Tobacco cessation interventions for young people (Review)

Grimshaw GM, Stanton A

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2007, Issue 4

http://www.thecochranelibrary.com

TABLE OF CONTENTS

Tobacco cessation interventions for young people (Review)

Grimshaw GM, Stanton A

This record should be cited as:
Grimshaw GM, Stanton A. Tobacco cessation interventions for young people. *Cochrane Database of Systematic Reviews* 2006, Issue 4. Art. No.: CD003289. DOI: 10.1002/14651858.CD003289.pub4.

This version first published online: 18 October 2006 in Issue 4, 2006.
Date of most recent substantive amendment: 15 August 2006

ABSTRACT

Background
Teenage smoking prevalence is around 15% in developing countries (with wide variation from country to country), and around 26% in the UK and USA. Although most tobacco control programmes for adolescents are based around prevention of uptake, there are also a number of initiatives to help those who want to quit. Since those who do not smoke before the age of 20 are significantly less likely to start as adults, there is a strong case for programmes for young people that address both prevention and treatment.

Objectives
To evaluate the effectiveness of strategies that help young people to stop smoking tobacco.

Search strategy
We searched the Cochrane Central Register of Controlled Trials (CENTRAL) and the Cochrane Tobacco Addiction Group's Specialized Register, MEDLINE, EMBASE, PsyclNFO, ERIC, CINAHL, and the bibliographies of identified trials. We also searched the 'grey' literature (unpublished materials), and contacted authors and experts in the field where necessary.

Selection criteria
Types of studies: Randomized controlled trials, cluster-randomized controlled trials and controlled trials.
Types of participants: Young people, aged less than 20, who are regular tobacco smokers.
Types of interventions: The interventions ranged from simple ones such as pharmacotherapy, targeting individual young people, through complex programmes targeting people or organizations associated with young people (for example, their families or schools), or the community in which young people live. We included cessation programmes but excluded programmes primarily aimed at prevention of uptake.
Types of outcome measures: The primary outcome was smoking status at six months follow up, among those who smoked at baseline. We report the definition of cessation used in each trial (e.g seven- or thirty-day point prevalence abstinence, or sustained or prolonged abstinence), and we preferred biochemically verified cessation when that measure was available.

Data collection and analysis
Both authors independently assessed the eligibility of candidate trials identified by the searches, and extracted data from them. We categorized included trials as being at low, medium or high risk of bias, based on concealment of allocation, blinding (where applicable) and the handling of attrition and losses to follow up. We conducted limited meta-analyses of some of the trials, provided that it was appropriate to group them and provided that there was minimal heterogeneity between them. We estimated pooled odds ratios using the Mantel-Haenszel method, based on the quit rates at longest follow up for trials with at least six months follow up from the start of the intervention.

Main results
We found 15 trials, covering 3605 young people, which met our inclusion criteria (seven cluster-randomized controlled trials, six randomized controlled trials and two controlled trials). Three trials used or tested the transtheoretical model (stages of change) approach, two tested pharmacological aids to quitting (nicotine replacement and bupropion), and the remaining trials used various psycho-social interventions, such as motivational enhancement or behavioural management. The trials evaluating TTM interventions achieved

moderate long-term success, with a pooled odds ratio (OR) at one year of 1.70 (95% confidence interval (CI) 1.25 to 2.33) persisting at two-year follow up with an OR of 1.38 (95% CI 0.99 to 1.92). Neither of the pharmacological intervention trials achieved statistically significant results (data not pooled), but both were small-scale, with low power to detect an effect. The three interventions (5 trials) which used cognitive behavioural therapy interventions did not individually achieve statistically significant results, although when the three Not on Tobacco trials were pooled the OR 1.87; (95% CI 1.00 to 3.50) suggested some measure of effectiveness. Although the three trials that incorporated motivational interviewing as a component of the intervention achieved a pooled OR of 2.05 (95% CI 1.10 to 3.80), the impossibility of isolating the effect of the motivational interviewing in these trials meant that we could not draw meaningful inferences from that analysis.

Authors' conclusions

Complex approaches show promise, with some persistence of abstinence (30 days point prevalence abstinence at six months), especially those incorporating elements sensitive to stage of change. There were few trials with evidence about pharmacological interventions (nicotine replacement and bupropion), and none demonstrated effectiveness for adolescent smokers. Psycho-social interventions have not so far demonstrated effectiveness, although pooled results for the Not on Tobacco trials suggest that that this approach may yet prove to be effective; however, their definition of cessation (one or more smoke-free days) may not adequately account for the episodic nature of much adolescent smoking.

There is a need for well-designed adequately powered randomized controlled trials for this population of smokers, with a minimum of six months follow up and rigorous definitions of cessation (sustained and biochemically verified). Attrition and losses to follow up are particularly problematic in trials for young smokers, and need to be kept to a minimum, so that management and interpretation of missing data need not compromise the findings.

PLAIN LANGUAGE SUMMARY

There is not yet sufficient evidence to test the effectiveness of smoking cessation programmes for adolescents, although some approaches show promise

Up to one in four UK and American teenagers smoke. Many adolescent tobacco programmes focus on preventing teenagers from starting to smoke, but some programmes have been aimed at helping those teenagers already smoking to quit. We identified 15 good quality studies (3605 participants) that researched ways of helping teenagers to quit. Complex programmes, including those tailored to the young person's preparation for quitting, and behavioural therapy programmes show some promise. However, the number of trials and participants do not yet provide enough evidence to judge effectiveness. Medications such as nicotine replacement and bupropion have not yet been sufficiently tested in adolescents. Trials used different definitions of quitting and many smaller trials did not have enough participants for us to be confident about wider application of the results. Some approaches may be worthy of consideration but there is still a need to provide better evidence before large scale investment in programmes.

BACKGROUND

There is some evidence of prevalence of smoking falling slightly in the last 20 years. The incidence of the initiation of smoking first becomes detectable in the 10 to 12 years age range (ONS 2000), and approximately one quarter of 15-year-olds and 1% of 11-year-olds smoke in the UK. Teenage smoking prevalence is similar in the United States but the downward trend for the last five years is encouraging, with a fall from a peak of 36.5% having smoked at least once in the last 30 days to 27% in 2002 (NIDA 2003). In developing economies smoking prevalence is slightly lower overall (15%) but with wide variation, from around 40% in ex-soviet states to 6-7% in the least developed states in the south (Nelson 2003; WHO 2005). World-wide nearly one quarter of all teenage smokers smoked their first cigarette before they were 10 years old.

Many teenage smokers want to quit (Burt 1998; Hu 1998; Stanton 2001; Sussman 1998) and frequent quit attempts are reported (Stanton 2001). In a South African national sample of grade 8 to grade10 students, 74% expressed a desire to stop smoking, and of these 77% had in fact made an attempt to stop (Swart 2000).

Most countries are concentrating public health policy for smoking cessation on adults, and programmes are mainly tailored to the adult smoker. Nevertheless, although the main tobacco control effort for young people is focused on prevention, a significant amount of work has been done to develop cessation programmes for young smokers. These programmes acknowledge that although a majority may not want to quit, a significant minority do want to,

and need support. In addition, it is generally held that knowledge about quitting may be useful as young people mature and develop their motivation to quit. As the evidence shows that those who do not smoke before the age of 20 are significantly less likely to start as adults, a strong case can be made for programmes for young people that address both prevention and treatment (MMWR 1998).

There is now a large literature on smoking cessation services for adults. This is reflected in a number of Cochrane reviews examining several aspects of the subject in detail. However, whilst some have suggested that similar services, suitably modified, should be considered for young people (Raw 1998), this assertion is open to challenge in view of the difference in smoking pattern, lifestyle and attitudes to services in this age group (TAG 2000). Previous reviews of adolescent smoking cessation have been published (McDonald 2003; Sussman 1999; Sussman 2002) but this is the first Cochrane review to focus on smoking cessation and young people. The paucity of high quality research evidence to answer important clinical questions is a recurrent theme of previous reviews.

Other Cochrane reviews of interventions relevant to tobacco addiction amongst young people have mainly focused on primary prevention. These include a review of school-based prevention programmes (Thomas 2002), and reviews of mass media interventions (Sowden 2000), community interventions (Sowden 2002), and interventions for reducing access by preventing illegal sale of tobacco (Lancaster 2005). This review looks at strategies for smoking cessation in young people and more specifically at the context in which the interventions are offered, and how young people are enrolled into quit attempts.

OBJECTIVES

The aim of this review was to evaluate the effectiveness of strategies that help young people to stop smoking tobacco.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

Interventions designed to meet the needs of young people aged 20 years or under. The issues may be very different for those under 18, who are more likely to be living at home with parents, and therefore results are stratified, if appropriate, by age greater or less than 18th birthday at time of the start of the study programme. If a study includes participants beyond our top threshold of 20 years (for example,16- to 21-year-olds), we have included the study if the majority of participants are aged less than 20, and if the design of the programme specifically considers the needs of young people.

Eligible studies include:
a) Randomized controlled trials (RCTs)
Studies in which individuals, classes, schools, units or groups were randomized to either the intervention or the control arm of the experiment, or randomized to receive different interventions.

b) Cluster-randomized controlled trials (C-RCTs)
Trials that have as the unit of allocation a school or organization level, or where clusters of professionals or groups of professionals are implementing interventions.

c) Controlled trials
We include trials that allocate individuals or units to intervention and control conditions without formal randomization if baseline characteristics are assessed and are comparable. We have assessed the sensitivity of our conclusions to the inclusion of evidence from non-randomized studies.

Control interventions:
Interventions in the control arm of the experiment may be one of the following:

- no intervention
- delayed intervention beyond the last date of data acquisition including follow up
- information on stopping smoking
- general tobacco education given to all participants

Studies that compare two different cessation interventions or combinations of interventions are also included.

Types of participants

Participants are young people, aged less than 20, who are regular tobacco smokers. As there is evidence that some young people have an irregular pattern of smoking, for example smoking only at weekends (Grimshaw 2003) or weekly (O'Loughlin 2003), we define a regular smoker in this review as a young person who smokes an average of at least one cigarette a week, and has done so for at least six months. Trials which target young people who smoke less than this are excluded. Analysis of trials may allow identification of subgroups according to frequency of smoking, dependent on the definition of smoking used by individual investigators.

The intervention may also be aimed at the organization to which the young person is attached. If so, the study design must demonstrate suitable control for differences in the two groups. Only studies with an outcome related to the individual smoker are included.

Exclusions

We exclude from this review Interventions specifically targeting young women in pregnancy, since this topic is covered by the Pregnancy and Childbirth Group (Lumley 2004).
We also exclude any programme aimed primarily at the adult population, and have contacted investigators where there was a lack of clarity on this issue.

Types of intervention

In this review interventions may range from simple ones such as pharmacotherapy, targeting individual young people, through strategic programmes targeting people or organizations associated with young people (for example, their families or schools), to complex programmes targeting the community in which young people live. We differentiate between these in the analyses.

All interventions must be aimed at helping young people to stop smoking tobacco. We include cessation programmes or strategies that also target relapse. We include programmes or strategies that target psycho-social determinants (for example, enhancing self efficacy for refusing tobacco), or that focus on developing life skills in order to stay abstinent, if the study design is appropriate. No restriction were placed on the setting in which the intervention was offered (for example, school, hospital, doctor's surgery, dentist).

Smoking prevention programmes were excluded, even if they reported cessation data, as they have been the subject of previous reviews (Sowden 2000; Sowden 2002; Thomas 2002). Within large-scale community primary prevention interventions, health education programmes/curricula or mass media campaigns that target young people, we have only included the cessation component of those programmes where that part of the intervention has been specifically designed to target cessation, and programmes in which the interventions can be separately assessed, and that explicitly meet the criteria of this review for study design and recruitment.

We have not included primary prevention strategies that identify and follow up baseline tobacco users, or programmes aimed solely at relapse prevention.

Types of outcome measures

Measures of quitting

The primary outcome of interest is change in smoking behaviour, i.e. being a smoker at baseline and becoming an ex-smoker at post-test for all participants who received the intervention. Trials may report outcomes at multiple follow-up points. The primary outcome was smoking status at six months follow up. We also extracted data for other assessment points where they are reported; for example at end of programme, four weeks, six months and one year or longer. We summarize the outcome for each timepoint in each trial as an odds ratio (OR), calculated as follows:
(Number of quitters in intervention/ number of continuing smokers in intervention group)/(Number of quitters in control/ number of continuing smokers in control group)

We have not included relapse rates in the review.

We have reported the definition of cessation used in each trial, for example abstinence during a particular period, such as in the past seven days or 30 days (point prevalence), abstinence from the start of the programme (continuous abstinence), or abstinence following occasional relapse in the two weeks post-treatment grace period (prolonged abstinence) (Hughes 2003).

Biochemical confirmation of self-reported non-smoking is generally taken to be the gold standard for reporting of quit rates. This tests for the presence of smoking-related substances in exhaled breath, saliva, urine or blood, and is the preferred outcome where it is available. Although the data were not available for this review, in future updates we hope to use subgroup analysis to check for differences between the results of trials with and without biochemical validation. It should be noted that biochemical validation may not be a very sensitive measure of change in smoking status for irregular smokers; it is possible that some studies may have recruited participants who would not be identified as smokers at baseline.

Enrolment

Where possible, we have analyzed data on an intention-to-treat basis, i.e. with all participants analyzed in the groups to which they were randomized, and including all the randomized participants. We have explored and categorized enrolment to studies according to type, as revealed in the study designs; e.g. personal invitation, entry through mass media campaigns, non-voluntary interviews in schools etc. Randomization may be at the level of individual or organization. We have noted whether randomization took place after enrolment into the intervention.

Participation and retention in intervention

Since one might postulate that there is educational benefit from participation in a cessation programme, we report data on drop-out and completion rates. We have counted drop-outs and losses to follow up as continuing smokers.

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: methods used in reviews.

We used the Cochrane Tobacco Addiction Review Group search strategies to identify randomized controlled trials (RCTs), cluster-randomized controlled trials (C-RCTs), and controlled trials. We searched the following databases: the Cochrane Tobacco Addiction Group Specialized Register, the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE (January 1966 onwards), EMBASE (January 1980 onwards), PsycINFO (1872 onwards), CINAHL (1982 onwards) and ERIC (1993 onwards). We have also searched the 'grey literature' (unpublished resources and conference proceedings) and the reference lists of identified studies.

Where necessary, we have contacted the authors of existing trials and other experts for ongoing trials, and for unpublished results pertaining to completed trials, subject to the availability of peer review.

We also circulated smoking cessation e-networks with a list of the references to extracted studies, to request verification and any additional information.

METHODS OF THE REVIEW

Pilot of inclusion criteria

We drew up a prospective list of eligibility criteria with two levels of priority: essential and desirable. Two authors (GG and AS) assessed the retrieved abstracts against this list for possible inclusion, to measure the feasibility of each criterion. We assessed levels of agreement by kappa score.

Assessment of abstracts for eligibility

After piloting, we applied the agreed criteria to the abstracts of all studies extracted from the databases. We then categorized studies into three groups:

1. Both authors agree on inclusion based on the abstract;
2. One author suggest inclusion based on the abstract;
3. Both authors agree on exclusion based on the abstract.

We retrieved full text articles for groups (1) and (2).

Assessment of full articles

Two authors independently assessed each full article, using the agreed inclusion criteria. For studies where there was disagreement, the editorial base was consulted, to reach a consensus. Where there was ambiguity in trial reporting or lack of data, we contacted investigators for clarification where possible. If we could not retrieve missing data, a study may have been excluded on that basis.

For included studies, we rated the overall methodological quality of the studies as being at low, moderate, or high risk of bias.

We used the following criteria to assess risk of bias:

1. Concealment of allocation (adequate [A], unclear [B], inadequate or not applicable [C]). For cluster-randomized controlled trials which recruited after allocation to intervention or control status, we took account of whether individuals may have been selectively recruited or may have differentially refused to participate in the light of the known allocation, where this could be ascertained (Campbell 2004a; Campbell 2004b; Hahn 2005).
2. Blinding (if applicable); where the trial design precluded blinding, this component did not adversely influence the quality assessment (Roland 1998).
3. Follow up (attrition rates and losses to follow up).

We have maintained a full list of excluded studies (see the Excluded Studies Table).

Data collection

We extract and report the following information, where it was available, concerning each study:

1. Country and study setting
2. Theoretical framework (including a brief description of the intervention)
3. Focus of the intervention
4. Type of intervention, its duration, intensity, delivery format, gatekeeper
5. Length of follow up
6. Size of eligible population
7. Recruitment rate
8. Number of participants or number of clusters and participants
9. Definition of the study population
10. Age range, grade, gender and ethnicity (if relevant) of participants
11. Definition of smoking status used
12. Definition of abstinence
13. Biochemical validation (if present)
14. Movement through stages of change (according to the Transtheoretical Model) will be noted if applicable
15. Differential effects post-intervention relating to age, gender, ethnicity and intensity of intervention
16. Change in other determinants that contribute to, predict and accompany the outcome of interest (e.g. self efficacy, intention, attitude)
17. Adverse effects of intervention

We initially regarded it as unlikely that meta-analysis would be possible, as study and programme designs were likely to be diverse. However, we have pooled groups of studies that we consider to be sufficiently similar in their interventions, comparison groups, setting and participants, provided that there was no evidence of substantial statistical heterogeneity as assessed by the I^2 statistic (Higgins 2003). We estimated a pooled odds ratio using the Mantel-Haenszel method, based on the quit rates at longest follow up for trials with at least six months follow up from the start of the intervention. Studies with less than six months follow up have not contributed to meta-analytic estimates of effect size. Where meta-analysis was not appropriate, we present summary and descriptive statistics.

We also report any threats to validity or other limitations described by the studies.

DESCRIPTION OF STUDIES

Included Studies

We identified 93 references from the Specialized Register of the Cochrane Tobacco Addiction Group, and a further 14 from secondary sources, including 'grey literature' and other reviews. Twenty-seven reports of 15 studies met the review inclusion criteria. Thirty-two references were not relevant to this review and 48 studies were excluded from the review as they did not meet one or more of the inclusion criteria. Many of the excluded trials had a short follow up, typically no more than three months from the start of the trial, which, in many cases, co-incided with the end of the intervention. Full details of the included studies are given in the Table of Included Studies. The excluded trials are listed in the Table of Excluded Studies with reasons for their exclusion. Trials are identified by the first author and the publication year of the main report, except for a group of studies reporting the Not

on Tobacco (NoT) programme. These are identified by the trial location and publication year of the main report; Florida (NoT FL 2001), North Carolina (NoT NC 2002), and West Virginia (NoT WV 2004).

Of the 15 studies that were included, seven were cluster-randomized trials, with allocation by group or institution (Aveyard 2001; Brown 2003; Chan 1988; NoT FL 2001; NoT NC 2002; NoT WV 2004; Project EX-1) and six randomized individuals (Colby 2005; Hollis 2005; Killen 2004; Lipkus 2004; Moolchan 2005; Robinson 2003). Greenberg 1978 and Myers 2005 were controlled trials without randomization.

Theoretical basis of intervention

It was difficult to stratify studies into categories with respect to the nature of the intervention. One intervention, conducted in 1978, used the health promotion strategies of that period (Greenberg 1978). Another used personal health risk management (Chan 1988). However, many interventions were complex and used combinations of psycho-social theories. Constructs relating to motivational enhancement and strategies for resisting cultural and social pressures were the most common. Studies of this type included those using Motivational Interviewing (Miller 2002), such as Colby 2005, sometimes combined with some form of relapse prevention advice and ongoing support (Brown 2003; Lipkus 2004; Robinson 2003). Other studies tested interventions based on the Transtheoretical Model of Change for adolescents (Prochaska 2000), either alone (Aveyard 2001) or in combination with other modalities, including brief advice and motivational enhancement (Hollis 2005) and cognitive behavioural therapy (CBT) (Lipkus 2004). Myers 2005 used an intervention based on CBT and motivational enhancement, while another study (Project EX-1) used a more eclectic mix which included yoga and meditation. One group of related studies, Not on Tobacco (NoT) used social cognitive theory (NoT FL 2001; NoT NC 2002; NoT WV 2004). Finally, two studies explored pharmacological support for quitting (Killen 2004; Moolchan 2005).

Recruitment and settings

As can be expected from a cohort where most are still associated with some form of formal education, recruitment for studies was mainly within an educational setting (Aveyard 2001; Chan 1988; Greenberg 1978; Killen 2004; NoT FL 2001; NoT NC 2002; NoT WV 2004; Project EX-1, Robinson 2003). Five studies recruited from the healthcare environment (Brown 2003; Colby 2005; Hollis 2005; Moolchan 2005; Myers 2005). Only one study (Lipkus 2004) recruited directly from the community. Typically, where school or college was the base, the trials were clustered and the intervention delivered to all students in one school, with matched schools used for control (Aveyard 2001; NoT WV 2004; NoT NC 2002; NoT FL 2001; Project EX-1). All trials but one (Aveyard 2001, UK-based) were based in the United States. The rate of recruitment was commented on by several trialists. Where schools were recruited and matched or randomized (Aveyard 2001; Greenberg 1978; NoT FL 2001; NoT NC 2002; NoT WV 2004; Project EX-1) and attendance in the programme was not compulsory, typically fewer than half of the students who smoked showed interest in enrolling. It should be noted, however, that for many of these studies parental permission was a requirement. Inducements to enrol and to remain in the study were also a feature of these trials (Colby 2005; Greenberg 1978; Killen 2004; Lipkus 2004; Moolchan 2005; Myers 2005; Project EX-1). In three trials some element of compulsion was present (Brown 2003; Myers 2005; Robinson 2003) either with attendance as an option because of smoking policy violation (Robinson 2003) or a controlled regimen in a hospital setting (Brown 2003; Myers 2005).

Definition of smoking

One of the crucial issues for smoking cessation research for young people is how smoking is defined, and how cessation is defined and verified. The cessation issues are dealt with in the Methodological Quality of Studies section and in the Discussion section. There was diversity among the included studies concerning the definition of smoking status, with most studies relying on self-reported smoking status at recruitment. In general at least one cigarette per week was used as a definition of being a smoker. Hollis 2005 did differentiate between smokers and 'experimenters', but no studies took account of the episodic nature of adolescent smoking (Corby 2000; Grimshaw 2003). A majority of studies estimated nicotine dependence using the modified Fagerstrom Questionnaire (Prokhorov 2000) (Brown 2003; Killen 2004; Lipkus 2004; Moolchan 2005; Myers 2005; NoT FL 2001; NoT NC 2002; NoT WV 2004; Project EX-1).

METHODOLOGICAL QUALITY

Measurement of outcomes

The primary outcome of all interventions was smoking cessation for each individual. Just as a wide variety of definitions of smoking were used so there were several definitions of cessation. Point prevalence measures were in the majority and these ranged from cessation for longer than one day (NoT FL 2001; NoT NC 2002; NoT WV 2004) to 30 day cessation (Aveyard 2001; Chan 1988; Hollis 1994; Hollis 2005; Project EX-1). The most common outcome measure was seven-day point prevalence (Aveyard 2001; Brown 2003; Colby 2005; Killen 2004; Lipkus 2004; Moolchan 2005; Myers 2005; Robinson 2003).

Other outcome measures included 90-day abstinence (Myers 2005) and continuous cessation (Moolchan 2005) and two sequential reports at four months and eight months from the start of the intervention (Lipkus 2004).

Verification of smoking status

Of the 15 studies which satisfied the inclusion criteria for this review, only nine used some form of verification of self reports of smoking status for the whole cohort or for the full duration of follow-up. More than one method of biochemical verification

was used in four trials Colby 2005; Killen 2004; Moolchan 2005; Myers 2005). Carbon monoxide levels were measured in seven trials (Colby 2005; Killen 2004; Moolchan 2005; Myers 2005; NoT FL 2001; NoT NC 2002; NoT WV 2004), and salivary cotinine in seven (Brown 2003; Colby 2005; Killen 2004; Lipkus 2004; Moolchan 2005; Myers 2005; Robinson 2003). In Chan 1988 and Myers 2005 smoking status was confirmed by report of another individual.

Assessment of risk of bias

Allocation concealment was adequate (rated A) in nine studies (Aveyard 2001; Colby 2005; Hollis 2005; Killen 2004; Moolchan 2005; NoT FL 2001; NoT NC 2002; NoT WV 2004; Project EX-1). In other studies either the information was not available to judge (rated B), although authors were contacted where possible (Lipkus 2004; Myers 2005) or allocation concealment was deemed to be inadequate or not used (rated C) (Brown 2003; Chan 1988; Greenberg 1978; Robinson 2003). One marked feature of all these studies was the effort required to follow up cases. Losses to follow up ranged from less than 10% to more than 50% of the cohort. It is a frequent feature of analysis of smoking cessation studies that cases lost to follow up are assumed to be still smoking. Several authors attempt to discuss this issue and make adjustments in analysis (Hollis 2005; NoT FL 2001; NoT NC 2002; NoT WV 2004). As these studies cover those aged 20 or less, it can be assumed that, amongst other issues, this is a mobile population, changing or leaving school, moving on to college, etc. Paradoxically, there may be real pressures to conceal quit attempts from social groups. Seven trials analyzed their data on an intention-to-treat basis, i.e. including all participants in the groups to which they were originally randomized, and classifying those lost to follow up as continuing smokers (Aveyard 2001; Colby 2005; Hollis 2005; Lipkus 2004; Moolchan 2005; Project EX-1; Myers 2005). One other feature of reporting was a tendency to report outcomes as percentages, sometimes without any particular clarity as to the denominator. Some of the results of our analysis have been imputed from percentage data, and in all cases authors have been contacted to ask for verification of the calculations (Brown 2003; Chan 1988; Colby 2005; Killen 2004; Lipkus 2004; NoT FL 2001; NoT NC 2002; NoT WV 2004; Project EX-1).

We developed a method of assessing the risk of bias based on a composite of the unweighted adequacy of allocation concealment, the blinding of subject, provider and assessor, the presence of confounding variables, and the use of an intention-to-treat analysis (or the feasibility of being able to do this calculation from available data where appropriate). Studies were scored as 1 (low risk of bias) if all the above criteria were adequately met. The following studies scored 1: Killen 2004; Moolchan 2005; NoT FL 2001; NoT NC 2002; NoT WV 2004. Three studies (Colby 2005; Project EX-1; Robinson 2003) were scored as 2 (moderate risk of bias) , i.e. one of the criteria was only partially fulfilled. The remaining studies scored 3 (high risk of bias) i.e. one or more criteria were not met (Aveyard 2001; Brown 2003; Chan 1988; Greenberg 1978; Hollis 2005; Lipkus 2004; Myers 2005)

RESULTS

Details of individual study outcomes are given in Table 07.01. Three studies included interventions based on the transtheoretical model of stages of change (TTM). Nine studies used some form of motivational enhancement; three studies testing the Not on Tobacco intervention (NoT) measured outcomes within the inclusion criteria, and two studies explored a pharmacological approach. In total 3605 young people participated in the included trials. The wide confidence intervals for individual studies (Comparison 01.04) reflect the lack of power in many of the studies. This graph of unpooled data is for illustrative purposes only and not a comparison or synthesis. as outcome measures varied between studies.

Comparison 01.01 is an illustration and summary of results of individual studies that used seven-day point prevalence abstinence (PPA) for outcomes measured at various points greater than six months but less than one year. A meta-analysis of these results is not appropriate as the nature of each intervention was different. Comparison 01.02 shows the results of four trials where outcomes were 30 days point prevalence abstinence, again within the first year of the intervention, while Comparison 01.03 shows those trials reporting sustained or prolonged abstinence for at least six months.

Studies including Transtheoretical Model of Change (TTM)

Three studies were based on interventions targeting the stage of change of individual participants using the transtheoretical model of change. A school-based intervention using a TTM computer expert system (Aveyard 2001) had an odds ratio (OR) for 30 day PPA of 1.52 (95% Confidence Interval [CI] 1.02 to 2.26) at 12 months, and 1.16 (0.76 to 1.75) for 24 months. By contrast the 'Teen Reach' study (Hollis 2005) included a brief clinical message and motivational counselling and booster sessions as well as using a TTM-based computer expert system recruiting from family practices and paediatric departments. The 'Teen Reach' intervention was effective for smokers (a subgroup of those recruited), with an OR of 2.04 (95% CI 1.24 to 3.35) at 12 months and the intervention effect persisted with an OR of 1.86 (95% CI 1.07 to 3.23) at 24 months. If the results from these two trials are pooled they produce an OR at 12 months of 1.70 (95% CI 1.25 to 2.33: Comparison 02.01) or a number needed to treat of 17.5 at the end of the first year after the beginning of the intervention. The effectiveness of the intervention persists to the end of the second year with a pooled OR of 1.38 (95% CI 0.99 to 1.92: Comparison 02.02), but the number needed to treat doubles.

Lipkus 2004 used a TTM-based intervention that also included motivational enhancement via telephone and cognitive be-

haviour therapy (CBT) for young people recruited in the community (shopping malls and an amusement park). He followed up the participants for eight months but the hypothesis that telephone counselling as an adjunct to self-help material would be effective was not supported (OR 1.12, 95% CI 0.69 to1.83) for seven-day PPA. As this trial was testing mode of delivery rather than stage of change, we have not thought it appropriate to combine it in a pooled analysis with the other TTM-based trials. It should be noted that Lipkus was one of the few researchers included in this review who attempted to measure sustained quitting between two points of data collection (four months and eight months).

Pharmacological Interventions

There were two studies with pharmacological interventions One study explored the effectiveness of nicotine replacement therapy (NRT) in supporting cessation, and the other tested bupropion as an adjunct to NRT. Moolchan 2005 compared NRT patches and gum with placebo. Results at six months were biochemically verified but in this underpowered study an effect could not be demonstrated, with an OR of 4.93 (95% CI 0.95 to 25.6) for patches and an OR of 1.81 (95% CI 0.31 to 10.4) for gum versus placebo using seven-day PPA (Comparison 03.01). Using prolonged' abstinence also failed to detect a significant effect of either patch (OR 8.36; 95% CI 0.95 to 73.3) or gum (OR 2.72; 95% CI 0.27 to 27.3). Killen 2004 also failed to detect an effect for bupropion used as an adjunct to NRT patches, with an OR of 1.05 (95% CI 0.38 to 2.92; Comparison 03.01). It should be noted that we have not found any evidence regarding the effectiveness of the use of bupropion alone in adolescence. We have not thought it useful to pool these two studies.

Psycho-social interventions around enhancement of motivation and behavioural management.

In all, nine studies used some form of motivational enhancement for young people (Comparisons 04.01, illustrative for trials where data is available, data not pooled). Three studies used motivational interviewing as one of their theoretical frameworks. Brown 2003 was based in an inpatient psychiatric facility (OR 1.71; 95% CI 0.63 to 4.62), and Colby 2005 in a hospital outpatients and emergency room (OR 3.08; 95% CI 0.31 to 30.82). Neither study demonstrated effectiveness at six months or longer, and nor did the school-based Project EX-1 (OR 2.39; 95% CI 0.98 to 5.84; Comparison 04.02, data for comparison only). Although when pooled the three interventions that included Motivational Interviewing as one component of the intervention had an OR of 2.05 (95% CI 1.10 to 3.80), it would be unwise to draw any inferences from this finding, as not all three trials studied Motivational Interviewing alone, and it is not safe to disaggregate the effectiveness of a single component of different complex interventions.

Studies which included cognitive behavioural techniques (Comparison 05.01, illustrative, data not pooled) were Lipkus 2004 (six-month OR 1.12; 95% CI 0.69 to 1.83), Myers 2005 (12-month OR 4.91; 95% CI 0.51 to 47.16) and the NoT trials (NoT FL 2001 six-month OR 1.63, 95% CI 0.82 to 3.24; NoT NC 2002 six-month OR 2.03, 95% CI 0.18 to 23.04; NoT WV 2004 six-month OR 5.65, 95% CI 0.61 to 52.02).

Greenberg 1978 explored three educational approaches: fact-based, scare-based and attitudinal (values and affective strategies), but differences between the small groups were not statistically significant. Health Risk Assessment (HRA) was one intervention trialed by Chan 1988 amongst university students. This study recruited only 40 smokers to the group contributing to this review and failed to detect a difference between HRA with feedback and HRA without feedback (OR 5.65; 95% CI 0.61 to 52.22 at nine months).

In some studies there was a degree of externally applied motivation to quit smoking. In Brown 2003, the inpatient adolescents were prohibited from smoking during hospital admission. The Myers 2005 cohort were obliged to attend group quit sessions, although they could decline to be followed up. The Robinson 2003 cohort were referred because of a violation of a local no smoking policy, and reduced punitive sanctions were offered if they attended groups in addition to monetary inducements.

Not on Tobacco Interventions

The Not on Tobacco intervention has been trialed in three localities with 673 smokers in 84 schools (NoT FL 2001; NoT NC 2002; NoT WV 2004). The ORs of the individual trials and overall effectiveness are summarized in Comparison 06.01. Individually none of the three trials of the NoT intervention demonstrated a statistically significant effect at six months follow up using an intention-to-treat analysis (raw data supplied by the authors). This may be related to the low power of the individual trials which failed to detect evidence of an effect; once the data are pooled the overall result (OR 1.87; 95% CI 1.00 to 3.50: Comparison 06.01) suggests that the intervention may have demonstrated a statistically significant effect.

Adverse Effects

No adverse effects were reported in any of the psycho-social trials. In the trial of bupropion as an adjunct to nicotine patch (Killen 2004), although young people reported a total of 47 self-rated 'severe' complaints with nausea the most common, none of these was judged to be severe by the lead study physician. In the trial of nicotine patch versus nicotine gum (Moolchan 2005), active medication was associated with a statistically significant ($P > 0.01$) increase in four symptom categories, including sore throat, erythema, pruritus and shoulder/arm pain.

DISCUSSION

For the purpose of this review, we have taken a clinical focus on young smokers. In public health terms, the line between young smokers, experimenters and 'potential' smokers is blurred. Some interventions are therefore aimed at population level, attempting

to combine prevention and cessation. Clinicians however face a different problem: what advice should they give and what works for the young person who has started smoking and expresses a wish to stop? For this review, therefore, we drew what might otherwise be seen as an arbitrary line and developed a protocol which would include those prevention studies that had a cessation intervention component and discrete results for smokers (Aveyard 2001; Chan 1988; Hollis 2005).

Ideally, we would wish to know outcomes in terms of true smoking cessation, i.e. quitting smoking and not returning to the habit, although an absolute measure of cessation in these terms is in practice impossible, as it would require life-long follow up of subjects. It is necessary therefore to consider just how well what are effectively proxy measures correspond to the desired outcome. Clearly, longer periods of follow up will be of geater value. We therefore limited our review to studies with six months follow up, as recommended elsewhere (Mermelstein 2002; West 2005). There is clear evidence in some of the included studies that have done repeated measures, of a waning effect over this period (e.g. Myers 2005 and Brown 2003). Early relapse is an obvious danger, especially for young people who have been shown to make many quit attempts. In order to standardize comparisons, we took the six month period as beginning from baseline measurement. It should be noted however, that studies may not set a quit date until some weeks into the programme, (e.g. Project EX-1) and this may be a source of bias when comparing outcomes.

A more substantial weakness in the evidence base springs from the definitions of quitting used in studies. These vary from self-reported quitting without any specific time frame (e.g. NoT FL 2001; NoT NC 2002; NoT WV 2004 specify cessation for longer than one day) through seven-day or 30-day point prevalence abstinence (PPA) at the point of ascertainment, to longer or continuous periods (see Results section and graphic comparisons). With respect to the shorter PPAs, a negative result is useful in demonstrating evidence of a lack of effect where the study size is adequate. Otherwise, the irregularity and instability of the smoking habit in its early stages, and the low number of cigarettes smoked at baseline by some subjects, call into question the prognostic value of short-term PPA measurements. It is tempting to conclude that encouraging an increased number of what are effectively short-lived (eg seven-day) quit attempts allows young people to 'practice' quitting, and therefore may help to achieve prolonged cessation in the long run. Prolonged quit attempts might also have a health benefit of their own, or interrupt the progression to more regular or heavy smoking. However, we have no data for young people against which we can test these assumptions.

For our results, we have used an intention-to-treat analysis, i.e. all those randomized included in their original groups, whether or not they received the full intervention. We also counted all those with missing data as continuing smokers. We requested information from authors where necessary to facilitate these calculations. Although this is standard practice in adult cessation studies, our review demonstrates that the reasons for young people dropping out from follow up are diverse, and by no means always related to risk of continued smoking (Hollis 2005; NoT FL 2001; NoT NC 2002; NoT WV 2004). We accept, therefore, that the assumption leads to a conservative analysis, and that it may bias our results towards the null. Unfortunately, there does not seem to be any other way of reliably imputing missing data across all situations, so this problem would seem to be intractable.

Several studies clearly demonstrate the importance of biochemical verification (Colby 2005; Killen 2004; Robinson 2003) as substantial numbers of subjects have given false information regarding quit attempts. This raises possible doubts about the validity of those studies which showed positive results but did not use verification, e.g.Hollis 2005. In Project EX-1, verification was incomplete and a weighting factor was added to results.

With regard to the limitations of the pharmacotherapy trials (Killen 2004; Moolchan 2005), the existing evidence base gives us no reason to believe that the neuropharmacological efficacy, effectiveness and safety would be different for adolescents than for any other group of smokers. However, the context and meaning of smoking in adolescence is very different from that for adult smokers (Amos 2006), and there is currently insufficient evidence to determine whether NRT aids quitting in adolescents.

Several of the studies we reviewed appear underpowered as demonstrated by wide confidence intervals (e.g. Chan 1988; Colby 2005; Greenberg 1978; Myers 2005), whilst Moolchan 2005 was apparently powered for smoking reduction outcomes rather than cessation. Overall the total number of young people currently contributing to this review is 3605, a very small number considering the low quit rates and the range of interventions under investigation.

The results of this review are consistent with the very different reviews conducted by Sussman (Sussman 1998; Sussman 2002) and McDonald 2003. They had a much wider focus and included non-experimental studies. Our review has aimed to evaluate where possible the experimental evidence for effectiveness rather than the more discursive evaluation of current approaches undertaken by other authors. Our results are also consistent with Riemsma 2003, whose review found results similar to Aveyard 2001.

For all the above caveats, it is notable that this is a growing field. With the exception of two very small trials (Chan 1988 and Greenberg 1978), all the included studies have been published within the last eight years, suggesting an increase in both activity and quality. We are aware of several other studies either in progress or in preparation and we intend to cover them in future updates of this review. Finally, no intervention has, as yet, demonstrated increased rates of continuous abstinence for a six-month period from enrolment or quit date, when compared with a control group.

AUTHORS' CONCLUSIONS

Implications for practice

Research is at an early stage and no study has tackled sustained quitting. Those interventions with positive outcomes, in terms of their own protocols, are complex and are designed to respond to the many issues that characterise young persons' smoking. In particular complex approaches show promise and show some persistence of abstinence (30 days PPA) but there is not as yet sufficient evidence to recomend widspread implementation of any one model. It would also appear that the Not on Tobacco programme is at least as effective as other interventions, but a major issue for this programme is that the meaningfulness of the definition of cessation (one day or more) must be challenged when compared to the episodic nature of patterns of smoking of young people.

There is currently little evidence on effective regimens of pharmacotherapies or incorporation of NRT into psychosocial programmes in this age group. The evidence does not support the use of bupropion as an adjunct to NRT. There is no evidence regarding the use of bupropion alone. Evidence from one study suggests intervention with those caught in violation of school smoking cessation policies is ineffective. In view of the paucity of the evidence services need to be rigorously evaluated in terms of outcomes. Practitioners need to be aware of the developing evidence base and be prepared to modify services accordingly. Barriers to implementation of the research studies, even when strategies can be shown to be effective, should be considered by those who develop services, as many of the issues did not arise simply from research protocols but from the practicalities of working with organisations and young people (Kishnuck 2004; Grimshaw 2003).

Implications for research

Those psycho-social interventions showing promise need to be replicated and tested in different settings. The role of motivation to quit and other variables in predicting cessation need to be explored. Trials of brief interventions or self-help materials would be useful, particularly as these are often used as control conditions for more complex interventions. Further studies of nicotine replacement therapy in adolescent populations are needed (adequately powered for cessation).

Given the evidence now available about effect sizes there is no reason why future studies should not be adequately powered. Likely losses to follow up (see Table of Included Studies) for this age group must also be considered in the research design. Every effort should be made to keep the latter as small as possible, so that intention-to-treat analysis with missing subjects treated as continuing smokers can be carried out without excessive bias towards the null. Brown 2003 demonstrated good practice in this respect. Subsidiary analysis of data with other imputed data is acceptable but should not represent the main result. Biochemical verification is essential if data are to be robust. The theoretical basis of all interventions should be explicit ,and reporting using CONSORT standards should be the norm (e.g. Hollis 2005).

Six months follow up should be a minimum requirement, and research now needs to move on to using outcomes based on sustained, continuous quitting in line with the proposed Russell Standard (West 2005). Longer interventions, perhaps with relapse prevention as a feature, need to be further explored. As a complementary measure, long-term prospective studies of the natural smoking history of those making quit attempts in adolescence are needed. Finally, as the field matures, direct comparisons of effective treatments should become possible and should support full economic analyses.

POTENTIAL CONFLICT OF INTEREST

None known.

ACKNOWLEDGEMENTS

We would like to thank Paul Aveyard and Cathy Backinger for reading and commenting on earlier drafts of this review. Our gratitude goes to Kate Cahill and Lindsay Stead, Review Group Co-ordinators, who have been untiring in their support, especially with searches and with software applications, and to all the trialists who supplied additional data or information for this review. We would particularly like to thank Steve Sussman for sharing with us the bibliography of his most recent systematic review, due to be published during 2006 in *Health Psychology*. This provided an invaluable secondary check of our search and quality assessment strategies. No additional studies were identified from this bibliography as meeting the criteria for inclusion in this Cochrane Review.

SOURCES OF SUPPORT

External sources of support

- No sources of support supplied

Internal sources of support

- No sources of support supplied

REFERENCES

References to studies included in this review

Aveyard 2001 *{published and unpublished data}*

Aveyard P, Cheng KK, Almond J, Sherratt E, Lancashire R, Lawrence T, et al. Cluster randomised controlled trial of expert system based on the transtheoretical ("stages of change") model for smoking prevention and cessation in schools. *BMJ* 1999;**319**:948–53. [MedLine: 6143].

* Aveyard P, Sherratt E, Almond J, Lawrence T, Lancashire R, Griffin C, et al. The change-in-stage and updated smoking status results from a cluster-randomized trial of smoking prevention and cessation using the transtheoretical model among British adolescents. *Preventive Medicine* 2001;**33**:313–24.

Brown 2003 *{published data only}*

Brown RA, Ramsey SE, Strong DR, Myers MG, Kahler CW, Lejuez CW, et al. Effects of motivational interviewing on smoking cessation in adolescents with psychiatric disorders. *Tobacco Control* 2003;**12** (Suppl iv):iv3–iv10. [MedLine: 10360].

Chan 1988 *{published data only}*

Chan CW, Witherspoon JM. Health risk appraisal modifies cigarette smoking behavior among college students. *Journal of General Internal Medicine* 1988;**3**(6):555–9. [MedLine: 3343].

Colby 2005 *{published data only}*

* Colby SM, Monti PM, O'Leary Tevyaw T, Barnett NP, Spirito A, Rohsenow DJ, et al. Brief motivational intervention for adolescent smokers in medical settings. *Addictive Behaviors* 2005;**30**(5):865–74.

Monti P, Colby SM, O'Leary TA, Spirito A, Woolard RH, Lewander WJ, et al. Motivational interviewing for adolescent smokers: preliminary results from a randomized clinical trial. Society for Research on Nicotine and Tobacco 8th Annual Meeting Rapid Communications Posters (RP-27) Savannah, Georgia; February 20-23 2002. 2002.

Greenberg 1978 *{published data only}*

Greenberg JS, Deputat Z. Smoking intervention: comparing three methods in a high school setting. *Journal of School Health* 1978;**48**: 489–502. [MedLine: 2230].

Hollis 2005 *{published data only}*

Hollis JF, Polen MR, Whitlock EP, Lichtenstein E, Mullooly JP, Velicer WF, et al. Teen Reach: outcomes from a randomized, controlled trial of a tobacco reduction program for teens seen in primary medical care. *Pediatrics* 2005;**115**(4):981–9. [MedLine: 17].

Killen 2004 *{published data only}*

Killen JD, Robinson TN, Ammerman S, Hayward C, Rogers J, Stone C, et al. Randomized clinical trial of the efficacy of bupropion combined with nicotine patch in the treatment of adolescent smokers. *Journal of Consulting and Clinical Psychology* 2004;**72**(4):729–35. [MedLine: 10941].

Lipkus 2004 *{published data only}*

Lipkus IM, McBride CM, Pollak KI, Schwartz-Bloom RD, Bloom PN, Tilson E. A randomized trial comparing the effects of self-help materials and proactive telephone counseling on teen smoking cessation. *Health Psychology* 2004;**23**(4):397–406. [MedLine: 10934].

Moolchan 2005 *{published data only}*

Mancha B, Cranford D, Snidow N, Radzius A, Conrad S, Cadet JL. Patterns of compliance of teenage smokers in cessation treatment: are the first two weeks determining? (PO3 75). Society for Research on Nicotine and Tobacco 7th Annual Meeting March 23-23 2001 Seattle Washington. 2001.

* Moolchan ET, Robinson ML, Ernst M, Cadet JL, Pickworth WB, Heishman SJ, et al. Safety and efficacy of the nicotine patch and gum for treatment of adolescent tobacco addiction. *Pediatrics* 2005;**115** (4):407–14.

Moolchan ET, Robinson ML, Schroeder JR, Huestis MA, Ernst M. A randomized trial of the efficacy of the nicotine gum and patch for adolescent smokers (PA2-8). Society for Research on Nicotine and Tobacco 10th Annual Meeting February 18-21 2004, Phoenix, Arizona. 2004.

Myers 2005 *{published data only}*

* Myers MG, Brown, SA. A controlled study of a cigarette smoking cessation intervention for adolescents in substance abuse treatment. *Psychology of Addictive Behaviors* 2005;**19**(2):230–3.

NoT FL 2001 *{published data only}*

Dino G, Goldcamp J, Fernandes A, Kalsekar I, Massey C. A 2-year efficacy study of Not On Tobacco in Florida: An overview of program successes in changing teen smoking behavior. *Preventive Medicine* 2001;**33**(6):600–5. [MedLine: 10502].

NoT NC 2002 *{published data only}*

* Horn K, Dino G, Kalsekar I, Mody R. The impact of NoT On Tobacco on teen smoking Cessation. *Journal of Adolescent Research* 2005;**20**(6):640–61.

NoT WV 2004 *{published data only}*

Horn K, Fernandes A, Dino G, Massey CJ, Kalsekar I. Adolescent nicotine dependence and smoking cessation outcomes. *Addictive behaviours* 2003;**28**:769–76.

Horn KA, Dino GA, Kalsekar ID, Fernandes AW. Appalachian teen smokers: Not On Tobacco 15 months later. *American Journal of Public Health* 2004;**94**(2):181–4.

Project EX-1 *{published data only}*

Dent CW, Pfingston YM, Schmuker K, Granstra J. Nicotine replacement in school-based cessation (RP-33). Society for Research on Nicotine and Tobacco 8th Annual Meeting Rapid Communications Posters February 20-23 2002 Savannah, Georgia. 2002.

McCuller WJ, Sussman S, Wapner M, Dent C, Weiss DJ. Motivation to quit as a mediator of tobacco cessation among at-risk youth. *Addictive Behaviors* 2006;**31**(5):880–8.

* Sussman S, Dent CW, Litchman KL. Project EX: outcomes of teen smoking cessation program. *Addictive Behaviours* 2001;**26**:425–38.

Sussman S, McCuller WJ, Zheng H, Pfingston YM, Miyano J, Dent CW. Project EX: A program of empirical research on adolescent tobacco use cessation. *Tobacco Induced Diseases* 2004;**2**(3):119–32.

Robinson 2003 *{published data only}*

Robinson LA, Vander Weg MW, Riedel BW, Klesges RC, McLain-Allen B. "Start to stop": results of a randomised controlled trial of a smoking cessation programme for teens. *Tobacco Control* 2003;**12** (Suppl IV):iv26–iv33. [MedLine: 10421].

References to studies excluded from this review

Abelin 1989

Abelin T, Ehrsam R, Buhler Reichert A, Imhof PR, Muller P, Thommen A, et al. Effectiveness of a transdermal nicotine system in smoking cessation studies. *Methods and Findings in Experimental and Clinical Pharmacology* 1989;**11**:205–14. [MedLine: 214].

Adelman 2000

* Adelman WP, Duggan A, Hauptman P, Joffe A. Effectiveness of a high school smoking cessation program. *Journal of Adolescent Health* 2000;**26**(2):83.

Adelman WP, Duggan AK, Hauptman P, Joffe A. Effectiveness of a high school smoking cessation program. *Pediatrics* 2001;**107**(4): e50–9. [MedLine: 8162].

Bauman 2000

Bauman KE, Ennett ST, Foshee VA, Pemberton M, King TS, Koch GG. Influence of a family-directed program on adolescent cigarette and alcohol cessation. *Prevention Science* 2000;**1**:227–37. [MedLine: 8142].

Bloor 1999

Bloor M, Frankland J, Langdon NP, Robinson M, Allerston S, Catherine A, et al. A controlled evaluation of an intensive, peer-led, schools-based, anti-smoking programme. *Health Education Journal* 1999;**58**(1):17–25. [MedLine: 8047].

Burton 1994

Burton D. Tobacco cessation programs for adolescents. In: RichmondR editor(s). *Interventions for smokers: an international perspective*. Baltimore: Williams and Wilkins, 1994:95–136.

* Burton D, Chakravorty B, Weekes K, Flay BR. Outcome of TNT tobacco-cessation randomised trial with high school students. Unpublished material 1994.

Cai 2000

* Cai YM, Zhao CX, Wong SU, Zhang L, Lim SK. Laser acupuncture for adolescent smokers - A randomized double-blind controlled trial. *American Journal of Chinese Medicine* 2000;**28**(3-4):443–9. [MedLine: 7262].

Yiming C. Laser acupuncture for adolescent smokers - a randomised double blind controlled study. XI World Congress of Psychiatry, Hamburg, August 6-11, 1999. 1999; Vol. II:105.

Colby 1998

* Colby SM, Monti PM, Barnett NP, Rohsenow DJ, Weissman K, Spirito A, et al. Brief motivational interviewing in a hospital setting for adolescent smoking: a preliminary study. *Journal of Consulting and Clinical Psychology* 1998;**66**(3):574–8. [MedLine: 4545].

Monti P, Colby SM, O'Leary TA, Spirito A, Woolard R, Rohsenow D, et al. Motivational interviewing plus parental intervention for adolescent smokers: results from a randomized clinical trial (POS4-31). Society for Research on Nicotine and Tobacco 9th Annual Meeting February 19-22 2003 New Orleans, Louisiana. 2003.

Digiusto 1994

Digiusto WE. Pros and cons of cessation interventions for adolescent smokers at school. In: RichmondR editor(s). *Interventions for smoking - an international perspective*. Baltimore: Williams and Wilkins, 1994: 107–36.

Dino 1998

Dino, G, Horn, K, Meit, H. A pilot study of Not On Tobacco: a stop smoking programme for adolescents. *Health Education* 1998;**6**: 230–41.

Egger 1983

Egger G, Fitzgerald W, Frape G, Monaem A, Rubinstein P, Tyler C, et al. Results of large scale media antismoking campaign in Australia: North Coast 'Quit for Life' programme. *British Medical Journal* 1983; **287**:1125–8.

Ehrsam 1991

Ehrsam RE, Buhler A, Muller P, Mauli D, Schumacher PM, Howald H, et al. [Weaning of young smokers using a transdermal nicotine patch]. *Schweizerische Rundschau für Medizin Praxis* 1991;**80**(7): 145–50. [MedLine: 847].

Elsasser 2002

Elsasser GN, Guck TP, Destache CJ, Daher PM, Frey DR, Jones J, et al. Sustained release bupropion in the treatment of nicotine addiction among teenage smokers (RP-32). Society for Research on Nicotine and Tobacco 8th Annual Meeting Rapid Communications Posters February 20-23 2002 Savannah, Georgia. 2002.

Emmons 2003

Emmons KM, Butterfield RM, Puleo E, Park ER, Mertens A, Gritz ER, et al. Smoking among participants in the childhood cancer survivors cohort: the Partnership for Health Study. *Journal of Clinical Oncology* 2003;**21**(2):189–96. [MedLine: 8824].

Escoffery 2004

Escoffery C, McCormick L, Bateman K. Development and process evaluation of a web-based smoking cessation program for college smokers: innovative tool for education. *Patient Education and Counseling* 2004;**53**(2):217–25. [MedLine: 10949].

Fagan 2003

Fagan P, Stoddard AM, Hunt MK, Frazier L, Girod K, Sorensen G. The feasibility of evaluating a tobacco control intervention for working youth. *Tobacco Control* 2003;**12**:34–9. [MedLine: 10374].

Figa-Talamanca 1989

Figa-Talamanca I, Modolo M. Evaluation of an anti-smoking educational programme among adolescents in Italy. *Hygie* 1989;**8**:24–8. [MedLine: 2223].

Flay 1995

Flay BR, Miller TQ, Hedeker D, Siddiqui O, Britton CF, Brannon BR, et al. The television, school, and family smoking prevention and cessation project. VIII student outcomes and mediating variables. *Preventive Medicine* 1995;**24**:29–40. [MedLine: 1538].

Hamilton 2005

Hamilton G, Cross D, Resnicow K, Hall M. A school-based harm minimization smoking intervention trial: outcome results. *Addiction* 2005;**100**(5):689–700. [MedLine: 11124].

Hancock 2001

Hancock L, Sanson-Fisher R, Perkins J, Girgis A, Howley P, Schofield M. The effect of a community action intervention on adolescent smoking rates in rural Australian towns: the CART project. Cancer Action in Rural Towns. *Preventive Medicine* 2001;**32**(4):332–40. [MedLine: 8032].

Hanson 2003

Hanson K, Allen S, Jensen S, Hatsukami D. Treatment of adolescent smokers with the nicotine patch. *Nicotine & Tobacco Research* 2003; **5**(4):515–26. [MedLine: 9694].

Hellmann 1988

Hellmann R, OShea RM, Kunz ML, Schimpfhauser FT. University health service physician intervention with cigarette smokers. *Journal of American College Health* 1988;**37**:91–3. [MedLine: 3339].

Helstrom 2004

Helstrom AW. A smoking intervention for high-risk adolescents. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 2004;**64**(7-B):3525. [MedLine: 11091].

Higgs 2000

Higgs PE, Edwards D, Harbin RE, Higgs PC. Evaluation of a self-directed smoking prevention and cessation program. *Pediatric Nursing* 2000;**26**(2):150–5. [MedLine: 8048].

Horn 2004

* Horn K, Dino G, Kalsekar I, Massey CJ, Manzo-Tennant K, McGloin T. Exploring the relationship between mental health and smoking cessation: a study of rural teens. *Prevention Science* 2004;**5**(2): 113–26.

Hort 1995

Hort W, Hort H, Willers R. [An interventional study against cigarette smoking among Dusseldorf high school students 1992-94]. *Zeitschrift Fur Kardiologie* 1995;**84**(9):700–11. [MedLine: 2007].

Jason 1982

Jason L.A, Mollica M, Ferrone L. Evaluating an early secondary smoking prevention intervention. *Preventive Medicine* 1982;**11**(1): 96–102.

Josendal 1998

* Josendal O, Aaro LE. Evaluation of an intervention programme for smokefree schools. *Tidsskrift for den Norske Laegeforening* 2002;**122** (4):403–7.

Josendal O, Aaro LE, Bergh IH. Effects of a school-based smoking prevention program among subgroups of adolescents. *Health Education Research* 1998;**13**(2):215–24.

Kelleher 1999

* Kelleher CC, Fallon UB, McCarthy E, Dineen BD, ODonnell M, Killian M, et al. Feasibility of a lifestyle cardiovascular health promotion programme for 8-15-year olds in Irish general practice: results of the Galway Health Project. *Health Promotion International* 1999;**14**:221–9.

Kentala 1999

Kentala J, Utriainen P, Pahkala K, Mattila K. Can brief intervention through community dental care have an effect on adolescent smoking?. *Preventive Medicine* 1999;**29**:107–11. [MedLine: 6031].

Killen 1988

Killen JD, Robinson TN, Telch MJ, Saylor KE, Maron DJ, Rich T, Bryson S. The Stanford Adolescent Heart Health Program. *Health Education Quarterly* 1989;**16**(2):263–83. [MedLine: 3519].

* Killen JD, Telch MJ, Robinson TN, Maccoby N, Taylor CB, Farquhar JW. Cardiovascular disease risk reduction for tenth graders. A multiple-factor school-based approach. *Journal of the American Medical Association* 1988;**260**:1728–33.

Lotecka 1983

Lotecka L, MacWhinney M. Enhancing decision behavior in high school 'smokers'. *International Journal of the Addictions* 1983;**18**:479–90. [MedLine: 2280].

Niederhofer 2004

Niederhofer H, Huber M. Bupropion may support psychosocial treatment of nicotine-dependent adolescents: preliminary results. *Pharmacotherapy* 2004;**24**(11):1524–8. [MedLine: 10987].

O'Neill 2000

O'Neill HK, Gillispie MA, Slobin K. Stages of change and smoking cessation: a computer-administered intervention program for young adults. *American Journal of Health Promotion* 2000;**15**(2):93-6, iii. [MedLine: 7384].

Pallonen 1998

Pallonen UE, Velicer WF, Prochaska JO, Rossi JS, Bellis JM, Tsoh JY, et al. Computer-based smoking cessation interventions in adolescents: Description, feasibility, and six-month follow-up findings. *Substance Use and Misuse* 1998;**33**(4):935–65. [MedLine: 4408].

Perry 1980

Perry C, Killen J, Telch M, Slinkard LA Danaher BG. Modifying smoking behavior of teenagers: a school-based intervention. *American Journal of Public Health* 1980;**70**(7):722–5.

Quinlan 2000

Quinlan KB, McCaul KD. Matched and mismatched interventions with young adult smokers: testing a stage theory. *Health Psychology* 2000;**19**(2):165–71. [MedLine: 6718].

Rabius 2004

Rabius V, McAlister AL, Geiger A, Huang P, Todd R. Telephone counseling increases cessation rates among young adult smokers. *Health Psychology* 2004;**23**(5):539–41. [MedLine: 11009].

Severson 1991

Severson H, Glasgow RE, Wirt R, Brozovsky P, Zoref L, Black C, et al. Preventing the use of smokeless tobacco and cigarettes by teens: results of a classroom intervention. *Health Education Research* 1991; **6**:109–20. [MedLine: 2290].

Stephens 2001

Stephens SA. The effectiveness of Motivational Enhancement Therapy in adolescent smoking cessation. *Dissertation Abstracts International* 2001;**62**(2-B):1101. [MedLine: 9743].

Sussman 1995

Sussman S, Dent CW, Burton D, Stacey AW, Flay BR. Cessation Clinic Evaluation. *Developing school-based tobacco use prevention and cessation programmes*. California: Sage, 1995:204–10.

Winkleby 2004

Winkleby MA, Feighery E, Dunn M, Kole S, Ahn D, Killen JD. Effects of an advocacy intervention to reduce smoking among teenagers. *Archives Of Pediatrics & Adolescent Medicine* 2004;**158**(3):269–75. [MedLine: 6].

References to studies awaiting assessment

Braverman 1994

Braverman MT, Moskowitz JM, D'Onofrio CN, Foster V. Project 4-health develops program to curb youth tobacco use. *California Agriculture* 1994;**48**:39–43. [MedLine: 7593].

Hollis 1994

Hollis JF, Vogt TM, Stevens V, Biglan A, Severson H, Lichtenstein E. The tobacco reduction and cancer control (TRACC) program: team approaches to counseling in medical and dental settings. In: U.S.Dept of Healh and Human Services, editor(s). *Tobacco and the clinician: interventions for medical and dental practice:*. Vol. I, Washington DC: U.S. Govt printing office, 1994:143.

References to ongoing studies

Hoffman 2003

Hoffman J, Nemes S, Weil J, Zack S, Munly K, Levin H. Adolescent smoking cessation escaping nicotine and tobacco (ASCENT): outcome evaluation preliminary findings (POS3-67). Society for Research on Nicotine and Tobacco 9th Annual Meeting February 19-22 New Orleans, Louisiana Rapid Communications Posters. 2003.

Muramoto 2001

Muramoto ML, Leischow SJ, Enright P, Strayer L, Hadjioannou M, Matthews E, et al. So you want to do a smoking cessation study with teens ... interim process evaluation or 'Lessons Learned' from a dose response study of safety and efficacy of sustained release bupropion for smoking cessation in adolescents (PO3 67). Society for Research on Nicotine and Tobacco 7th Annual Meeting March 23-23 Seattle Washington. 2001.

Project-EX4

Sun P, Miyano J, Rohrbach LA, Dent CW, Sussman S. Short term effects of Project EX4: a classroom based smoking prevention and cessation intervention program (SYM3A). Society for Research on Nicotine and Tobacco 12th Annual Meeting February 15-18, Orlando, Florida. 2006.

Additional references

Amos 2006

Amos A, Wiltshire S, Haw S, NcNeill A. Ambivalence and uncertainty: experiences of and attitudes towards addiction and smoking cessation in the mid-to-late teens. Health Education Research 2006; Vol. 21, issue 2:181–91.

Burt 1998

Burt R, Peterson AV. Smoking cessation among high school seniors. *Preventive Medicine* 1998;**27**:319–27.

Campbell 2004a

Campbell MK, Elbourne DR, Altman DG [for the CONSORT Group]. CONSORT statement: extension to cluster randomised trials. *BMJ* 2004;**328**:702–8.

Campbell 2004b

Campbell MJ. Extending CONSORT to include cluster trials: welcome extension will help to understand trials better and reduce bias. *BMJ* 2004;**328**:654–5.

Grimshaw 2003

Grimshaw G, Stanton A, Blackburn C, Andrews K, Grimshaw C, Podinovskaya Y, et al. Patterns of smoking, quit attempts and services for a cohort of 15 to 19 year olds. *Child: Care, Health and Development* 2003;**29**:457–64.

Hahn 2005

Hahn S, Puffer S, Torgerson DJ, Watson J. Methodological bias in cluster randomised trials. *BMC Medical Research Methodology* 2005; **5**(10):1–8.

Higgins 2003

Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003;**327**(7414):557–60.

Hu 1998

Hu SC, Lanese RR. The applicability of the theory of planned behavior to the intention to quit smoking across workplaces in southern Taiwan. *Addictive Behaviors* 1998;**23**:225–37.

Hughes 2003

Hughes JR, Keeley JP, Niaura RS, Ossip-Klein DJ, Richmond RL, Swan GE. Measures of abstinence in clinical trials: issues and recommendations. *Nicotine & Tobacco Research* 2003;**5**(1):13–25.

Kishnuck 2004

Kishchuk N, Tremblay M, Lapierre J, Heneman B, O'Loughlin J. Qualitative investigation of young smokers and ex-smokers views on smoking cessation methods. *Nicotine & Tobacco Research* 2004;**6**(3): 491–500.

Lancaster 2005

Lancaster T, Stead L. Interventions for preventing tobacco sales to minors. *Cochrane Database of Systematic Reviews* 2005, Issue 1. Art. No.: CD001497. DOI:10.1002/14651858.CD001497.pub2.

Lumley 2004

Lumley J, Oliver SS, Chamberlain C, Oakley L. Interventions for promoting smoking cessation during pregnancy. *Cochrane Database of Systematic Reviews* 2004, Issue 4. Art. No.: CD001055. DOI: 10.1002/14651858.CD001055.pub2.

McDonald 2003

McDonald P, Colwell B, Backinger C, Huston C, Maule C. Better practices for youth tobacco cessation. evidence of review panel. *American Journal of Health Behavior* 2003;**27**:S144–58.

Mermelstein 2002

Mermelstein R, Colby SM, Patten C, Prokhorov A, Brown R, Myers M, et al. Methodological issues in measuring treatment outcomes in adolescent smoking cessation studies. *Nicotine & Tobacco Research* 2002;**4**(4):395–403.

Miller 2002

Miller WR, Rollnick S. *Motivational Interviewing: preparing people for change*. New York: Guilford, 2002.

MMWR 1998

Centers for Disease Control and Prevention. Selected cigarette smoking initiation and quitting behaviors among high school students -- United States 1997. http://www.cdc.gov/mmwr/PDF/wk/mm4719.pdf (accessed 4th March 2005) 1998; Vol. 47, issue 19:386–9.

Nelson 2003

Nelson JP. Youth smoking prevalence in developing countries: effect of advertising bans. *Applied Economics Letters* 2003;**10**(13):805–11.

NIDA 2003

National Institute on Drug Abuse. Teen smoking dropped dramatically in 2003. www.drugabuse.gov/NIDA_notes/NNVol17N6/tearoff.html (accessed 4th March 2005) 2003.

O'Loughlin 2003

O'Loughlin J, DiFranza J, Tyndale RF, Meshefedjian G, McMillan-Davey E, Clarke PBS, et al. Nicotine-dependence symptoms are associated with smoking frequency in adolescents. *American Journal of Preventive Medicine* 2003;**25**:219–25.

ONS 2000
Office for National Statistics. Drug use, smoking and drinking among young teenagers in 1999. www.statistics.gov.uk/pdfdir/drugs0500.pdf (accessed 4th March 2005) 2000; Vol. 189.

Prochaska 2000
Prochaska JO. Stages of change model for smoking prevention and cessation in schools. *BMJ* 2000;**320**:447.

Prokhorov 2000
Prokhorov AV, de Moor C, Pallonen UE, Suchanek Hudmon K, Kole S, Hu S. Validation of the modified Fagerström tolerance questionnaire with salivary cotinine among adolescents. *Addictive Behaviors* 2000;**25**(3):429–33.

Raw 1998
Raw M, McNeill A, West R. Smoking cessation guidelines for health professionals. A guide to effective smoking cessation interventions for the health care system. Health Education Authority. *Thorax* 1998; **53**(Suppl 5 (1)):S1–19.

Riemsma 2003
Riemsma RP, Pattenden J, Bridle C, Sowden AJ, Mather L, Watt IS, et al. Systematic review of the effectiveness of stage-based interventions to promote smoking cessation. *BMJ* 2003;**326**(7400):1175–7.

Roland 1998
Roland M, Torgerson DJ. Understanding controlled trials. What are pragmatic trials?. *BMJ* 1998;**316**:285.

Sowden 2000
Sowden A, Arblaster L. Mass media interventions for preventing smoking in young people. *Cochrane Database of Systematic Reviews* 2000, Issue 1. Art. No.: CD001006. DOI: 10.1002/14651858.CD001006.

Sowden 2002
Sowden A, Arblaster L, Stead L. Community interventions for preventing smoking in young people. *Cochrane Database of Systematic Reviews* 2002, Issue 4. Art. No.: CD001291. DOI: 10.1002/14651858.CD001291.

Stanton 2001
Stanton A, Grimshaw GM, Andrews K, Grimshaw CM, Robertson W, Blackburn C. *Maybe not tomorrow but soon*. Warwick: University of Warwick, 2001.

Sussman 1998
Sussman S, Dent CW, Nezami E, Stacy AW, Burton D, Flay BR. Reasons for quitting and smoking temptation among adolescent smokers: gender differences. *Substance Use & Misuse* 1998;**33**:2703–20.

Sussman 1999
Sussman S, Lichtman K, Ritt A, Pallonen UE. Effects of thirty-four adolescent tobacco use cessation and prevention trials on regular users of tobacco products. *Substance Use and Misuse* 1999;**34**:1469–503.

Sussman 2002
Sussman S. Effects of sixty-six adolescent tobacco use cessation trials and seventeen prospective studies of self-initiated quitting. *Tobacco Induced Diseases* 2002;**1**(1):35–81.

Swart 2000
Swart D, Reddy P. *Global Youth Tobacco Survey in South Africa. Overview and progress report*. Cape Town: South African Medical Research Council, 2000.

TAG 2000
Tobacco Advisory Group. *Nicotine addiction in Britain*. London: Royal College of Physicians, 2000.

Thomas 2002
Thomas R. School-based programmes for preventing smoking. *Cochrane Database of Systematic Reviews* 2006, Issue 3. Art. No.: CD001293. DOI:10.1002/14651858.CD001293.pub2.

West 2005
West R, Hajek P, Stead L, Stapleton J. Outcome criteria in smoking cessation trials: proposal for a common standard. *Addiction* 2005; **100**(3):299–303.

WHO 2005
World Health Organization. The Tobacco Atlas. www.who.int/tobacco/statistics (accessed 4th March 2005) 2005.

* *Indicates the major publication for the study*

TABLES

Characteristics of included studies

Study	Aveyard 2001
Methods	Country: UK Setting: Schools in West Midlands Study design: Cluster controlled trial. Schools sampled with probability in proportion of size of year group. Combined prevention/cessation trial
Participants	Participants: 1089 adolescent smokers (defined as >=1cpw); I: 547; C: 542. Age range: 13-14 yrs Criteria for inclusion: Inclusion was at level of school 89 schools were approached and 53 agreed to participate. Data extracted for this cessation review based on all pupils in year 9 who smoked at least 1 cpw .

Characteristics of included studies (*Continued*)

	Follow-up method: Questionnaire to all students Inducements to enter study: None Pre-study Smoking status assessment: self reported Post study smoking status assessment: self reported Significant demographic differences between arms of trial: None apparent in published data* Other:
Interventions	Schools randomized to intervention or control. Intervention: Computer 'expert system' designed to diagnose stage of change and deliver material tailored to individual. Six sessions, 2 per term, 1 class-based (tutor training mandatory) and one computer-based delivered over period of school year (3 school terms per year in UK). Theoretical basis of intervention: Psychosocial intervention based on transtheoretical model of stages of change. Control: Control schools received health education as delivered locally at that time; in addition teachers received 3 lesson plans plus handouts but no specialist training or record of what was delivered. Theoretical basis of control: Normal local practice
Outcomes	Measurement: 7-day and 30-day PPA (supplied by author); Follow-up periods >3m, 12m (mean length of follow up 359 (I) to 347 (C) days) and 24m from start of study, equivalent to 4m and 16m after end of intervention. Verification: None Losses to follow up: 11% (I) and 10.7% (C) @ 12m; 14% (I) and 16.9% (C) @ 24m (additional data from authors)..
Notes	7- and 30-day abstinence provided by author based on pupil reporting as quitting AND abstinent for stated period as opposed to not smoking for stated period. The latter is basis for results given in this review. Tested sensitivity of questionnaire kappa 0.87 (0.7-1.00) bias would be towards positive result so ascertainment unlikely to affect validity
Allocation concealment	A – Adequate

Study	**Brown 2003**
Methods	Country: USA Setting: Psychiatric hospital, Providence RI Study design: Cluster randomized controlled trial
Participants	Participants: 191 patients (116: I; 75 C), 62.3% female, ethnicity 94.8% white Age range: 13-17 year olds, mean 15.4yrs Criteria for inclusion: at least 1 cpw for previous 4 weeks, 64% daily smokers, on average smoking for 3.6 years (additional data from authors) Follow-up method: Telephone questionnaire Inducements to enter study: Gift certificates to local mall, escalating in value, on completion of each phase No significant demographic differences between arms of trial. Other: Participants were prohibited from smoking during hospital stay (mean length 9 days)
Interventions	Intervention: Motivational interviewing given in 2 sessions of 45 mins plus relapse prevention manual and self help pamphlet Control: Brief advice session plus self-help pamphlet
Outcomes	Measurement: 7-day PPA; Follow up period/s >3m, 6m, 12m Pre-study smoking status assessment: Modified Fagerstrom, mean 4.9 (±1.82) Post study smoking status assessment. Verification: Salivary cotinine and CO Losses to follow up: At 6m 8%; at 12m 9%
Notes	
Allocation concealment	C – Inadequate

Characteristics of included studies (*Continued*)

Study	**Chan 1988**
Methods	Country: USA Setting: University dormitories, Richmond VA Study design: Cluster controlled trial; Only two arms contribute (Health Risk Assessment with and without feedback) as single control group not measured at beginning and end of study.
Participants	Participants: 40 University freshmen smokers Age range: 17-18 Criteria for inclusion: 50% of freshman randomly selected. Follow-up method: Computer scored Health Risk Appraisal [HRA] Questionnaire Inducements to enter study: None Pre-study Smoking status assessment: self assessment Post study smoking status assessment: self assessment verified by resident advisor with option to modify No significant demographic differences between arms of trial.
Interventions	Four-arm trial: 1) Health Risk assessment [HRA] at start of study, feedback on results and second assessment 1 year later (n=23) 2) HRA at start of study and HRA at end (n=17) 3) HRA at start only (no end of study data collection on smoking behaviour) 4) HRA at end only (no baseline data collection on smoking behaviour) Only arms (1) and (2) compared for this review
Outcomes	Measurement: self-reported 30-day PPA; Follow-up period/s >3m; approx 9m. Verification: resident advisor's report, with no biochemical validation
Notes	As data collection on control groups was not done before and after, only one comparison can be made. Authors noted that there was a risk of contamination between groups.
Allocation concealment	C – Inadequate

Study	**Colby 2005**
Methods	Country: USA Setting: Hospital outpatient or emergency departments in Rhode Island Study design: Randomized controlled trial
Participants	Participants: 85 adolescents (43 I; 42 C) Age range: 14 -19 yrs Criteria for inclusion: reported daily smoking for previous 30 days Follow-up method: Timeline Follow Back to inform structured interview Inducements to enter study: US$10 gift voucher for completion. Pre-study Smoking status assessment: self reported cpd in last 30 days Post study smoking status assessment: verified self-reported smoking pattern in last 90 days Significant demographic differences between arms of trial: Not reported
Interventions	Intervention: 35 minute personal motivational interview with 1 week follow-up phone call of 15- 20 minutes Theoretical basis of intervention: Motivational enhancement Control: 5 minute advice interview plus pamphlet and brief phone call 1 week after visit Theoretical basis of control:Brief Intervention
Outcomes	Measurement: 7-day PPA; Follow up periods: >3m, 6m. Verification: CO and cotinine Losses to follow up: 20% at 6 months
Notes	Author of study considers little confounding amongst extensive array of variables High withdrawal and non-recruitment rate.
Allocation concealment	A – Adequate

Characteristics of included studies (*Continued*)

Study	**Greenberg 1978**
Methods	Country: USA Setting: High schools Study design: Randomized controlled trial
Participants	Participants: Open recruitment, first 100 recruited Age range: 14 -16 (Grades 9-11) Criteria for inclusion: All participants smoked at least 5cpd Inducements to enter study: Half a unit credit for experimental groups Pre-study Smoking status assessment: self report Post study smoking status assessment: self report
Interventions	Intervention: Group A (n=25) received 'scare' education; Group B (n=25) 'fact'-based education, Group C (n=25) 'attitude' approach using affective strategies. All classes took place in weekly sessions over 7 weeks. Theoretical basis of intervention: Affective teaching strategies consistent with theoretical development at time of trial Control: Control group (n=25) spent time in study hall without any active intervention
Outcomes	Measurement: PPA ['no longer smoked']; Follow up period/s >3m, 5m after end of intervention. Intervention lasted 7 weeks, so endpoint 6-7m post-baseline. No biochemical verification. Losses to follow up: 22% at final follow up. Results: All ORs calculated. Quitters: Group A 3 students; Group B 0 students; Group C 6 students and control 1 student Overall OR for aggregated quitting = 3.27 (0.39 - 27.21) Group A vs control OR = 3.27 (0.32-33.84) Group B vs control OR = 1(0) Group C vs control OR = 7.58 (0.84 - 68.46)
Notes	No power calculations evident from paper but published in 1978 so report consistent with current practice. Lack of information regarding allocation and potential confounding in this study.
Allocation concealment	C – Inadequate

Study	**Hollis 2005**
Methods	Country: USA Setting: 7 pediatrics and family practice departments in HMO medical centres in Oregon and Washington state. Study design: Randomized controlled trial (prevention and cessation). Blocked randomization method, using sealed envelopes.
Participants	Participants: 448 adolescent smokers selected from 2524 recruits attending clinic appointments. Age range: 14 - 17 Criteria for inclusion: Those who were willing to stay after consultation at clinic and had no intention of leaving geographical area within 1 year. Follow-up method: Mailed questionnaires and telephone interviews Inducements to enter study: None Pre-study Smoking status assessment: self-reported 30-day smoking status Non-significant demographic differences between arms of trial at level of $P < 0.05$ except for small difference in positive at depression screen ($P < 0.01$)
Interventions	Intervention: 3 sequential interventions plus maximum of 2 boosters: (1) Clinical message encouraging quitting or not starting, (2) 10-12 minute individual multi-media interactive computer-delivered expert system tailored to stage of change of individual (3) 3-5 mins of motivational counselling by trained health counsellors. Boosters were delivered at clinic attendance (computer programme

	and motivation counselling) or by telephone (motivational counselling only). Repeated attempts were made to deliver boosters. Theoretical basis of intervention: Prompts to clinicians to give brief advice, TTM and motivational interviewing Control: Dietary advice (5-a-day fruit and veg); Theoretical basis of intervention: Brief advice - 3-5 mins motivational counselling
Outcomes	Measurement: 30-day PPA; Follow-up periods: >3m, 1 year and 2 years. No verification. Losses to follow up: 6% at 12 months and 12% at 24 months
Notes	This sytematic review uses definition of smoking of 1 cpw for at least 6m to define a regular smoker. Hollis et al confirm that their definition of 'smokers' most closely fits this criterion. We have only used the data for smokers, although the trial included separate smoking uptake prevention results.
Allocation concealment	A – Adequate

Study	**Killen 2004**
Methods	Country: USA Setting: Nine continuation high schools in San Francisco, CA Study design: Randomized controlled trial. Quality of allocation concealment confirmed by author.
Participants	Participants: 211 smokers. Age range: 15-18 years Criteria for inclusion: currently smoked at least 10 cpd, for at least 6m, with >1 quit attempt and a score of at least 10 on modified FNTQ. Inducements to enter study: US$50 at end of treatment and US$50 for completing 6m assessment. Pre-study Smoking status assessment: mean cpd 15 and mean FNTQ score 16.6 No significant demographic differences between arms of trial. Health screening was conducted; those screened positive for depression (clinical diagnosis) were excluded
Interventions	Intervention: 8 weeks of tailored NRT patch therapy plus 150mg SR bupropion tablet (for 8 weeks from quit date)and relapse prevention Theoretical basis of intervention: Pharmacological plus group work (theoretical basis not given) Control: 8 weeks of tailored NRT patch therapy plus placebo tablet.(for 8 weeks from quit date). Theoretical basis of intervention: Pharmacological
Outcomes	Measurement: 7-day PPA; Follow up periods: >3m, 6m. Verification: CO monitoring (below 9ppm) and saliva cotinine (below 20 ng/ml) at 6m; adherence to bupropion measured at 5 weeks Losses to follow up: 36% at 6m.
Notes	
Allocation concealment	A – Adequate

Study	**Lipkus 2004**
Methods	Country: USA Setting: 11 shopping malls and an amusement park in North Carolina, South Carolina, Gerogia and Tennessee Study design: Randomized controlled trial
Participants	Participants: 402 adolescents (I: 209; C: 193) Age range: 15-18 years old Criteria for inclusion: at least one cigarette within preceding 7 days (mean years smoked 3 ±2, and 10 ±8 cpd) Follow up: Telephone survey Inducements to enter study: a movie pass

Characteristics of included studies (*Continued*)

	Pre-study smoking status assessment: Nicotine dependence measured using mFTQ No significant demographic differences between arms of trial.
Interventions	Intervention: Telephone counselling, self help materials and a video Theoretical basis of intervention:Eclectic but pre-tested with age-appropriate group and contains elements of CBT and TTM. Telephone counselling used motivational interviewing Control: Self help materials and a video Theoretical basis of intervention: Eclectic, see above
Outcomes	Measurement: 7-day PPA and sustained abstinence (defined as not smoking at both 4m and 8m assessment points); Follow up periods >3m, 8m. Verification: saliva cotinine at level of >10ng/ml at 4m; self-report only at 8m. Losses to follow up: 36% at 8m. Results: 7 day quitting: 21% (calculated as 44smokers) in intervention and 19% (calculated as 37) in control and sustained quitting 9% (calculated as 19 students) in intervention arm and 7% (calculated as 14 students) in control. ITT for sustained quitting OR =1.279 (0.622 - 2.627) ITT for 7 day point prevelance OR = 1.124 (0.690 - 1.833)
Notes	
Allocation concealment	B – Unclear

Study	**Moolchan 2005**
Methods	Country: USA Setting: Baltimore, MD, by invitation through media advertisements, schools, churches. Study design: Randomized controlled trial; randomization was by an algorithm held bi the National Institue on Drug Abuse pharmacy, with true replacement of trial non-completers.
Participants	Participants: 120 Smokers (I: 80, C: 40) Age range: 13-7 years Criteria for inclusion: Smoking 10 or more cpd for at least 6m and motivation to quit >5 on 10-point integer scale. Only those who were happy to inform parents of smoking status were included. Follow-up method: interim and final questionnaires and final visit for verification of smoking status Inducements to enter study: US$90 for baseline and US$135 after final visit/completion Pre study Status assessment: Mean 18.8 cpd, 'youth appropriate' Fagerstrom mean 7.04 No significant demographic differences between arms of the trial.
Interventions	Intervention: Nicotine patch and gum, and self-help written materials. Two active groups (a) active patch with placebo gum (n=34) (b) active gum with placebo patch (n=46). NRT for both groups was tailored to weight and smoking level. Participants received 11 visits over 12 weeks to receive NRT, and attended 45 minute group CBT session at the end of each visit, + self-help materials. Theoretical basis of intervention: Pharmacological Control: placebo patch and gum (n=40).
Outcomes	Measurement: 7-day PPA, and 'prolonged' abstinence, i.e. continuous abstinence after a 2 week grace period from end of intervention; Follow-up periods: >3m, 6m. Verification: CO, salivary cotinine and thiocyanate. Losses to follow up: 54%
Notes	Timeline for trial was verified with authors. Adverse event 'profile consistent with that reported for adults'.
Allocation concealment	A – Adequate

Study	**Myers 2005**
Methods	Country: USA Setting: Outpatients in substance abuse programme in Southern California

Characteristics of included studies (*Continued*)

	Study design: Non-randomised controlled trial
Participants	Participants: 54 Smokers: (I: 26; C: 28 [on waiting list]) Age range: 13-18 years, mean 16.1 yrs Criteria for inclusion: Reported weekly smoking, smokers were required to attend treatment but 'particpation in the outcome study was voluntary' Follow-up method: questionnaires and visit for verification of smoking status/ Inducements to enter study: Gift certificates US5 for baseline, US5 for 3m follow up and US$45 on completion at 6m. Pre study Status assessment: Mean 7.96 cpd in intervention group and 10.0 in control group, modified Fagerstrom scores of 3.85 in intervention group and 3.68 in control group Post study smoking status assessment: Teen Smoking Questionnaire Significant demographic differences between arms of the trial: Authors claim statistically signifiant difference only in % of pre-contemplaters, although we note that the control group had fewer girls than the intervention group (14% vs 31%).
Interventions	Intervention: Motivational enhancement delivered in 6 sessions of 1 hour each in groups. Theoretical basis of intervention: Eclectic with CBT and motivational enhancement Control: waiting list
Outcomes	Measurement: 7-day and 90-day PPA and Time Line follow back; Follow-up periods: >3m, 6m. Verification: CO and salivary cotinine, and parental corroboration Losses to follow up: 33%
Notes	Additional information from author
Allocation concealment	C – Inadequate

Study	**NoT FL 2001**
Methods	Country: USA Setting: 40 high schools in Florida Study design: Cluster controlled trial. A matching procedure was used 'to better accommodate the community based research partners and challanges they faced (e.g. local schools who already had NoT in place)'.
Participants	Participants: 423 Smokers in 40 schools (I: 249; C: 174). Age range: 14-19 years,mean approx 16 years. Criteria for inclusion: self-reported smoking at least 5cpd. Follow-up method: self reports and verification of smoking status Pre study smoking status assessment: Approx 11.7 cpd on weekdays and 18.2 cpd on weekends. mFTQ of around 6.0 (reported for each arm of trial) Significant demographic differences between arms of the trial: Interevention group had slightly higher nicotine dependence.
Interventions	Intervention: NoT Intervention: 1 x 50-minute session once a week for 10 weeks, same-gender small groups (no more 10 in the group) led by same-gender faciltiators. Covers motivation, smoking history, nicotine dependence, social, pdychological and health consequences of smoking, preparation for quitting, urges and cravings, relapse prevention, stress management, family/peer pressure, healthy lifestyle, nutrition. Four booster sessions offered post-programme at 2 and 4 weeks. Theoretical basis of intervention: Social cognitive theory Control: Brief Intervention (mixed gender groups, 5 minutes scripted advice, 10 minutes to describe purpose and answer questions, pamphlets) Theoretical basis of control:
Outcomes	Measurement: 1-day or longer PPA; Follow-up periods: >3m, 6m (mean 7.3m from baseline) Verification: CO Losses to follow up: approx 50%
Notes	

Characteristics of included studies (*Continued*)

Allocation concealment	A – Adequate

Study	**NoT NC 2002**
Methods	Country: USA Setting: 10 high schools (5 matched pairs) in North Carolina Study design: Cluster controlled trial. Intervention schools were allocated where there were NoT facilitators trained to deliver the intervention already present in the school.
Participants	Participants: 122 smokers (I: 61; C: 61) Age range: 14-19 years, mean approx 16 years. 93.4% white, 56% female. Criteria for inclusion: self-reported smoking at least 5cpd. Follow-up method: self reports and verification of smoking status. Pre study smoking status assessment: Approx 13.3 cpd on weekdays and 19.4 cpd on weekends. Modified Fagerstrom score showed them 'highly addicted'
Interventions	NoT intervention with Brief Intervention as control. See NoT Florida for details.
Outcomes	Measurement: 1-day or longer PPA; Follow-up periods: >3m, 6m, 15m. Verification: CO < 9 ppm. Losses to follow up: approx 50% at 15m.
Notes	ITT data used. End of programme, if including booster sessions, is around 6m. Serious flaw and risk of confounding by picking intervention schools where already 'trained to administer' intervention in past (acknowledged). OR calculated from trial report.
Allocation concealment	A – Adequate

Study	**NoT WV 2004**
Methods	Country: USA Setting: 10 high schools (5 matched pairs) in North Carolina Study design: Cluster controlled trial. Intervention schools were allocated where there were NoT facilitators trained to deliver the intervention already present in the school.
Participants	Participants: 136 smokers (I: 63; C: 73) Age range: 14-19 years, mean approx 16 years. 93.4% white, 56% female. Criteria for inclusion: self-reported smoking at least 5cpd. Follow-up method: self reports and verification of smoking status. Pre study smoking status assessment: Approx 13.3 cpd on weekdays and 19.4 cpd on weekends. Modified Fagerstrom score showed them 'highly addicted'
Interventions	NoT intervention with Brief Intervention as control. See NoT Florida for details.
Outcomes	Measurement: 1-day or longer PPA; Follow-up periods: >3m, 6m, 15m. Verification: CO < 9 ppm. Losses to follow up: approx 52% at 15m.
Notes	Non-significant difference at 15m caused by doubling of control quit rate between 6m and 15m. This may be partly attributable to Master Settlement Agreement funding of US$5.8 million administered across the state for prevention activities, which confounded the background rate.
Allocation concealment	A – Adequate

Study	**Project EX-1**
Methods	Country: USA Setting: 18 Continuation high schools in southern California Study design: Cluster randomized controlled trial (assigned by block randomization)

Characteristics of included studies (*Continued*)

Participants	Participants: 335 smokers, recruited by advertising and flyers within each school. 139 in 6 Project EX schools, 120 in 6 Project EX plus SAC schools, 76 in 6 control schools. Age range: 14-19 yrs Mean age was 16.8 (± 0.8) years. Criterion for inclusion: used tobacco in last 30 days. Follow-up method: Questionnaires and telephone for those who had left school Inducements to enter study: class credits and class release time Pre-study smoking status assessment: Questionaire. Mean smoking 8.8cpd (± 9.3) Modified Fagerstrom scores 30% in range 0-6, 53% in range 7-13 and 17% in range 14-21. Post study smoking status assessment: questionnaires No significant demographic differences between arms of trial
Interventions	Intervention: Initially schools split into three arms: (1) Project EX sessions alone (clinic only schools). (2) Project EX plus school community development 'school-as-community' (SAC schools). (3) Control: standard care. 1. Project Ex is 8 sessions or 'clinics' over a 6-week period delivered to groups and developed in trials. Four sessions are preparation for quitting over 2 weeks, and next 4 are weekly during the first month post-quit. Theoretical basis of intervention: Complex theoretical constructs including motiovation interviewing etc, and including games for groups, education and anger management, yoga, weight control, meditation, assertiveness training, role play and relapse prevention. 2. SAC intervention: modeled on Toward No Drug Abuse programme. Student body organised service, recreational and job training functions, and produced a Project newsletter, to enable expression of anti-tobacco attitudes.
Outcomes	Measurement: 30-day PPA; Follow-up periods: >3m, 6m from start of study. Verification: CO (for 62 students and results adjusted by false quit reporting factor of this group) Losses to follow up: 51% in intervention group - 40% of intervention group dropped out during clinics - 42% in control group lost to follow up. Results: No difference in outcomes between two intervention arms of trial so authors pooled data and compared, as a single arm with control arm. Calculated OR based on 17% in intervention = 44 people and 8% in control being 6 people* Calculated OR = 2.388 (0.976 to 5.841) Details from authors:
Notes	Recruitment in intervention arm was voluntary; 90% of subjects said they had volunteered because they wanted help with quitting
Allocation concealment	A – Adequate

Study	**Robinson 2003**
Methods	Country: USA Setting: 18 schools in Memphis, Tennesee Study design: Randomized controlled trial
Participants	Participants: 316 smokers referred to study by school adminstrators or parents after violation of school no smoking policy, 261 students (I: 169; C: 92) followed up so far [2006]. Age range: 13-19 year olds; 64% male. Follow-up method: Telephone assessment, self-reporting Inducements to enter study: Fast food coupons, discounts at music stores and money on completion. Pre-study smoking status assessment: mFTQ Significant demographic differences between arms of trial: More cases in intervention than control arms because of school wish to have offenders treated.
Interventions	Intervention: 4 x 50-minute sessions behavourial programme, based on STS (Start To Stop) model, of motivational interviews at start of programme and monthly phone calls for 1 year to assess smoking status and give brief support, based on stage of change. Theoretical basis of intervention: Social influence theory, motivational enhancement, CBT and TTM

	Control: Written material at start of study, and monthly phone calls to assess smoking status.
Outcomes	Measurement: 7-day PPA; Follow-up periods: >3m, 12m. Verification: Attempted for all quitters. Salivary cotinine samples obtained for 18/41 cases, CO initially as a 'bogus pipeline' for some students.
Notes	Authors were contacted for original allocation of students and clarification. Possible contamination as unit of allocation was student, so that controls and interventions mixed in same schools, and there was no concealment of allocation. Stratified data available on baseline characteristsics Referral to study for violation of school no smoking policy raises issues of consent.
Allocation concealment	C – Inadequate

C: Control Group
CBT: cognitive behavioural therapy
CO: Carbon monoxide
cpw: cigarettes per week
mFTQ: modified Fagerstrom tolerance questionnaire
I: Intervention Group
m: month(s)
PPA: point prevalence abstinence
TTM: Transtheoretical model (stages of change)

Characteristics of excluded studies

Study	Reason for exclusion
Abelin 1989	NRT double blind randomised trial for 112 young people. Reported follow up was for three months only.
Adelman 2000	RCT of a psycho-social intervention targetted at young people. Although measurements made at 6 months follow-up the control group were given the intervention three months after the intervention group, therefore only three month effectiveness data is available.
Bauman 2000	The authors state that there were "no activities focussed explicitly on cessation or reduction " in their intervention.
Bloor 1999	Controlled trial using pupil advocates but only three month follow up.
Burton 1994	This is a report of the secondary cessation component/effects of the Project TNT intervention designed as a preventative programme. Follow up is 4 months after start of trial
Cai 2000	Intervention over 4 weeks and follow up of cases for further three months. Excluded as not having six month follow up but results from three months give no evidence of effectiveness: 1/12 (end of treatment OR=1.027 (0.57-1.84) and 4/12 from beginning of study = OR 0.971 (0.53-1.77)
Colby 1998	RCT of Brief motivational interviewing in a hospital setting. Follow up at three months so not eligible for this review.
Digiusto 1994	This study, a "quasi-experiment" with pair matching for analysis, describes two interventions (same intervention but different time of delivery) and control. Control data on quitting collected at 6 months but data from one intervention arm collected at approximately 19 weeks after allocation.
Dino 1998	West virginia Not with 3 month and four month follow up data from baseleine
Egger 1983	Community intervention, with cessation companent and control population, aimed at adults in community over age of 18 years. Although subset of population this study was not aimed primarily at young people.
Ehrsam 1991	Average age of participants in intervention group 21.9±6.8 years and control 24.1±6.9 years. Small size of overall study groups (56 cases in each arm) would mean it would be difficult to extract meaningful outcomes from sub-group analysis for age range of this review.

Elsasser 2002	Conference paper: Trial of only 17 cases randomised to treatment or control therefore very underpowered. Outcome measured at 3/12
Emmons 2003	This study was long term follow up of children who had had cancer. Current age of participants was 31±6.6 years
Escoffery 2004	programme aimed at college students over 18 years of age. Average age of participants was 21 years
Fagan 2003	This was an RCT designed to control tobacco use amongst young people and based in the workplace. Outcomes were reduction of use and intention to quit measures rather than actual cessation.
Figa-Talamanca 1989	Educational RCT aimed at whole class groups and not specifically smokers.
Flay 1995	Primarily a prevention programme and measured outcomes were in terms of knowledge and intention to quit. Cessation component not discrete.
Hamilton 2005	A school based cluster randomised controlled trial designed to test a harm mininisation approach. Only prevelance data available, no discrete results for smokers.
Hancock 2001	Trial of community intervention aimed at teenagers that reported population prevelance of smoking rather than following up individual smokers.
Hanson 2003	Trial of NRT(patches) for 13-19 year olds. Abstinence reported at 10 weeks post quit date.
Hellmann 1988	Although (quasi) experimental in design there was no formal randomisation or attempt to case match and baseline characteristics have not been assessed or compared.
Helstrom 2004	Potentailly interesting study with positive results but follow up only 5 months from baseline
Higgs 2000	This primarily a prevention trail reporting secondary cessation effects.
Horn 2004	Report of West Virginia trail with 3 month follow up data only.
Hort 1995	In prevention review. No discrete cessation programme.
Jason 1982	This is essentially a trial of two whole class prevention strategies
Josendal 1998	Primarily a prevention study
Kelleher 1999	Smoking cessation was a component of an intervention to reduce cardovascular risk. No discrete results measured.
Kentala 1999	Intervention by dentists to discuss smoking during annua check up. Young people randomised to brief intervention or normal care. Prevalence data only collected. Individual smokers not followed up.
Killen 1988	This is a cardiovascular health promotion trial witha smoking cessation component but without discrete results for individual smokers.
Lotecka 1983	Cognitive Behavioural intervention trialed in four schools. No discrete results available and follow-up three months.
Niederhofer 2004	Trial of buproprion versus placebo. Effectiveness measured at 90 days (three months).
O'Neill 2000	computer-based intervention using stage change model. The Mean age of oparticipants was 19.7 years range 18 years to 25 years. This falls outside our definition for this reveiw.
Pallonen 1998	This was a comparison trial between two interventions. There was no control group randomised to "placebo"/no intervention. The authors state "The inclusion of two different interventions (for smokers) rather than a treatment/control comparison is for process analysis since the sample size was inadequate for a clinical trial." The number of smokers in study was 135.
Perry 1980	This is primarily a prevention study as the stated aim is to influence the incidence of smoking. The results are presented in such a form that overall prevalence is measured for a whole year group and discrete smokers cannot be identified.
Quinlan 2000	Clinical trial using intervention matched to stage of change (TTM). Age range 18 years to 55 years. Mean age by group of participants was 20.41 yrs, 21.71 and 23.3 years and therefore this study falls outside the scope of this reveiw.
Rabius 2004	The age range of this study includes a cohort of 18-15 year olds. it is not possible to disagregate 18 and 19 year olds from report of study but author contacted for primary data. If available this data will be incorporated in future versions of review.

Characteristics of excluded studies (*Continued*)

Severson 1991	Essentially a prevention study.
Stephens 2001	Good quality trial of Motivational Enhancement for young people but follow up only 30 days at end of an intervention of 5 weeks duration. Author notes a high drop out rate
Sussman 1995	This is a trial of Project TNT, a prevention programme, constructed into cessation intervention clinics. Outcomes are measured at 4 months after start of intervention. This trial is excluded as the primary purpose of the Project TNT was targetted at prevention.
Winkleby 2004	Programme aims were to reduce smoking and although gives 6/12 follow up discrete results not available for individual smokers as unit of analysis was school.

Characteristics of ongoing studies

Study	**Hoffman 2003**
Trial name or title	ASCENT
Participants	Young people between ages 14 - 18 years
Interventions	Information availabe on :http://www.hazelden.org/OA_HTML/ibeCCtpItmDspRte.jsp?AID=10273664&item=2660&PID=1260578
Outcomes	None available in peer reviewed literature
Starting date	?
Contact information	Conference papers give szack@danya.com as contact
Notes	This intervention is a commercial product and authors have been contacted for further information

Study	**Muramoto 2001**
Trial name or title	dose response study of safety and efficacy of sustained release bupropion for smoking cessation in adolescents
Participants	
Interventions	
Outcomes	
Starting date	Reported in abstract SRNT 2001
Contact information	
Notes	Unable to verify that this was not a trial

Study	**Project-EX4**
Trial name or title	Forth in series of Project EX trials
Participants	young people within eligible range
Interventions	Classroom delivered version of Project EX within Continuation High Schools
Outcomes	Cessation at 12 months follow up
Starting date	Not specified
Contact information	ssussma@usc.edu
Notes	

ANALYSES

Comparison 01. All studies

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 7 day point prevalence quitting within the first year			Odds Ratio (Fixed) 95% CI	Totals not selected
02 30 day point prevalence			Odds Ratio (Fixed) 95% CI	Totals not selected
03 Sustained or prolonged abstinence 6m+			Odds Ratio (Fixed) 95% CI	Totals not selected
04 All included trials with extractable data			Odds Ratio (Fixed) 95% CI	Totals not selected

Comparison 02. TTM vs standard care or dietary advice

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 1 year	2	1537	Odds Ratio (Fixed) 95% CI	1.70 [1.25, 2.33]
02 2 years	2	1537	Odds Ratio (Fixed) 95% CI	1.38 [0.99, 1.92]

Comparison 03. Pharmacological interventions

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Point prevalence abstinence at six months			Odds Ratio (Fixed) 95% CI	Totals not selected

Comparison 04. Motivational enhancement vs brief interventions

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Cessation at 6 months or longer			Odds Ratio (Fixed) 95% CI	Totals not selected
02 Interventions including Motivational Interviewing	3	611	Odds Ratio (Fixed) 95% CI	2.05 [1.10, 3.80]

Comparison 05. Interventions including Cognitive Behavioural Techniques

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Cessation at 6 months or longer			Odds Ratio (Fixed) 95% CI	Totals not selected

Comparison 06. NoT vs brief interventions

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Cessation at 6 months	3	673	Odds Ratio (Fixed) 95% CI	1.87 [1.00, 3.50]

Comparison 07. RESULTS

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Reported outcomes of Included studies			Other data	No numeric data

INDEX TERMS

Medical Subject Headings (MeSH)

Adolescent; Clinical Trials; Cognitive Therapy; Randomized Controlled Trials; Tobacco Use Cessation [*methods; psychology]

MeSH check words

Adult; Humans

COVER SHEET

Title	Tobacco cessation interventions for young people
Authors	Grimshaw GM, Stanton A
Contribution of author(s)	Both authors conceived the review, and both selected and extracted data. GG wrote the review, in collaboration with AS.
Issue protocol first published	2005/3
Review first published	2006/4
Date of most recent amendment	10 November 2006
Date of most recent SUBSTANTIVE amendment	15 August 2006
What's New	Information not supplied by author
Date new studies sought but none found	Information not supplied by author
Date new studies found but not yet included/excluded	Information not supplied by author
Date new studies found and included/excluded	Information not supplied by author
Date authors' conclusions section amended	Information not supplied by author
Contact address	Dr Gill Grimshaw Principal Research Fellow Medical Teaching Centre Warwick Medical School University of Warwick COVENTRY CV4 7AL UK E-mail: gill.grimshaw@warwick.ac.uk Tel: +44 02476 528208 Fax: +44 02476 524963

DOI 10.1002/14651858.CD003289.pub4

Cochrane Library number CD003289

Editorial group Cochrane Tobacco Addiction Group

Editorial group code HM-TOBACCO

GRAPHS AND OTHER TABLES

Analysis 01.01. Comparison 01 All studies, Outcome 01 7 day point prevalence quitting within the first year

Review: Tobacco cessation interventions for young people

Comparison: 01 All studies

Outcome: 01 7 day point prevalence quitting within the first year

Study	Intervention n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Odds Ratio (Fixed) 95% CI
Aveyard 2001	76/547	59/542		1.32 [0.92, 1.90]
Brown 2003	15/116	6/75		1.71 [0.63, 4.62]
Colby 2005	3/43	1/42		3.08 [0.31, 30.82]
Killen 2004	8/103	8/108		1.05 [0.38, 2.92]
Lipkus 2004	44/209	37/193		1.12 [0.69, 1.83]
Moolchan 2005	4/46	2/40		1.81 [0.31, 10.45]
Myers 2005	4/26	1/28		4.91 [0.51, 47.16]
Project EX-1	44/259	6/76		2.39 [0.98, 5.84]

Analysis 01.02. Comparison 01 All studies, Outcome 02 30 day point prevalence

Review: Tobacco cessation interventions for young people

Comparison: 01 All studies

Outcome: 02 30 day point prevalence

Study	Intervention n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Odds Ratio (Fixed) 95% CI
Aveyard 2001	66/547	45/542		1.52 [1.02, 2.26]
Chan 1988	6/23	1/17		5.65 [0.61, 52.22]
Hollis 2005	53/226	29/222		2.04 [1.24, 3.35]
Project EX-1	44/259	6/76		2.39 [0.98, 5.84]

Analysis 01.03. Comparison 01 All studies, Outcome 03 Sustained or prolonged abstinence 6m+

Review: Tobacco cessation interventions for young people

Comparison: 01 All studies

Outcome: 03 Sustained or prolonged abstinence 6m+

Study	Intervention n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Odds Ratio (Fixed) 95% CI
Lipkus 2004	19/209	14/193		1.28 [0.62, 2.63]
Moolchan 2005	3/46	1/40		2.72 [0.27, 27.26]
Myers 2005	4/26	1/28		4.91 [0.51, 47.16]

Analysis 01.04. Comparison 01 All studies, Outcome 04 All included trials with extractable data

Review: Tobacco cessation interventions for young people

Comparison: 01 All studies

Outcome: 04 All included trials with extractable data

Study	Intervention n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Odds Ratio (Fixed) 95% CI
Aveyard 2001	76/547	59/542		1.32 [0.92, 1.90]
Brown 2003	16/116	7/75		1.55 [0.61, 3.98]
Chan 1988	6/23	1/17		5.65 [0.61, 52.22]
Colby 2005	3/43	1/42		3.08 [0.31, 30.82]
Greenberg 1978	6/25	1/25		7.58 [0.84, 68.46]
Hollis 2005	53/226	29/222		2.04 [1.24, 3.35]
Killen 2004	8/103	8/108		1.05 [0.38, 2.92]
Lipkus 2004	44/209	37/193		1.12 [0.69, 1.83]
Moolchan 2005	7/34	2/40		4.93 [0.95, 25.57]
Myers 2005	4/26	1/28		4.91 [0.51, 47.16]
NoT FL 2001	29/249	13/174		1.63 [0.82, 3.24]
NoT NC 2002	2/61	1/61		2.03 [0.18, 23.04]
NoT WV 2004	4/55	1/73		5.65 [0.61, 52.02]
Project EX-1	44/259	6/76		2.39 [0.98, 5.84]

Analysis 02.01. Comparison 02 TTM vs standard care or dietary advice, Outcome 01 1 year

Review: Tobacco cessation interventions for young people

Comparison: 02 TTM vs standard care or dietary advice

Outcome: 01 1 year

Study	Intervention n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Aveyard 2001	66/547	45/542		64.0	1.52 [1.02, 2.26]
Hollis 2005	53/226	29/222		36.0	2.04 [1.24, 3.35]
Total (95% CI)	773	764		100.0	1.70 [1.25, 2.33]
Total events: 119 (Intervention), 74 (Control)					
Test for heterogeneity chi-square=0.83 df=1 p=0.36 I^2 =0.0%					
Test for overall effect z=3.36 p=0.0008					

Analysis 02.02. Comparison 02 TTM vs standard care or dietary advice, Outcome 02 2 years

Review: Tobacco cessation interventions for young people

Comparison: 02 TTM vs standard care or dietary advice

Outcome: 02 2 years

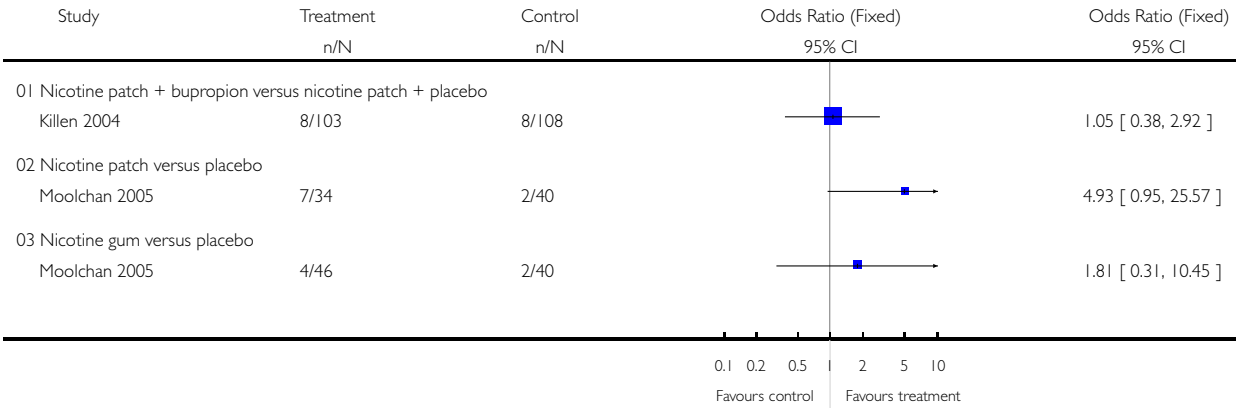
Study	Intervention n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Aveyard 2001	53/547	46/542		68.6	1.16 [0.76, 1.75]
Hollis 2005	40/226	23/222		31.4	1.86 [1.07, 3.23]
Total (95% CI)	773	764		100.0	1.38 [0.99, 1.92]
Total events: 93 (Intervention), 69 (Control)					
Test for heterogeneity chi-square=1.83 df=1 p=0.18 I^2 =45.3%					
Test for overall effect z=1.91 p=0.06					

Analysis 03.01. Comparison 03 Pharmacological interventions, Outcome 01 Point prevalence abstinence at six months

Review: Tobacco cessation interventions for young people

Comparison: 03 Pharmacological interventions

Outcome: 01 Point prevalence abstinence at six months

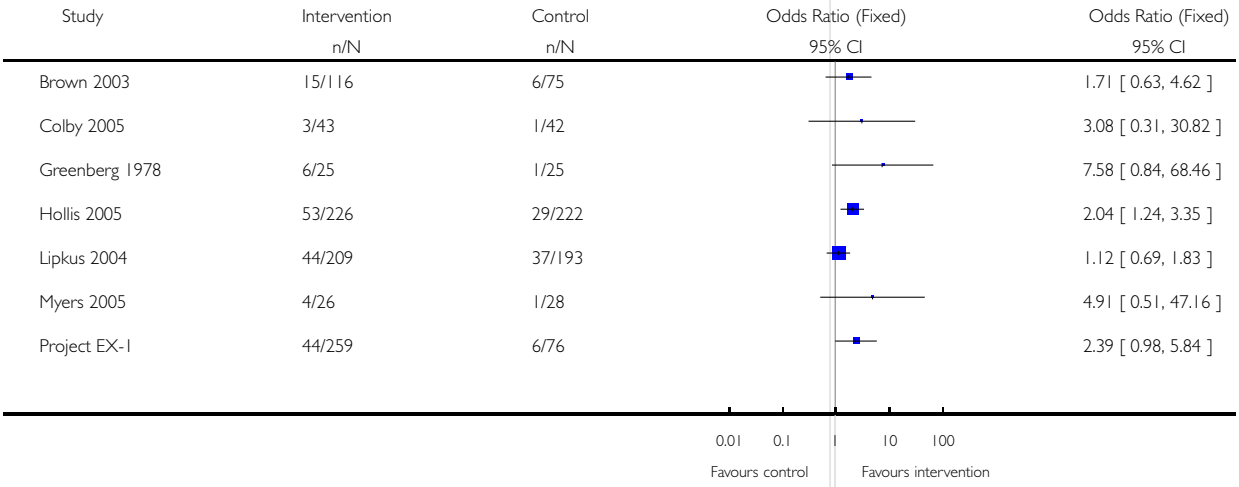


Analysis 04.01. Comparison 04 Motivational enhancement vs brief interventions, Outcome 01 Cessation at 6 months or longer

Review: Tobacco cessation interventions for young people

Comparison: 04 Motivational enhancement vs brief interventions

Outcome: 01 Cessation at 6 months or longer



Analysis 04.02. Comparison 04 Motivational enhancement vs brief interventions, Outcome 02 Interventions including Motivational Interviewing

Review: Tobacco cessation interventions for young people

Comparison: 04 Motivational enhancement vs brief interventions

Outcome: 02 Interventions including Motivational Interviewing

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Weight (%)	Odds Ratio (Fixed) 95% CI
Brown 2003	16/116	7/75		45.9	1.55 [0.61, 3.98]
Colby 2005	3/43	1/42		5.9	3.08 [0.31, 30.82]
Project EX-1	44/259	6/76		48.2	2.39 [0.98, 5.84]
Total (95% CI)	418	193		100.0	2.05 [1.10, 3.80]
Total events: 63 (Treatment), 14 (Control)					
Test for heterogeneity chi-square=0.56 df=2 p=0.75 I^2 =0.0%					
Test for overall effect z=2.26 p=0.02					

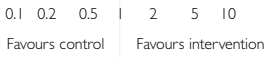
Analysis 05.01. Comparison 05 Interventions including Cognitive Behavioural Techniques, Outcome 01 Cessation at 6 months or longer

Review: Tobacco cessation interventions for young people

Comparison: 05 Interventions including Cognitive Behavioural Techniques

Outcome: 01 Cessation at 6 months or longer

Study	Treatment n/N	Control n/N	Odds Ratio (Fixed) 95% CI	Odds Ratio (Fixed) 95% CI
Lipkus 2004	44/209	37/193		1.12 [0.69, 1.83]
Myers 2005	4/26	1/28		4.91 [0.51, 47.16]
NoT FL 2001	29/249	13/174		1.63 [0.82, 3.24]
NoT NC 2002	2/61	1/61		2.03 [0.18, 23.04]
NoT WV 2004	4/55	1/73		5.65 [0.61, 52.02]

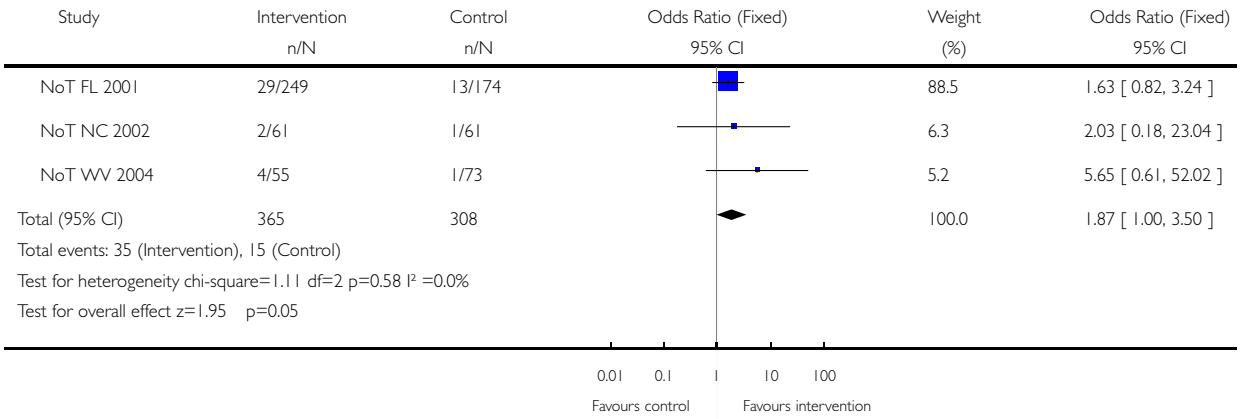


Analysis 06.01. Comparison 06 NoT vs brief interventions, Outcome 01 Cessation at 6 months

Review: Tobacco cessation interventions for young people

Comparison: 06 NoT vs brief interventions

Outcome: 01 Cessation at 6 months



Analysis 07.01. Comparison 07 RESULTS, Outcome 01 Reported outcomes of Included studies

Reported outcomes of Included studies

Study	Results	Notes
Aveyard 2001	a) 7 day abstinence: 76/547 (Int) and 59/542 (Cont) quit smoking at year 1; OR: 1.32 (CI 0.92 to 1.90). 63/547 (Int) and 49/542 (Cont) quit at year 2; OR: 1.30 (CI: 0.79 to 2.14) b) 30 day abstinence: 66/547 (Int) and 45/542 (Cont) quit at year 1; OR: 1.52 (CI 1.02 to 2.26) 53/547 (Int) and 46/542 (Cont) quit at year 2. OR: 1.1.8 (CI 0.7 to 1.97)	7 and 30 day abstinence provided by author based on pupil reporting as quitting AND abstinent for stated period as opposed to not smoking for stated stated period. The latter is basis for results given in this review. Tested sensitivity of questionnaire kappa 0.87 (0.7 to 1.00) bias would be towards positive result so ascertainment unlikely to affect validity.
Brown 2003	[ITT analysis]. At 6m, Intervention 13.3% (calculated as 15 students) and Control 8.5% (calculated as 6 students) quit; OR: 1.71 (CI: 0.63 to 4.62). At 12m 14% (calculated as 16 students) and 9.9% calculated as 7 students) quit; OR: 1.55 (CI: 0.61 to 4.00)	Not clear that calculations of % quitters based on original trial participants, therefore imputed OR calculated from translating % results using denominator of n=173 and OR calculated on ITT analysis basis using n=191. 'Cohort' may have led to clustering of outcomes and decreased study power.
Chan 1988	At approx 9m, 6/23 smokers quit in feedback group (arm 1) and 1/17 in no feedback group (arm 2). OR: 5.65 (CI: 0.61 to 52.22),comparing groups (1) and (2)	
Colby 2005	At 6m OR: 3.07 (CI: 0.307 to 30.817), based on calculations of ITT of 3 Intervention quitters and 1 control Losses to follow up: 20% at 6m	
Greenberg 1978	Quitters: Group A 3 students; Group B 0 students; Group C 6 students; Control 1 student	ORs based on ITT extrapolation.

Reported outcomes of Included studies (*Continued*)

Study	Results	Notes
	Overall OR for aggregated quitting: 3.27 (CI: 0.39 to 27.21). Group A vs control OR: 3.27 (CI: 0.32 to 33.84). Group B vs control OR: not calculable. Group C vs control OR: 7.58 (CI: 0.84 to 68.46)	
Hollis 2005	At 1 year: OR: 2.04 (CI: 1.24 to 3.35) (additional data from author). At 2 years: OR: 1.86 (CI: 1.07 to 3.23). Losses to follow up: 6% at 12 months and 12% at 24 months	
Killen 2004	At 6m, estimated OR: 1.05 (CI: 0.29 to 3.74), based on 8 quitters in each group (7% of 103 and 8% of 105)	
Lipkus 2004	At 8m, 7-day abstinence: 21% (calculated as 44 quitters) in intervention and 19% (calculated as 37) in control; Sustained abstinence 9% (calculated as 19 quitters) in intervention and 7% (calculated as 14 quitters) in control. ITT for sustained quitting OR: 1.28 (CI: 0.62 to 2.63) ITT for 7 day point prevalence OR: 1.12 (CI: 0.69 to 1.83).	
Moolchan 2005	At 6m, 7-day abstinence: Patch 20.6% (n=7, calculated), and for gum 8.7% (n=4 calculated). Control group 5% (n=2, calculated) At 6m, 'prolonged' abstinence: Patch 17.7% (n= 6, calculated), and for gum 6.5% (n=3, calculated). Control group 2.5% (n=1 calculated) ITT analysis: 'Prolonged abstinence: (i) patch vs placebo OR: 8.36 (CI: 0.95 to 73.3); (ii) gum vs placebo OR: 2.72 (CI: 0.27 to 27.3). 7-day pointprevalence: (i) patch vs placebo OR: 4.93 (CI: 0.95 to 25.6); (ii) gum vs placebo OR: 1.81 (CI: 0.31 to 10.4). Losses to follow up: 54%	
Myers 2005	Sustained abstinence (7-day and 90-day PPA): 4/26 (15.4%) in intervention group, and 1/28 (3.6%) in control group. OR: 4.91 (CI: 0.51 to 47.16).	
NoT FL 2001	At 6m, 1-day or longer abstinence: 29/249 quitters in intervention group and 13/174 in control group. OR: 1.63 (CI: 0.82 to 3.24). Range of sustained abstinence reported as 1-218 days. Losses to follow up: approx 50%	
NoT NC 2002	At 6m, 1-day or longer abstinence: 2/61 quitters in intervention group and 1/61 in control group. OR: 2.03 (CI: 0.18 to 23.04). At 15m, estimated NoT quit rate of between 11%	OR calculated from trial report.

Reported outcomes of Included studies (*Continued*)

Study	Results	Notes
	(ITT) and 22% (per protocol).	
NoT WV 2004	At 6m, 4/55 had quit in intervention group and 1/73 in control. OR: 5.65 (CI: 0.61 to 52.02). At 15m, estimated NoT quit rate of between 11% (ITT) and 22% (per protocol).	OR calculated from trial report.
Project EX-1	At 6m, no difference in outcomes between interventions (1) and (2), so authors pooled data and compared as a single arm against control arm. Calculated OR based on 17% in intervention group (44/259) and 8% (6/76) in control group. Calculated OR: 2.39 (CI: 0.98 to 5.84)	Quit rates based on ITT analysis and CO verification.