

End of Award Report:

Does changing attitudes, norms or self-efficacy change intentions and behaviour?

BACKGROUND

Attitudes, norms, and self-efficacy are construed as the key predictors of action in the dominant theories of social and health behaviour, including the theory of reasoned action (Fishbein, 1980), the theory of planned behaviour (Ajzen, 1991), the model of interpersonal behaviour (Triandis, 1980), the health belief model (Rosenstock, 1974), protection motivation theory (Rogers, 1983), the transtheoretical model (Prochaska et al., 1992), the prototype/willingness model (Gibbons et al., 1998), goal-setting theory (Locke & Latham, 1990), the model of action phases (Heckhausen, 1991), and social cognitive theory (Bandura, 1999). Attitude refers to people's overall evaluation of what it would be like to perform a behaviour (e.g., "Smoking cigarettes is enjoyable/not enjoyable"), and motivate behaviour because people wish to approach good outcomes and avoid bad outcomes. Social norms refer both to people's perceptions of social pressure to engage (or not) in a behaviour (e.g., "Most people who are important to me think that I should not smoke cigarettes") and to perceptions of other people's behaviour in the domain (e.g., "Most of my friends and family smoke cigarettes"). Self-efficacy refers to people's appraisals of their ability to perform a behaviour (e.g., "I am confident that I am able to quit smoking cigarettes"). One additional factor is also important for understanding the prediction of behaviour, namely, the concept of intention. Intentions are people's decisions or self-instructions to perform particular behaviours or achieve certain goals (e.g., "I intend to quit smoking cigarettes this week") and are thought to mediate the impact of attitude, social norm, and self-efficacy on behaviour (Ajzen, 1991).

Numerous primary studies and meta-analyses support the validity of attitudes, norms, self-efficacy as predictors of intentions and behaviour (e.g., Sheppard et al, 1988). However, because the vast majority of research is correlational, it does not provide a clear answer to the question, "Does changing attitudes, norms, and self-efficacy cause changes in intentions and behaviour?" A definitive answer to this question can only be provided by experimental tests. That is, a causal relationship between, e.g., attitude and behaviour can only be established by randomly assigning one-half of a sample to an intervention or treatment that succeeds in changing attitude compared to the other half of the sample that did not receive this treatment (the control group). Subsequent behaviour of the treatment group versus control group must then be compared. If the treatment group exhibit a significant difference in behaviour compared to the control group, this would indicate that attitude change has a causal impact on behaviour change.

The present research aimed to answer the question "Does changing attitudes, norms, and self-efficacy cause changes in intentions and behaviour?" by using meta-analysis to integrate experimental studies that met the three criteria of (1) random assignment of participants, (2) significant change in attitude, social norm, or self-efficacy among treatment compared to control participants, and (3) comparison of subsequent intention or behaviour by condition. In addition, the research aimed to design and test a behaviour change intervention based on findings from the meta-analysis.

OBJECTIVES

To identify interventions that are successful in changing attitudes, norms, and self-efficacy in order to: (a) assess how often these interventions produce changes in intention and behaviour, and (b) estimate the size of intervention effects on intention and behaviour change.

To confirm that intervention effects on intentions and behaviour are mediated by changes in attitudes, norms, and self-efficacy.

To test whether interventions that simultaneously change more than one of the predictors have greater impacts on outcomes than interventions that change attitudes only, norms only, or self-efficacy only.

To identify the characteristics of successful interventions and determine what characteristics best predict intervention impact.

To use the information about intervention characteristics to design a "best practice" intervention to promote intention and behaviour change in a primary research study.

METHODS

The research used two methods. First, meta-analysis was used to integrate the findings from published and unpublished studies in order to meet Objectives 1-4. Second, we conducted an intervention designed to change attitude, social norm, self-efficacy and examined its effects on intention and behaviour to reach Objective 5.

1. Meta-Analysis

Selection of studies. Three methods were used to generate the sample of studies (a) computerized searches of social scientific databases (Web of Science, PsychINFO, UMI's Dissertation Abstracts) from January 1981 to December 2004 using the search terms: *TS=(intention* or behav*) and TS=(intervention* or experiment* or random* or control or controls or controlled or trial) and TS=(attitud* or belief* or outcome* same expect* or costs or benefits or pros or cons or desirability or norms or norm or normative or peer or social pressure or parent* pressure or social influence* or parent* influence* or approv* or disapprov* or facilitat* or feasibility considerations or perceived control or perceived behav* control or control belief* or PBC or self efficacy or volition*) not TS=(theory of planned behav* or theory of reasoned action or social cognitive theory or protection motivation or health belief model or elaboration likelihood or transtheoretical model)* (studies had to include respective terms in either the title or abstract), (b) reference lists in each article were evaluated for inclusion (ancestry approach; Johnson, 1993), and (c) authors were contacted and requests were made for unpublished studies and studies in press. There were three inclusion criteria for the meta-analysis. First, the studies must involve random assignment of participants to a treatment group who received an intervention, and a comparison group who received either a control intervention or no intervention. Second, the intervention must produce a significant difference between the treatment and control groups in at least one of the predictor variables (attitude, social norm, self-efficacy). Finally, a measure of intention and/or behavior must be taken after the measurement of the predictor(s).

The search generated 24475 references whose abstracts were evaluated for inclusion in the review. The most frequent reasons for rejecting research reports were failure to conduct an intervention (cross-sectional studies, reviews), problems

with randomisation (no control group, non-random allocation), no or poor measurement of cognitions or behaviour, lack of intervention effects (no change in cognitions), and poor reporting of data on outcomes (findings could not be extracted from the original report, there was no response to requests for clarification). In total, $k = 214$ independent tests of intervention effects involving 65,289 participants met the inclusion criteria. These tests involved 129 successful attitude change interventions, 27 successful social norm interventions, and 117 successful self-efficacy interventions. Behaviour was the outcome in 163 tests, and intention was the outcome in 103 tests. A total of 74 different behaviours were examined among 47 types of sample.

Meta-analytic strategy. Where interventions employed more than one treatment condition, we selected the treatment group that produced the largest difference in attitude, social norm, or self-efficacy compared to the control group. The meta-analysis used the unbiased effect size estimator d (Hedges & Olkin, 1985), which is computed as the difference between the mean for the experimental group minus the mean for the control group divided by the pooled standard deviation. Computations were undertaken using Schwarzer's (1988) META program. Sample-weighted average effect sizes (d_+) were based on a random effects model because studies were likely to be "different from one another in ways too complex to capture by a few simple study characteristics" (Cooper & Hedges, 1994, p. 526). Interpretation of average effect size values was guided by Cohen's (1992) power primer which suggests that $d_+ = .20$ should be considered a "small" effect size, $d_+ = .50$ is a "medium" effect size, whereas $d_+ = .80$ is a "large" effect size.

Study characteristics (e.g., N s, effect sizes, type of measure, sample, dichotomisation of behaviour measure, *inter alia*) were coded by the research assistant (Eleanor Mann) and by a second independent coder; disagreements were resolved by a third coder. We were fortunate in getting Prof Charles Abraham's input in coding the behaviour change strategies used in interventions. He has developed a state-of-the-art coding frame that explicitly delineates the change tactic from the target cognition and mode of delivery of the intervention. Professor Abraham coded the interventions independently, trained the research assistant to use the 33-category coding frame (see Table 4 below); she then coded the interventions independently. Reliability of codings was high (median agreement = 91%).

2. Intervention

The content of the intervention designed to change attitude, social norm, and self-efficacy was guided by interim findings from the meta-analysis. Originally, we proposed to conduct the intervention among a sample of 300 students. However, because savings were made on inter-library loans during the conduct of the meta-analysis, we were able to devote resources to conducting a study using a more representative sample. More particularly, we gained access to the postal addresses of a sample of the population of North Yorkshire Council who had previously taken part in research directed by Dr Christopher Armitage. We therefore decided to embed the intervention manipulations (see below) in a postal questionnaire. The focal behaviour examined in the research was physical activity, because health benefits of physical activity are well established (e.g., Armitage, 2005). The research focused on increasing participants' activity levels to the recommended level of at least 30 minutes of moderate physical activity on at least 5 days per week. The study adopted a 2 x 2 between participants design in which two different types of interventions were tested. Participants were randomly assigned to conditions and were sent questionnaires appropriate to their group allocation. The questionnaire used standard

multi-item measures of attitude, social norm, self-efficacy, intention, and past behaviour (alphas = .70 to .81). Two weeks later, participants were sent a second questionnaire that assessed their physical activity (behaviour) since the intervention.

Intervention questionnaires were posted to 698 individuals, of whom 454 responded. This represents a response rate of 65% which is very good compared to similar postal surveys. Three hundred and eighty-two participants (84% of the original respondents) completed the second questionnaire. Participants were predominantly women (56%) and ranged in age from 21 to 90 years ($M = 50.45$, $SD = 12.86$). A detailed characterization, and evidence concerning representativeness, of the sample is described elsewhere (Reid & Armitage, 2005).

RESULTS

Objective 1: *To: (a) assess how often interventions that are successful in changing attitudes, norms, and self-efficacy produce changes in intention and behaviour, and (b) estimate the size of intervention effects on intention and behaviour change.*

Table 1 presents the number of tests, number of participants, effect sizes, and homogeneity of effects obtained in successful attitude, social norm, and self-efficacy interventions. Significance ratios (SRs; i.e., the percentage of interventions that produced statistically significant changes in intention and behaviour in the predicted direction) are also presented. Seventy-four interventions involving 20,836 participants successfully changed attitudes and examined the impact of this change on intention. Findings indicate that interventions produced a medium-to-large change in attitude on average, and generated significant changes in intention in 70% of tests. The overall effect of changing attitude on intention change was of medium magnitude ($d = .48$). Similar effects of changing attitude on behaviour change were also observed.

Successful interventions generated medium or medium-to-large changes in each of the predictors (attitude, social norm, self-efficacy) and produced significant changes in intention and behaviour in approximately 3 out of every 5 tests. The significance ratios indicate that changing attitude vs. social norm vs. self-efficacy had equivalent effects on how often intention and behaviour changed significantly (all $ps > .2$). Of course, significance ratios are a relatively crude indicator of the effectiveness of interventions, and fail to take account of respective sample sizes. The effect sizes for intention and behaviour change provide a better index of the impact of changing the predictors. The effect size findings indicate that changing attitude, social norm, and self-efficacy each have important impact on the outcomes, and generate changes of approximately medium magnitude in intention and behaviour. Comparing the effects on different outcomes (intention vs. behaviour) indicates that attitude had similar effects on intention versus behaviour ($p = .10$); social norm had greater impact on intention than behaviour ($p < .001$), whereas self-efficacy had greater impact on behaviour compared to intention ($p < .04$). Comparisons of the effects of different predictors indicates that changing self-efficacy produced greater intention change than did changing attitude, and produced greater behaviour change than did changing attitude or subjective norm ($ps < .01$); none of the other comparisons reached significance. In sum, the key finding from the present research is that changing attitude, social norm, and self-efficacy does change intention and behaviour. Interventions that successfully change these cognitions engender: (a) changes in intention and behaviour in approximately 60% of tests, and (b) produce medium-sized changes in intention and behaviour according to standard estimates of effect size. Changing self-efficacy has the largest impact on intention and behaviour

change. However, substantial intention and behaviour change accrues from interventions that change each of the three predictors.

Objective 2: *To confirm that intervention effects on intentions and behaviour are mediated by changes in attitudes, norms, and self-efficacy.*

To achieve this objective, three types of analyses were conducted on the effect size data. First, we conducted least square regression analyses to determine the strength of association between the effect sizes describing the impact of the intervention on predictors and the effect sizes describing how much change in intention and/or behaviour was generated. Table 2 (first and third column) show the results of these analyses. Findings indicate that the amount of change generated by the interventions in attitude, social norm, and self-efficacy is strongly related to the extent of subsequent intention and behaviour change. The univariate beta coefficients range from .45 to .83 and are each considerably larger than would be expected by chance alone (all $ps < .001$).

Second, because the strength of respective predictor à outcome relationships might be affected by a variety of study characteristics, relevant features were coded and their association with the intention and behaviour effect sizes was estimated. In particular, the following study characteristics were examined: (a) whether the study came from a journal article or a thesis, (b) whether or not the behaviour had a physiological component, (c) whether the behaviour could be characterized as frequently performed in stable contexts (i.e., whether the behaviour was likely to involve habit according to Ouellette & Wood's, 1998, analysis), (d) the time interval between the end of the intervention and measurement of the predictors and outcomes, (f) the type of attitude, norm, and self-efficacy measure (in each case, we used the most frequent category as the baseline [coded = 1] and all other categories as the alternative [coded = 0]; for attitude the baseline category was a direct, semantic differential measure, for social norm it was an injunctive norm measure, and for self-efficacy it was a standard self-efficacy measure [as opposed to a measure of perceived behavioural control, facilitating conditions, etc.]), (g) sample characteristics (baseline categories were students and children) (h) whether or not the behaviour measure was artificially dichotomized, and (i) objectivity of the behavioural measure (objective versus self-report). Table 2 indicates that study characteristics generally were not significantly associated with the effect sizes for intention or behaviour. For intention, there was a marginally significant effect of publication status ($p < .08$) such that theses were associated with larger effect sizes compared to journal articles; longer time intervals and non-student samples also were associated with less change in intention. For behaviour, the type of self-efficacy measure was the only study characteristic that had a significant univariate association with behaviour; standard measures had stronger associations. Multivariate analyses were then undertaken in order to determine whether changes in the predictors were still associated with outcomes when (significant) study characteristics were taken into account. As Table 2 indicates, in all of these analyses, predictors retained their significant associations with intention and behaviour change whereas associations for study characteristics became non-significant. Thus, there are strong associations between the predictors and outcomes and these associations are not attenuated by key study characteristics.

The best evidence concerning whether changes in intention and behaviour are mediated by changes in attitude, social norm, and self-efficacy can be obtained from studies that report associations between post-intervention measures of the predictors and the outcomes. Unfortunately, relatively few studies provided relevant correlations in the original reports, and few researchers responded to requests for information.

This meant that formal mediation analyses could be conducted on 7 tests of attitude-intention relation, 6 tests of the attitude-behaviour relation, 0 tests of the social norm-intention relation, 2 tests of the social norm-behaviour relation, 10 tests of the self-efficacy-intention relation, and 25 tests of the self-efficacy-behaviour relation only. Mediation was tested by means of meta-analytic path analyses. Sample-weighted average correlations were computed to represent intervention-predictor, intervention-outcome, predictor-outcome associations (d s were converted to r where appropriate). Regression analyses were used to calculate the relationships between the independent variable (the intervention) and the mediator (measured cognition change), and between the mediator and the dependent variable (intention/behaviour change) controlling for the independent variable, as specified by Baron and Kenny (1996). Sobel's (1982) test was used to measure the extent to which cognition change attenuated the intervention-intention/behaviour change relation.

Table 3 shows the results of these analyses. In all cases, the mediator (cognition change) was significantly associated with change in intention and behaviour ($ps < .001$); Moreover, Sobel tests indicated that changes in attitude, social norm, and self-efficacy engendered a significant reduction in the strength of the association between interventions and outcomes in every case ($ps < .05$). However, it is notable that the intervention-intention, and intervention-behaviour, relationships remained significant even changes in respective predictors were controlled. These findings indicate that change in specified cognitions does not entirely mediate the impact of interventions on outcomes.

Objective 3: *To test whether interventions that simultaneously change more than one of the predictors have greater impacts on outcomes than interventions that change attitudes only, norms only, or self-efficacy only.*

Our first approach to answering this question was to compare studies that, for instance, only changed attitude versus changed attitude+social norm versus changed attitude+social norm+self-efficacy. Unfortunately, however, this strategy did not provide a fair test because the extent of attitude change varied in these analyses (d s for attitude change were .73, .41, and .83, respectively). It did not seem legitimate to examine the effects of significant changes in more than one predictor when it was not possible to control for the extent of change in a focal predictor. We, therefore adopted a different strategy that involved conducting weighted least square regressions of the effect sizes for intentions and behaviour on respective effect sizes for attitudes, norms, and self-efficacy. There were 4 and 5 studies, respectively that generated significant changes in attitude+social norm+self-efficacy and examined effects on intention and behaviour. However, multicollinearity precluded computation of regression and beta coefficients (even though effect sizes were standardized prior to computing the interaction terms). Thus, it was not possible to test the effects of the 3-way (attitude*social norm*self-efficacy) interaction on outcomes. All of the 2-way interactions between predictors could be computed, however. Hierarchical regression indicated that in all but one case, entry of the interaction term at the second step did not account for an increment in the variance explained in intentions and behaviour, and was not associated with a significant beta coefficient (all $ps > .13$). Only the interaction between the effect sizes for attitude and subjective norm in predicting behaviour was significant ($B = 1.39$, $*R^2 = .25$, $*F = 6.69$, $p < .03$). Decomposition of the interaction term (see Figure 1) revealed that when interventions generated a small change in attitude, then changing subjective norm had a negative impact on behaviour change ($B = -.34$, $p < .04$). However, when an intervention generated a large change in attitude, then changing subjective norm had a positive impact on behaviour change ($B = .46$, $p < .01$). These findings are consistent with the contingent consistency hypothesis which states that behaviour change is greatest

when attitude and social norms both support the performance (Acock & deFleur, 1972). Overall, however, it appears that attitude, social norm, and self-efficacy interventions have additive rather than synergistic effects on intentions and behaviour.

Objective 4: *To identify the characteristics of successful interventions and determine what characteristics best predict intervention impact.*

We analysed the distribution and effects sizes for behaviour of the following key features of interventions that changed attitudes, norms, and self-efficacy: (a) theoretical basis of intervention (e.g., theory of planned behaviour, social cognitive theory), (b) behaviour change strategy (e.g., provide information on consequences, prompt intention formation), (c) mode of delivery (e.g., individual, group), (d) source of intervention (e.g., researcher, health educator). Forty-four percent of interventions did not state a theoretical basis for the intervention (see Table 4). Nonetheless, these interventions had an effect on behaviour of approximately medium size ($d = .60$). The most frequently used theoretical perspective was social cognitive theory (22% of interventions) and had a medium effect on behaviour. Behaviour change was greatest (and of 'large' magnitude) when interventions were based on the health belief model, cognitive behaviour therapy, goal setting theory and learning theory (all $ds \geq .75$). Interventions based on the transtheoretical model, protection motivation theory and other theories (e.g., the sexual behaviour sequence, experiential learning) had small effects. However, because of the relatively small number of studies that tested these different perspectives, caution is warranted in drawing conclusions about how effective are interventions based on different theories.

Prof Abraham's coding scheme for behaviour change strategies involved 33 categories. Three strategies were used in more than one-half of all interventions—*provide information about consequences, provide general information, provide opportunity for social comparisons*—that each produced changes in behaviour of medium magnitude. One strategy was not used (*shaping*). The most effective behaviour change strategies were to *prompt practice, prompt specific goal setting, generate self-talk, agree a behavioural contract, prompt review of behavioural goals*, and discuss *relapse prevention*. These strategies all had large effects on behaviour change ($d \geq .77$). However, it is notable that several of the most successful strategies were used infrequently. Virtually all of the strategies had effects of medium size or better which, perhaps, is not surprising given that the review involves only successful interventions. However, two strategies were clearly less effective, namely, *prompting anticipated regret* and *fear arousal* which only had small effects in changing behaviour ($ds \leq .23$).

The most frequently used mode of delivery involved a group setting which proved to have similar effects on behaviour change as interventions delivered on an individual (one-to-one) basis ($ds = .67$ and $.63$, respectively). The effect size for interventions delivered in classrooms was smaller ($d = .44$). Effects on behaviour were similar and of medium-to-large magnitude whether the source of the intervention was a researcher, health educator/professional, trained adult facilitator, or clinician ($ds = .66$ to $.80$). Using figureheads or teachers as the source of the intervention was not very effective, however ($ds \leq .21$). Peer interventions had a medium-sized effect on behaviour change, and combining peers and adults as the source of the intervention had a large effect in 2% of studies. We also coded two characteristics of interventions measured on continuous scales—duration of the intervention (e.g., number of sessions, total number of hours), and attrition rates. Neither index of intervention duration had significant associations with effect sizes for the predictors

or outcomes ($ps > .11$). However, greater attrition was associated with less change in behaviour ($\beta = -.19, p < .03$).

Objective 5. *To use the information about intervention characteristics to design a “best practice” intervention to promote intention and behaviour change in a primary research study.*

Based on interim findings from the meta-analysis, two broad behaviour change techniques were identified as effective, and thus appropriate for testing. The first technique was termed “motivational” because it was geared at changing attitude, social norm, and self-efficacy in order to strengthen intentions to act. This technique comprised the following specific behaviour change strategies from Prof Abraham’s coding frame: *provide information regarding consequences, provide information about other’s approval, provide opportunity for social comparisons, prompt intention formation, prompt practice, use of imagery, and generate self-talk*. The second technique was the strategy *prompt specific goal setting*. The motivational intervention took the form of an A4 leaflet entitled “Put the ‘I’ in Active!” that came with the questionnaire measuring attitude, social norm, self-efficacy, and past behaviour. Text was designed by the research team in relation to each behaviour change strategy. For instance, the following passage was designed to generate *self-talk*: **“Talk to yourself.** If you’re telling yourself you can’t do it, then try telling yourself you can. If you think *“I’m not the type”*, then remember you don’t need to be ‘sporty’ or slim to be active and benefit from it. If you think *“I haven’t the time”*, remember 30 minutes a day is all it takes—there are 23 $\frac{1}{2}$ hours left. You don’t need to make ‘special time’ for being active. Just make it part of your existing routine.” The passage designed to *prompt specific goal setting* came at the end of the questionnaire measuring the predictors and past behaviour and comprised the following text: “If you want to be more active, it will help to think of good opportunities to be active and what exactly it is that you will do. Make plans to be active using the format “If it is (*what day, time and place?*), then I will (*do what?*). Please make your first plan below.” (Spaces were presented after the stems “If it is...then I will...” for participants to write in their specific goals).

Data for the 382 participants who completed both waves of data collection were analysed using a 2 (motivational intervention vs. control) $\times$ 2 (specific goal setting intervention vs. control) multivariate analysis of variance with measures of cognitive and affective attitude, social norm, self-efficacy, intention, past behaviour, and subsequent behaviour (number of days of physical activity in the previous two weeks, length of time spent physically active on the average day) as the dependent variables. The multivariate tests involving the cognitions and past behaviour showed no significant main effects of the interventions and no significant interaction, $F(7, 372) < 1.31, ns$. Univariate tests also were not significant (max $F = 2.81, p = .10$). The interventions also had no significant effects on subsequent behaviour, $F(2, 377) < 1.84, ns$. In sum, the interventions tested here did not succeed in changing attitude, social norm, or self-efficacy, and had no impact on intention or behaviour.

Several factors may help explain why the interventions were not successful. First, the behaviour change strategies used in the interventions were based on interim—and not the complete—findings from the meta-analysis. This was because the large volume of interventions identified in the literature search, and difficulties extracting findings from respective studies meant that it was not possible to generate the complete findings before the interventions were conducted. Had it been possible to complete the meta-analysis sooner, the interventions could have used more effective behaviour change strategies such as *relapse prevention* or *agree behavioural contract*. A second factor that might explain the lack of impact of the

intervention is that the interventions were embedded in a postal survey. This meant that it was not possible to ensure that participants read the leaflet containing the motivational intervention or completed the specific goal setting intervention, and so the lack of effect might be because participants did not engage with the intervention materials. The third factor has to do with a possible ceiling effect for behaviour. Sixty per cent of the sample were physically active for at least 30 mins on 4 or more days per week. Thus, there was little scope for behaviour change among a substantial proportion of the sample. This (high) level of physical activity was not anticipated when the study was designed originally. Of course, a wide variety of explanations can be adduced for null findings. What the findings do make clear, however, is that it can be difficult to generate significant changes in attitude, social norm, and self-efficacy.

ACTIVITIES

A portion of the findings was reported in a poster presentation at the Society for Personality and Social Psychology Conference in New Orleans, January 20-22, 2005 (Webb, T. L. & Sheeran, P., "Does changing behavioral intentions engender behavior change? A review of the experimental evidence"). The main findings will be presented in a scheduled Keynote Address by the PI to the 20th Conference of the European Health Psychology Society in Warsaw (30 Aug –2 Sept, 2006) entitled "The role of cognition change in behaviour change."

OUTPUTS

The research has not yet generated outputs. However, we anticipate at least two refereed journal articles in prestigious outlets will accrue from the research. In particular, we will submit findings from the meta-analysis to *Psychological Bulletin* and findings from the survey will be submitted to *Psychology and Health*. We will be happy to deposit the data at the Data Archive.

IMPACTS

Academic researchers with whom we have discussed the research have shown considerable interest in the findings (this is demonstrated, for instance, by the invitation to speak about the findings at the European Health Psychology Conference in Warsaw this year). We anticipate that interest from practitioners also will be considerable once the findings are published.

FUTURE RESEARCH PRIORITIES

The findings demonstrate that changing key variables specified by psychological theories—attitude, social norm, and self-efficacy—is capable of generating substantial behaviour change. Although the present work constitutes an important first step in understanding the nature and mechanisms of behaviour change, a great deal more research is needed in order to integrate these variables within a broad theory of behaviour change, to specify precisely the most effective strategies for changing behaviour, and to disseminate the results to policy makers and practitioners concerned with changing what people do.

ANNEX: Tables and Figure

Table 1.
Effects of Changing Attitude, Social Norm, and Self-Efficacy on Intention and Behaviour

Change in Predictor		Change in Outcome									
Predictor	à Outcome	k	N	d	CI	Q	SR	d	CI	Q	
Attitude à Intention	74	20836	.66	[.46, .86]	894.0***	70%	.48	[.46, .86]	479.2***		
SN à Intention	17	13472	.41	[.22, .61]	139.8***	57%	.52	[.20, .83]	141.1***		
SE à Intention	45	11019	.51	[.38, .64]	199.4***	67%	.56	[.39, .72]	307.9***		
Attitude à Behaviour	87	31653	.60	[.43, .77]	1505.0***	60%	.45	[.32, .58]	2265.7***		
SN à Behaviour	23	16007	.53	[.30, .76]	370.5***	57%	.42	[.21, .64]	274.7***		
SE à Behaviour	105	21985	.74	[.59, .90]	1902.2***	57%	.61	[.47, .76]	871.8***		

Notes. SN = social norm, SE = self-efficacy, *k* = number of independent tests, *N* = sample size, *d* = sample-weighted average effect size, *CI* = 95% confidence interval, *Q* = homogeneity statistic, *SR* = significance ratio.

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2
Associations Between Predictors, Study Characteristics, and Effect Sizes for Intention and Behaviour Change

Predictor/Characteristic Intention Behaviour			
Univariate	Multivariate	Univariate	Multivariate
Predictor			
Attitude	.64***	.58***	.49*** .49***
Social norm	.80***	.65***	.83*** .83***
Self-efficacy	.77***	.64***	.45*** .75***
Study Characteristic			
Journal vs. thesis	-.17†	-.05	
Physiological component	-.01	-.07	
Frequency/stability	-.08	.09	
Time interval	-.34***	a	-.09
Attitude measure	.15	.01	
Social norm measure	-.09	-.09	
Self-efficacy measure	.13	.17*	c
Sample (student)	.36***	b	-.10
Sample (children)	-.16	-.10	
Dichotomisation (behaviour)	-.01		
Objective (behaviour)	.06		

Note. Values are beta coefficients.

^a Betas are -.19, *ns*, .02, *ns*, and -.18, *ns* in analyses for attitude, SN, and SE, respectively.

^b Betas are .10, *ns*, .28, *ns*, and .01, *ns* in analyses for attitude, SN, and SE, respectively.

^c Betas is -.19 in the analysis for self-efficacy.

Table 3
Associations Between Predictors, Study Characteristics, and Effect Sizes for Intention and Behaviour Change

	Intervention (- Mediator)	Intervention Mediator (+ Mediator)	Z _{Sobel}
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Attitude à Intention	.28***	.19***	.44***	6.03***
Social norm à Intention	.28***	.24***	.23***	2.52*
Self-efficacy à Intention	.35***	.23***	.37***	9.22***
Attitude à Behaviour	.69***	.68***	.06***	5.05***
Self-efficacy à Behaviour	.35***	.31***	.11***	5.15***

Note. Values are beta coefficients. There were too few cases to conduct mediation analyses for the social norm à behaviour relation.

Table 4
Distribution and Effects Sizes for Intervention Characteristics: Theoretical Basis, Behaviour Change Strategy, Mode of Delivery, and Source of Intervention

Intervention Characteristic	%	<i>d</i>
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Theoretical Basis		
None stated	44	.60
Social cognitive theory	22	.66
Health belief model	5	.75
Theory of reasoned action	4	.46
Theory of planned behaviour	3	.65
Protection motivation theory	3	.14
Social learning theory	3	.45
Transtheoretical model	2	.28
Cognitive behaviour therapy	2	1.70
Goal setting theory	2	.76
Learning theory	1	1.21
Elaboration likelihood model	1	.56
Unspecified "theory-based"	2	.63
Other	6	.20

Behaviour Change Strategy
 Provide information about consequences 63 .49
 Provide general information 58 .45
 Provide opportunities for social comparison 52 .55
 Prompt intention formation 38 .50
 Prompt practice 36 .77
 Provide instruction 35 .57
 Use general encouragement 24 .40
 Provide feedback on performance 22 .68
 Prompt barrier identification 22 .45
 Model/demonstrate the behaviour 21 .61
 Provide information about others' behaviour 17 .54
 Prompt monitoring of behaviour 16 .67
 Plan social support/change 16 .53
 Prompt specific goal setting 12 .80
 Use follow-up prompts 11 .60
 Provide information about others' approval 9 .52
 Emotion control training 7 .62
 Stress management 6 .55
 Use of imagery 6 .72
 Fear arousal 5 .23
 Use of contingent rewards 4 .67
 Self-talk 3 .93
 Relapse prevention 3 1.04
 Prompt generalization of target behaviour 2 .57
 Teach to use prompts/cues 2 .63
 Agree behavioural contract 2 .88
 Prompt review of behavioural goals 2 1.16
 Prompt identification as a role model 2 .51
 Prompt anticipated regret 1 .15
 Time management 1 .45
 Motivational interviewing 1 .51
 Shaping 0 ____
 Mode of Delivery
 Classroom 18 .44
 Group 51 .67
 Individual 29 .63
 Family 1 .00
 Pairs 1 .40
 Source of Intervention
 Researcher 25 .66
 Health educator/professional 22 .72
 Teacher 17 .21
 Trained adult facilitator 11 .78
Table 4 (cont.)
 Peers 8 .50
 Clinical professional 7 .80
 Figurehead (e.g., celebrity) 4 .18
 Peers + adults 2 1.38
 Parent 2 2.08
 Other group leader 2 .91

Table 5
Effects of Motivational Intervention and Specific Goal Setting Interventions on
Physical Activity Cognitions and Behaviour (N = 381)

Variable Control Motivational			
Control	Specific Goal	Control	Specific Goal
<i>Cognitions</i>			
Affective attitude	2.99 3.13	3.03 3.10	
Cognitive attitude	3.15 3.37	3.20 3.18	
Social norm	2.46 2.68	2.66 2.67	
Self-efficacy	2.71 2.69	2.71 2.75	
<i>Intention</i>			
Behaviour (Time 1)			
Time	119.24 131.73	109.74 108.90	
Days	4.15 4.17	4.45 4.32	
Behaviour (Time 2)			
Time	102.93 92.71	97.51 86.05	
Days	3.52 3.44	3.85 3.84	