to be adult smokers (Chassin *et al.*, 1990). Young smokers have more respiratory infections, more coughs, more stress on their hearts, are less fit, have a higher risk of strokes, and the younger they are when they start smoking the younger they are in developing heart disease (The Royal College of Physicians, 1992). They also have a greater risk of lung cancer (Doll & Peto, 1981). Despite these well-established consequences to smoking, initiation rates in young people remain high. Action to reduce smoking amongst teenagers is essential to prevent the detrimental long-term consequences of smoking on health. A recent report from the Office for National Statistics in England found that smoking amongst secondary school children (11 – 15 years old) was 11% in 1998 compared with 13% in 1996. Although this figure represents a significant drop in

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smoking since 1996, prevalence from 1982 to 1998 has continued to fluctuate between 10–13%[1] with no long term pattern of change (Goddard & Higgins, 1999). Over the last 18 years despite steadily increasing efforts to curb smoking amongst young people, there is still no definite downward trend in smoking behaviour.

Smoking is a complex behaviour and attempts to understand why people start smoking has led to research into risk factors associated with initiating this behaviour. Goddard (1992) after studying the smoking habits of English school children compiled a list of factors that were associated with starting to smoke: being a girl; having brothers or sisters that smoke; having parents who smoke; living with a lone parent; having relatively less negative views about smoking; not intending to stay on in full-time education after 16; and thinking that you might be a smoker in the future. Each of these factors was more likely to be found in children who subsequently started to smoke than among those who did not.

With so many independent variables predicting smoking behaviour it has been difficult to intervene to prevent adolescents from smoking. Mass media campaigns have been found to be both effective (Flynn *et al.*, 1992; Hafstad *et al.*, 1997; Worden *et al.*, 1996), and ineffective (Bauman *et al.*, 1991; Flay *et al.*, 1995) in reducing teenage smoking. It is not known why some of these programmes work and others do not. Rooney and Murray (1996) conducted a meta-analysis of peer or social-type school based programmes aimed at preventing adolescent smoking, published between 1974 and 1991. They found that on average effect sizes were quite small and would translate to approximately a 5% relative reduction in smoking (see also NHS Centre for Reviews and Dissemination, University of York, 1999). Conrad *et al.* (1992) in their meta analysis of 27 prospective studies of the onset of children's smoking called for future theory-driven studies.

The Theory of Planned Behaviour (TPB) has been applied to the prediction of a number of different behaviours with some success (Ajzen, 1991; Armitage & Conner, 2001; Conner & Sparks, 1996; Godin & Kok, 1996) including smoking (see Norman *et al.*, 1999, for an example and review of studies). The TPB is an extension of the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). The TPB suggests that the proximal determinants of behaviour are intentions to engage in the behaviour and perceived behavioural control over the behaviour. Intentions represent conscious plans or a decision to exert effort to perform the behaviour. Perceived behavioural control (PBC) is the perception that performance of the behaviour is within one's control. Intentions are determined by attitudes, subjective norm and PBC. Attitudes are overall evaluations of the behaviour. Subjective norms are beliefs about whether significant others think the target individual should engage in the behaviour. PBC is proposed to predict both intention and behaviour. According to the TPB, individuals are likely to intend to initiate smoking if they believe that the behaviour will lead to particular outcomes which they value, if they believe that people whose views they value think they should carry out the behaviour, and if they feel that they have the necessary resources and opportunities to smoke.

The TPB and TRA have both been used to predict adolescent's intentions to smoke and their smoking behaviour. Norman and Tedeschi (1989) found support for the TRA in their study with 420 5th to 8th grade pupils (10–13 years old), with attitude and subjective norm predicting intention and intention predicting behaviour. Maher and Rickwood (1997) found the TPB to be a comprehensive theoretical model in accounting for the predictors of adolescent smoking; intention was the best predictor of smoking, with PBC adding slightly after accounting for intentions; and PBC was the best predictor of intentions. Thus, both the TRA and TPB have successfully been applied to adolescent smoking (see also Chassin *et al.*, 1981; 1984; Hill *et al.*, 1997).

The role of various additional variables in the TPB have also been considered (see Conner & Armitage, 1998), in an attempt to explain health behaviours, and to better predict the relationship between intention and action. O'Callaghan *et al.* (1999) using structural equation

modelling found that the TRA with the addition of past behaviour provided a marginally better fit than the TPB or the TRA. de Vries *et al.* (1995) also found support for the predictive validity of the TPB in adolescent smoking, but again found a unique contribution of past behaviour not accounted for by the model. Fitzhugh (1995) also suggested the addition of past behaviour as a proximal antecedent of smoking intentions. Hence, the usefulness of the TRA/TPB for explaining adolescent smoking has been shown in the above studies, however, the role of past behaviour needs to be further examined.

Another possible extension is to examine the role of implementation intentions (Gollwitzer, 1993). Our intentions are not always executed and thus there is frequently a gap between intention and action. This could be for a number of different reasons: competing priorities, not recognizing a situation where we could have acted out our intention, not acting fast enough in a situation. According to Gollwitzer (1993) implementation intentions service intentions, they commit an individual to a specific plan of action in order to facilitate the achievement of the intention. Gollwitzer (1993; 1999) has defined an implementation intention as a plan of how, where and when to commit a behaviour. This type of plan establishes a link between a situation and a planned behaviour ('I intend to do X whenever the circumstances Y occur'). By forming an implementation intention people pass on control of goal directed activities from the self to the environment. When a situation is encountered it prompts intended behaviour, through automatic activation of the plan. Implementation intentions work through: disrupting focused attention by affecting perceptual and attentional processes when related to specified opportunities (when 'Y' occurs); increasing readiness to respond; facilitating quick and reliable initiation of the intended behaviour; and all this through automatic processes (Gollwitzer, 1993). Thus far, there have been relatively few studies using implementation intentions in a health related context, however, the studies that have been done show very promising effects of implementation intentions (see Sheeran, 2002 for a review). Orbell *et al.* (1997) found that 100% of women who made an implementation intention (specifying where and when they would perform the behaviour) to complete a breast self-examination did so in the month following the formation of their implementation intention. In addition those forming implementation intentions have been found to be: more likely to attend for a cervical cancer screening test (Sheeran & Orbell, 2000); more likely over 3 weeks to take vitamin C tablets (Sheeran & Orbell, 1999); more likely to exercise vigorously for at last 20 min each week (Milne, 1998); more likely to eat healthily (Verplanken & Faes, 1999); and more likely to be active sooner after joint replacement surgery (Orbell & Sheeran, 2000). Implementation intentions have not been tested in relation to preventive behaviours such as avoiding smoking initiation. Nevertheless implementation intentions help individuals to pursue a goal in the midst of competing priorities or when they do not know how to get started and thus might be useful in relation to pursuing preventive behaviours.

A further issue addressed in the present study was the extent to which implementation intentions might moderate relationships within the TPB. Although a number of possible moderation effects were tested, two specific predictions were made. First that forming an implementation intention may commit the individual to the behaviour and thus reduce the role of perceptions of control in the formation of the goal intention (Gollwitzer, 1993). PBC will have less of a role in a person who has committed to an implementation intention because the behaviour no longer requires their conscious intent to execute it. In contrast we expect that in the control group, PBC becomes more important in resisting smoking because of the need to make conscious efforts. We expect that this might also be evident in PBC being less stable over time in the implementation compared to the control group. A complementary effect might also be expected for intentions such that they are stronger predictors of behaviour and more stable over time in the control group compared to the implementation intention group.

Second because forming an implementation intention increases commitment to the goal independent of previous behaviour this should weaken the impact of past behaviour on intentions. Thus the prospective relationship between past behaviour and intentions should be less strong in the implementation group compared to the control group.

The aims of the present study are therefore threefold. First, to examine the power of the TPB and past smoking behaviour to predict intentions and smoking behaviour in a prospective sample of adolescents. Second, to carry out a preliminary test of the power of implementation intentions to help prevent smoking in adolescents. Third, to examine the impact of implementation intentions on relationships among variables in the TPB. To this end a prospective study of smoking over an 8 week period was conducted in two groups of adolescents. One group received information about smoking, while the second received the same information and were asked to form an implementation intention in regard to resisting smoking. Given the relatively low rate of smoking initiation over the time period studied, the present study must be considered as only a pilot in relation to the second aim. Nevertheless, the present design could offer important data in relation to the other aims of the study.

Method

Participants

There were 347 children from seven different secondary schools in Leeds, UK, who took part in this study. All of the children were in year 7 at school (11 – 12 years old) and were in mixed ability classes. These pupils were selected because at this age very few of them might be expected to be regularly smoking; 1 – 3% according to National Statistics (Jarvis, 1997). However, it is a time when children are starting to smoke (around 10% might have been expected to have tried smoking) and therefore prevention efforts are imperative. The pupils participated by filling in questionnaires on two separate occasions during lesson time. A total of 250 children were present at time 1 and 239 children were present at time 2 (8 weeks later). Of these participants 196 were present for both parts of the study (97 girls, 98 boys, and one person who did not declare their gender). None of the children refused to participate. The absentee rate was similar at the two time points (18% and 22%). Responses from the children were matched from time 1 to time 2 using information on school, class, date of birth, and gender.

Design and procedure

Seventeen schools were randomly selected from the local state schools and contacted to participate in the study. Seven were eligible, through having mixed ability form classes, and were willing to participate. The schools took pupils from a range of socio-economic status (SES) groups (as determined by the percentage of children receiving free school dinners at the particular schools)[2]. The participating form classes within each school were randomly assigned to either the experimental or control condition. All of the participants were assured that their responses were confidential. The pupils filled in questionnaires and read information about the negative consequences of smoking, then the experimental group formed an implementation intention for how not to smoke and the control group formed an implementation intention for how to complete all their work at school that term. Eight weeks later a similar questionnaire was administered to record any changes in smoking behaviour or in TPB measures.

Questionnaire

Two questionnaires were developed to assess demographic data, smoking behaviour, and components of the TPB in relation to smoking. Both questionnaires assessed TPB constructs: *attitudes* towards smoking were measured by response to the stem, 'If I started to smoke this term it would be ...' on five semantic differential scales (bad-good, harmful-beneficial, unpleasant-pleasant, unenjoyable-enjoyable, foolish-wise). These scales were scored −2 (negative towards smoking) to +2 (positive towards smoking). Attitude items were averaged and reliability was high (*alpha* = 0.84). *Subjective norm* was measured using five items all on five point scales scored − 2 (should not smoke) to + 2 (should smoke): 'My friends think I should' (smoke-not smoke); 'My best friend thinks I should' (not smoke-smoke); 'My family think I should' (not smoke-smoke); 'People who are important to me think I should' (not smoke-smoke); 'People who are important to me want me to smoke' (likely-unlikely). These items were averaged (*alpha* = 0.62). Perceived behavioural control was measured using three items: 'How much control do you feel you have over your smoking' (no control-complete control); 'I am confident that I could resist smoking this term if I wanted to' (strongly agree-strongly disagree); 'For me to resist smoking this term is' (easy-difficult). All of these items were scored 1 (high control) to 5 (low control). These items were averaged (*alpha* = 0.66). *Intention* was measured using a single item: 'How certain are you that you could resist smoking this term?' (very certain-not at all certain). This item was measured on a five point scale: 1 (high intention not to smoke) to 5 (low intention not to smoke)[3].

Other variables were also measured, but are not reported in this paper. At time 2, the TPB measures remained the same for subjective norm, but for attitudes, perceived behavioural control, and intention instead of asking about 'this term' we asked the same questions with reference to the time period of 'the summer holidays' (the period since the intervention).

The *smoking behaviour* questions asked pupils to classify themselves as: someone who had never smoked (non-smoker group); someone who had only tried smoking once (tried smoking group); someone who used to smoke sometimes, but never smokes now (tried smoking group); someone who smokes cigarettes, but not as many as one/week (smokes less than one/week group); someone who smokes between one – six cigarettes/week (smokes more than one/week group); or someone who smokes more than six cigarettes/week (smokes more than one/week group). These questions were followed by suitable questions to check that pupils had categorized themselves appropriately[4]. At time two pupils were asked the same smoking behaviour questions except that each question was modified to ask specifically if they had smoked this term (during the last 8 weeks).

Implementation intention manipulation

Making an implementation intention for the experimental group involved planning how, where, and when to resist smoking. With an avoidance behaviour this presents a number of problems in relation to defining where and when smoking will need to be resisted. The following procedure was developed. The pupils were given five options for *how* they could refuse smoking and were instructed to tick the option that they planned to say if they were tempted to smoke, or offered a cigarette. The options were: 'No thanks, I don't want to smoke.'; 'No thanks, I don't want the habit.'; 'No cancer sticks for me.'; 'No thanks, smoking makes you smell bad.'; 'No, it's bad for your health'. If none of these options were deemed appropriate, the pupils were instructed to write their own statement for how they would resist smoking, or refuse a cigarette that was offered. Next they were asked *where* they would refuse smoking and they were asked to tick all the places they would refuse to smoke. The options

given to them were: 'I will resist smoking at school'; 'I will resist smoking at a party.'; 'I will resist smoking at home.'; 'I will resist smoking with my friends.'; 'I will resist smoking if offered a cigarette'. Finally, they were asked *when* they would resist smoking and they were given the option of signing a statement which said, 'I think I can resist smoking for the whole term'[5].

The control group formed an implementation intention for how, where, and when to complete all their work at school. The method for forming this implementation intention was the same as described for the experimental condition except that the options were focused on completing school work.

Results

Description of the sample

A total of 250 children completed a questionnaire at time 1, and 239 completed a questionnaire at time 2. Based on these numbers it was possible to accurately match data from 196 children who were present at both time 1 and time 2. We examined potential biases in the sample by comparing those present at only time 1 with those present at both time points on the TPB variables measured at time 1; a MANOVA indicated no significant difference between groups ($F(5, 211) = 2.24$, $p > 0.05$). Subsequent analyses therefore focused on only those children present at both time points.

A total of 36 adolescents had missing data on at least one of the study variables and were excluded from subsequent analyses. Thus *all* subsequent analyses were based upon a final sample of 162. We next tested for the equivalence of the control and experimental groups at time 1 on the key study variables (intention, attitude, subjective norms, PBC, and past behaviour). A MANOVA indicated no significant difference between groups ($F(5, 156) = 1.25$, $p > 0.25$).

Smoking behaviour

Table 1 shows the changes in smoking behaviour over the 8 weeks of the study by condition. This data is relevant to the second aim of the study. In the experimental condition, none of the 51 non-smokers at time 1 went on to try smoking during the 8 weeks (0%), whereas, three of the 53 non-smokers in the control condition tried smoking in this period (6%). In addition, in the experimental condition, 19 of the 28 who were smokers at time 1 were not smoking at time 2 (68%), whereas in the control condition, 18 of the 30 who were smokers at time 1, were not smoking at time 2 (64%). Clearly these differences are too small to be statistically significant. The modest sample size and short time interval between testing times limit the power of the study to detect differences and mean that this can only be treated as a pilot test of the impact of implementation intentions on adolescent smoking. Nevertheless they suggest that an implementation intervention could be useful in helping children resist smoking. In subsequent analyses we examine smoking behaviour as a dichotomous variable (i.e., never smokers vs. other groups; scored 0 and 1 respectively).

Descriptive data

Table 2 reports descriptive data (means and standard deviations) for the TPB data, measures of smoking behaviour (a dichotomous split into smokers and non-smokers) and also intercorrelations amongst measures. This data is most relevant to the first two aims of the

Table 1. *Changes in smoking behaviour over time by condition (*N = *162)*

		Time 2				
		Non-smoker	Tried smoking this term	Smoked less than 1/week	Smoked more than 1/week	Total
Control condition	Time 1: Non-smoker	50	2	1	0	53
	Tried smoking	17	3	2	0	22
	Smoked less than 1/week	1	1	3	0	5
	Smoked more than 1/week	0	1	0	2	3
	Total	68	7	6	2	83
Experimental condition	Time 1: Non-smoker	51	0	0	0	51
	Tried smoking	16	3	0	2	21
	Smoked less than 1/week	3	1	0	0	4
	Smoked more than 1/week	0	1	0	2	3
	Total	70	5	0	4	79

Table 2. *Correlations and descriptive measures on study variables (*N = *162)*

	BEH	BIt2	BI	ATT	NORM	PBC	PB	CONDN	Mean	SD
BEH	1.00	0.54	0.39	0.54	0.52	0.13	0.45	− 0.09	0.15	0.36
BIt2		1.00	0.35	0.42	0.29	0.21	0.30	− 0.05	1.32	0.82
BI			1.00	0.31	0.21	0.45	0.15	− 0.17	1.44	0.96
ATT				1.00	0.56	0.17	0.37	− 0.06	− 1.82	0.50
NORM					1.00	0.01	0.35	− 0.09	− 1.70	0.63
PBC						1.00	0.11	− 0.10	1.65	1.06
PB							1.00	− 0.01	0.36	0.48
CONDN								1.00	0.49	0.50

Note: BEH = smoking behaviour (time 2); BIt2 = behavioural intention (time 2); BI = behavioural intention; ATT = attitude; NORM = subjective norm; PBC = perceived behavioural control; PB = past behaviour; CONDN = condition. $rs > 0.17$, $p < 0.05$, $rs > 0.22$, $p < 0.01$.

study. Time 2 smoking was most strongly related to a positive attitude towards smoking at time 1. Time 1 intentions were most strongly related to time 1 PBC. Time 2 intentions were also most strongly related to time 1 attitude. Condition was generally unrelated to the TPB variables or smoking behaviour.

Predicting smoking behaviour

We next employed moderated logistic regression analysis to predict time 2 smoking behaviour based on TPB variables and past behaviour (Table 3). In relation to the third study aim, we also examined whether condition moderated the effects of these variables on behaviour (a moderation test; Baron & Kenny, 1986). Table 3 shows the results of these analyses. Intentions and PBC correctly classified 83.9% of respondents into smokers and non-smokers ($\chi^2(2) = 18.8$, $p < 0.001$), although only intentions were significant. The addition of attitudes and subjective norms to the equation correctly classified a further 6.1% of respondents ($\Delta\chi^2(2) = 25.3$, $p < 0.001$), with both attitudes and subjective norms being significant in the equation along with intentions. The addition of past behaviour to the equation correctly classified a further 0.8% of respondents ($\Delta\chi^2(1) = 5.59$, $p < 0.05$), with intentions, subjective

Table 3. *Logistic Regression predicting time 2 smoking behaviour (*N = *162)*

Variable	Beta Coefficients	Significance
Step 1		
Behavioural intentions	0.93	0.001
Perceived behavioural control	− 0.21	0.40
Step 2		
Behavioural intentions	0.75	0.01
Perceived behavioural control	− 0.19	0.50
Attitude	1.26	0.02
Subjective norms	1.64	0.001
Step 3		
Behavioural intentions	0.88	0.01
Perceived behavioural control	− 0.22	0.50
Attitude	0.73	0.18
Subjective norms	1.26	0.01
Past behaviour	2.45	0.001
Step 4		
Behavioural intentions	0.86	0.01
Perceived behavioural control	− 0.24	0.50
Attitude	0.76	0.20
Subjective norms	1.26	0.01
Past behaviour	2.47	0.001
Condition	− 0.27	0.70

norms and past behaviour being significant in the equation. The addition of condition did not add to the numbers correctly classified (0.3%; $\Delta\chi^2(1) = 0.18$). Intentions, subjective norms, and past behaviour were significant in this equation. The addition of the interaction terms did not significantly improve the prediction of time 2 smoking behaviour. Thus the data would appear to indicate that having positive intentions not to smoke, perceiving others to want you to not smoke and not smoking in the past were the best predictors of not smoking in the future in this sample of adolescents.

Predicting smoking intentions

In the next set of analyses, we examined the power of the TPB variables in predicting intentions at times 1 and 2 (Table 4). In predicting time 2 intentions we also examined whether condition moderated the effects of other variables on intentions (a moderation test; Baron & Kenny, 1986).

For time 1 intentions, attitude, subjective norm and PBC explained 26.7% of the variance in intentions ($F(3, 158) = 19.2$, $p < 0$ .001). Only attitudes and PBC were significant in this equation. Addition of past behaviour ($\Delta R^2 = 0.00$, $F(1, 157) = 0.00$), and condition ($\Delta R^2 = 0.013$, $F(1, 156) = 2.53$) did not significantly improve the predictions of intentions (Table 4). Thus intentions not to smoke at time 1 were best predicted by holding negative attitudes towards smoking and perceiving control over not smoking.

For time 2 intentions, attitude, subjective norm and PBC explained 20.5% of the variance in intentions ($F(3, 158) = 13.6$, $p < 0.001$). Only attitudes and PBC were significant in this equation. Whilst the addition of past behaviour did significantly improve the predictions of intentions ($\Delta R^2 = 0.020$, $F(1, 157) = 4.02$, $p < 0.05$), the addition of condition did not ($\Delta R^2 = 0.0001$, $F(1, 156) = 0.03$) (Table 4). However, the addition of the interactions between

Table 4. *Linear Multiple Regression predicting behavioural intentions at times 1 and 2 (N = 162)*

Variables	Predicting T1 intentions (β)	Predicting T2 intentions (β)
Step 1		
Attitude	0.19*	0.35**
Subjective norms	0.10	0.09
Perceived behavioural control	0.42***	0.15*
Step 2		
Attitude	0.18*	0.31***
Subjective norms	0.11	0.06
Perceived behavioural control	0.42***	0.14*
Past behaviour	0.00	0.15*
Step 3		
Attitude	0.18*	0.31***
Subjective norms	0.09	0.05
Perceived behavioural control	0.40***	0.14*
Past behaviour	0.01	0.15*
Condition	− 0.11	− 0.01
Step 4		
Attitude		0.30***
Subjective norms		0.06
Perceived behavioural control		0.11
Past behaviour		0.15
Condition		− 0.01
Attitude × condition		0.16*
Subjective norms × condition		− 0.09
Perceived behavioural control × condition		− 0.15*
Past behaviour × condition		0.06

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TPB variables and condition did add significantly to the proportion of variance in time 2 intentions explained ($\Delta R^2 = 0.036$, $F(4, 152) = 2.52$, $p < 0.05$). The interactions between condition and attitude and condition and PBC were significant (Table 4).

We probed the nature of the significant interactions using simple slope analyses (Aiken & West, 1991) by examining the regression lines in the control and experimental groups. For the attitude × condition interaction, simple slope analyses demonstrated that time 1 attitudes were not a significant predictor of time 2 intentions in the control group ($\beta = 0.14$, ns), while they were a strong predictor in the experimental group ($\beta = 0.45$, $p < 0.001$). Conversely, PBC was a significant predictor of time 2 intentions in the control group ($\beta = 0.28$, $p < 0.01$) but not in the experimental group ($\beta = -0.03$, ns).

Finally, also in relation to the third aim, we examined the temporal stability of the TPB variables across time points in the control and experiemental groups. Intentions showed greater stability in the control ($r = 0.39$, $p < 0.001$) compared to the experimental ($r = 0.16$, ns) group and this difference was marginally significant ($z = 1.57$, $p < 0.10$). The stability of attitudes was greater in the experimental ($r = 0.61$, $p < 0.001$) compared to the control ($r = 0.46$, $p < 0.001$) group, although this difference was not significant ($z = -1.33$). For subjective norms, stability was greater in the control ($r = 0.58$, $p < 0.001$) compared to the experimental ($r = 0.42$, $p < 0.001$) group, although again this difference was not significant ($z = 1.34$). Finally, PBC stability was greater in the control ($r = 0.67$, $p < 0.001$) compared to the experimental ($r = 0.44$, $p < 0.01$) group, and this difference was significant ($z = 2.12$, $p < 0.05$). This latter result

would suggest that the more powerful effect of PBC on time 2 intentions in the control group might be attributable to PBC showing greater temporal stability in this group.

Discussion

The present study had three aims: (1) to test the power of the TPB and past behaviour to predict intentions and smoking behaviour in a sample of adolescents; (2) to provide a preliminary test of the power of implementation intentions on adolescent smoking; and (3) to test the impact of implementation intentions on the relationship amongst TPB variables. In relation to the first aim, the TPB variables and past behaviour were found to provide good predictions of intentions cross-sectionally and prospectively and of subsequent smoking behaviour. Intentions to not smoke at time 1 (the cross-sectional predictions) were based on holding a negative attitude towards smoking and perceiving smoking to be within one's control (27% variance explained). Subjective norms, past behaviour and condition were unrelated to intentions cross-sectionally. Predictions of intentions prospectively (time 2) provided a similar pattern of results. Having a negative attitude toward smoking, perceiving control over smoking and not smoking in the past all predicted intentions not to smoke prospectively (22.5% explained variance). Subjective norms and condition were unrelated to time 2 intentions. Finally, in relation to the first aim, time 2 smoking was predicted by prior intentions not to smoke, perceiving others to not want you to smoke, and not smoking in the past (91% of respondent correctly classified into smokers and non-smokers). This supports and extends earlier work, with the TRA, that intentions are a good predictor of smoking behaviour (Fishbein, 1982). However, the impact of subjective norms on behaviour unmediated by intentions is unusual with work on the TRA/TPB. Nevertheless, in the smoking area social pressures (as injunctive or descriptive norms) commonly emerge as predictors of smoking initiation in adolescents (see Goddard, 1992). These findings also provide further support for the TPB, adding to an already considerable body of support (see Armitage & Conner, 2001 for a review). However, they also support other research suggesting a role for past behaviour in the TPB, particularly in relation to predicting behaviour (Conner & Armitage, 1998).

In relation to the second aim of the study, the findings are more tentative given the pilot nature of the study in relation to this aim. Implementation intentions were not significant in reducing the numbers initiating smoking in this adolescent group over an 8 week period, although there was a trend in the predicted direction. In the implementation intention group none of the initially non-smoking children went on to smoke during the 8 weeks, whereas in the control group 3 of these children started smoking. In addition, a slightly larger percentage of children stopped smoking during the period of the study in the implementation compared to the control condition. In the logistic regressions with smoking behaviour there was also no significant effect of condition, although again the direction of effect was as predicted (less smoking in the implementation intention condition). We interpret these findings as failing to support the use of implementation intentions with a preventive behaviour. It may have been that the numbers of children taking up smoking during the course of our study were too small to detect any significant differences between the control and implementation groups. Studies involving significantly larger numbers of children over considerably longer time periods will be required to provide a definitive test of the power of implementation intentions in relation to adolescent smoking.

In relation to the third aim of the study, a number of interesting findings were revealed, although only one of these effects had been predicted. In particular, we found two significant interactions (condition $\times$ attitude; condition $\times$ PBC) that added to the explained variance in intentions at time 2. The implementation intention group's time 1 attitudes were a strong

predictor of time 2 intentions, but a non-significant predictor for the control group. Gollwitzer (1993) comments that implementation intentions do change the mind set of an individual: processing of information that is relevant to the chosen goal become very effective; they overestimate the desirability of the goal and have an illusory positive view of its feasibility; the implemental mind-set is distinguished by a close-minded view towards information that does not pertain to the goal at hand. Implementation intentions appear to have strengthened attitudes impact on intentions in the intervention group, perhaps through an overestimation of the desirability of their chosen goal and by helping them to ignore information that was contrary to their goal (this would cause them to ignore positive aspects of smoking and could prevent attitude change). Their commitment to a way of behaving (not smoking) might then lead to more tenacious attitudes against smoking. It is interesting to note in this regard that attitudes in the implementation intention group were more stable over time than in the control group (although the difference was not significant). However, this explanation was *post hoc* in nature and the effect needs to be confirmed in further tests.

The other significant interaction with condition was with PBC and was predicted. PBC was a significant predictor of intentions for the control group, but not for the experimental group. Again, this may have to do with the way in which implementation intentions function. Gollwitzer (1993) states, 'by forming implementation intentions people pass the control of their behaviour on to the environment. Situations and means are turned into elicitors of action that are hard to forget, ignore, and miss. They possess the potential to instigate the respective intended behaviour directly, that is without any further conscious intent on the side of the individual' (p. 173). PBC will then have less of a role in a person who has committed to an implementation intention because the behaviour no longer requires their conscious intent to execute it. Thus, with the people in the control group, PBC becomes more and more important in resisting smoking as they need to make conscious efforts. Most of the control group were successful in doing this over the 8 week period, however, this may become increasingly difficult as time goes on. Whereas the implementation intention group have passed control of this activity to the environment and should find that they refuse smoking automatically in the future. It is interesting to note in this regard that as predicted PBC in the implementation intention group was significantly less stable over time than in the control group.

The predicted interaction between implementation intention and past behaviour was not supported. Previous smoking behaviour was a similarly strong predictor of future intentions to resist smoking for both control and implementation intention group. A final difference worth noting is that intentions to not smoke were marginally significantly more stable in the control compared to the implementation intention group. Thus counter-intuitively, forming an implementation intention may make one's goal intentions less stable over time. Given the demonstrated power of stable intentions to predict behaviour (Conner *et al.*, 2000; Sheeran *et al.*, 1999) this is potentially worrying for the long-term effectiveness of implementation intentions in relation to preventing smoking. Interestingly in the present data intentions were less predictive of subsequent smoking in the implementation intention compared to the control condition. Although this difference did not approach statistical significance.

In relation to interpreting the above findings it is important to bear in mind a number of study limitations. First, the power of the study is clearly weak in relation to testing for effects of implementation intentions. Similar studies with larger samples over longer time intervals are clearly required. Second, the use of self-report measures to assess smoking behaviour is potentially problematic. Nevertheless, several studies have validated the self-report measures used here against more objective measures (Klesges *et al.*, 1992; Patrick *et al.*, 1994; Petitti *et*

al., 1981) and concluded that self-report measures of smoking tend to be highly valid. In addition, in relation to the TPB, meta analyses demonstrate that the TPB produces similar findings with self-report and more objective measures (Armitage & Conner, 2001). Third, our measure of intention was only a single item measure and was not identical to commonly used measures (Conner & Sparks, 1996). This measure was designed to be easily understood by the participants. In addition, other work has shown it to have convergent validity with more traditional intention measures and discriminant validity with traditional measures of PBC (see note 3). However, it would be useful to replicate the present findings with a more traditional multi-item measure.

In summary, the present study found support for the TPB and past behaviour as predictors of smoking intentions and behaviour in adolescents. We only found limited evidence to support the impact of implementation intentions on preventing smoking initiation in adolescents. Although this finding needs to be treated with caution given the preliminary nature of this finding. Further research is needed to assess whether implementation intentions work in preventing adolescents from smoking. The numbers initiating smoking in this study were too small to verify if forming an implementation intention could significantly reduce the numbers starting smoking. Finally, we found implementation intentions to weaken the stability of intentions and PBC and to moderate the impact of attitudes and PBC on intentions to not smoke measured prospectively.

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Notes

[1] 1988 was the exception to this with smoking prevalence found to be 8%, however, 1988 is seen to be an atypical year in comparison to all the other smoking surveys amongst young people carried out biannually, from 1982 to 1998, by the Department of Health (Goddard & Higgins, 1999).

[2] For a child to receive free school dinners the family must have government-assisted income. The main results were unaffected by SES and further results are therefore not reported.

[3] This is not a traditional intention measure. In particular, a certainty judgement is required rather than a likelihood judgement and the target behaviour is resisting smoking rather than not smoking. This particular wording was selected as being easily understood by this sample of adolescents. In addition, a different study with a similar sample of adolescents showed a very similar single-item measure with the same response format ('How certain are you that you will not smoke this term') to be significantly correlated with traditional measures of intention (e.g., 'I plan not to smoke this term', $r = 0.33$, $p < 0.001$, $N = 1552$; 'I will try not to smoke this term', $r = 0.33$, $p < 0.001$, $N = 1551$), yet unrelated or weakly related to traditional measures of PBC (e.g., 'How much control do you feel that you have over not smoking this term', $r = -0.03$, $N = 1552$; 'I am confident I could resist smoking this term', $r = 0.17$, $p < 0.001$, $N = 1552$). In addition, a dichotomous intention measure ('Will you resist smoking this term', yes/no) in the present study produced very similar results to those reported for the main intention measure.

[4] The smoking behaviour questions used were modelled after the questions used in *Smoking Among Secondary School Children: 1996*, a National smoking survey carried out by the Department of Health (Jarvis, 1997). A total of 35 children showed some inconsistencies in response to questions about smoking. However, exclusion of these adolescents from the sample did not substantively alter the major findings and so they were retained in the sample.

[5] A total of 13 adolescents failed to fully complete the implementation intention measure. However, they were retained in the sample as their exclusion did not substantively alter the major findings.

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