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Effectiveness of psychological interventions for smoking cessation in adults with mental health problems: A systematic review

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This review followed the PRISMA statement for reporting systematic reviews. Inclusion criteria were specified in advance and documented in a published protocol registered as CRD42014014159 and available at <http://www.crd.york.ac.uk/PROSPERO/>

ABSTRACT

Purpose

People with long-term mental health problems are heavier smokers than the general population, and suffer greater smoking-related morbidity and mortality. Little is known about the effectiveness of psychological smoking cessation interventions for this group. This review evaluates evidence from randomised controlled trials (RCTs) on the effectiveness of psychological interventions, used alone or with pharmacotherapy, in reducing smoking in adults with mental health problems.

Methods

We searched relevant articles between January 1999 and March 2019 and identified 6200 papers. Two reviewers screened 81 full-text articles. Outcome measures included number of cigarettes smoked per day, 7-day point prevalence abstinence, and continuous abstinence from smoking.

Results

Thirteen RCTs, involving 1497 participants, met the inclusion criteria. Psychological interventions included Cognitive Behavioural Therapy (CBT), Motivational Interviewing (MI), counselling, and telephone smoking cessation support. Three trials resulted in significant reductions in smoking for patients receiving psychological interventions compared with controls. Two trials showed higher 7-day point prevalence in intervention plus nicotine replacement therapy (NRT) versus standard care groups. Four trials showed that participants who combined pharmacotherapy (Bupropion or Varenicline) with CBT were more likely to reduce their smoking by 50% than those receiving CBT only. Four out of five trials that

compared different psychological interventions (with or without NRT) had positive outcomes regardless of intervention type.

Conclusions

This study contributes to our understanding in a number of ways: the available evidence is consistent with a range of psychological interventions being independently effective in reducing smoking by people with mental health problems; however, too few well-designed studies have been conducted for us to be confident about, for example, which interventions work best for whom, and how they should be implemented. Evidence is clearer for a range of psychological interventions – including CBT, MI and behavioural or supportive counselling – being effective when used with NRT or pharmacotherapy. Telephone-based and relatively brief interventions appear to be as effective as more intense and longer-term ones. There is also good evidence for a strong dose-response relationship – increased attendance predicts improved outcomes – and for interventions having more positive than negative effects on psychiatric symptoms.

KEYWORDS: smoking cessation and reduction; mental health; psychological interventions; health inequalities

Effectiveness of psychological interventions for smoking cessation in adults with mental health problems: A systematic review

Introduction

Smoking prevalence and levels of nicotine dependence are much higher in adults with a long-standing mental health problem than in the general population (National Centre for Social Research, 2015). Although smoking prevalence in the general adult populations of most Western countries has declined considerably in recent years – for example, from 46% in 1976 to 16% in 2016 in the UK (Office for National Statistics, 2016), and from 20.9% in 2005 to 15.5% in 2016 in the US (Jamal, Phillips, Gentzke et al., 2016) – it remains high among adults with mental health problems. In the UK, of patients with a mental health diagnosis, around 30-37% are smokers (The Royal College of Physicians, 2013; Royal College of Physicians and Royal College of Psychiatrists, 2013). For patients with schizophrenia, the smoking prevalence is as high as 45% (Szatkowski & McNeill, 2013), while the severity of a mental health condition can further increase the likelihood of smoking and addiction (Vanable, Carey, Carey & Maisto, 2003). This association between smoking and mental health problems is also evident in Spain, US and Australia (de Leone, Kiaz, Rogers, Browne & Dinsmore, 2002; Farrell, Howes & Bebbington, 2001; Jorm, Rodgers, Jacomb, Christenson, Henderson & Korten, 1999). In the US, adults with a psychiatric diagnosis are three times more likely to smoke than adults with no diagnosis, and are much less likely to quit (Smith, Mazure & McKee, 2014).

Studies in the UK and US also suggest that people with severe mental health problems are more likely to suffer from smoking-related illnesses such as cardiovascular disease and cancer, and to die at a younger age, compared with those without mental health problems (Colton & Manderscheid, 2006; Lawrence, Mitrou & Zubrick, 2009; Osborn, Levy, Nazareth,

Peterson, Islam & King, 2007). It is estimated that current smokers with mental health problems lose 14.9 years of life relative to non-smokers without a mental illness, and smoking accounts for up to two-thirds of the difference in life expectancy between these two groups (Tam, Warner & Meza, 2016).

This problem also has serious financial implications: in England, the Royal College of Physicians (2015) reported that smoking-related illnesses in people with mental health problems costs the National Health Service (NHS) approximately £720 million each year, and the global cost of smoking, including the related expenses, reaches \$1 trillion annually (Taylor, McNeill, Girling, Farley, Lindson-Hawley & Aveyard, 2014; U.S. National Cancer Institute and World Health Organization, 2016). There is therefore an urgent need to address smoking and related illnesses in patients with mental health problems and improve the support provided to them.

The National Institute for Health and Care Excellence in England (NICE, 2013) and the US Department of Health and Human Services (DHHS, 2008) recommend that mental health service users who smoke are offered tobacco dependence treatment advice, including pharmacotherapy, psychological support and practical counselling to aid quitting. However, support for smoking cessation is not offered or implemented consistently and to the same level across all mental health services (Ratschen, Britton & McNeill, 2009).

The 2010 Health Survey for England (National Centre for Social Research, 2010) reported that two-thirds of all smokers with mental health problems would like to quit. However, these smokers are more likely to be heavily addicted and face barriers in successfully quitting smoking compared with those without mental health problems (Brody, Zorick, Hubert et. al, 2007; Fagerström & Aubin, 2009; Royal College of Physicians and Royal College of Psychiatrists, 2013). In smoke-free psychiatric units, many patients manage to abstain from smoking, especially with the provision of nicotine replacement therapy

(NRT), but within five weeks of being discharged the majority start smoking again (Prochaska, Fletcher, Hall & Hall, 2006).

One barrier is that adults with mental health problems are less likely to be offered systematic support for smoking cessation than those in the general population (Ratschen, Britton, Doody & McNeil, 2016; Rethink, 2013). Despite the strong association between smoking and poor mental health, many smokers believe that smoking offers mental health benefits by alleviating feelings of depression, stabilising mood and relieving stress. Thus, smokers – and many health professionals – are often reluctant to engage in smoking cessation interventions due to the misconception that smoking mitigates psychiatric symptoms (Ratschen et al., 2016; Taylor et al., 2014). Moreover, smoking continues to be condoned in many mental health settings to support social interaction or as part of a shared smoking culture between staff and patients (Kelly, 2012; Ratschen et al., 2016). Mental health professionals often use cigarettes as positive reinforcement for managing behaviour and regard smoking as a legitimate coping mechanism or means of self-medication (Hahn, Harvey, Concheiro-Guisan, Huestis, Holcomb, Gold, 2013; Lawn & Condon; 2006).

However, there is no evidence to support these negative attitudes towards smoking cessation that are often shared by patients with mental health problems and staff. Peckham, Brabys, Cook, Tew and Gilbody (2017) found that pharmacotherapy, in particular the use of Varenicline and Bupropion, can be an effective smoking cessation aid not only for smokers in the general population but also for those with severe mental health problems. Furthermore, the mental health benefits of smoking cessation are as significant for smokers with psychiatric disorders as for those without: smoking cessation is associated with reduced depression, anxiety and stress, improved mood and quality of life (Taylor et al., 2014).

Although the current evidence for the effectiveness of pharmacotherapy (e.g., Bupropion or Varenicline) on smoking cessation in smokers with mental health problems is

promising, the effectiveness of psychological interventions such as supportive counselling or Cognitive Behavioural Therapy (CBT) remains unclear and has become the focus of ongoing research (Peckham et al., 2017; Ratschen et al., 2016; Taylor et al., 2014). Tsoi, Porwal and Webster (2013) found that, although contingent reinforcement (CR) with money had a short-term benefit, there was no evidence of other psychosocial interventions resulting in reduced smoking by people with schizophrenia. Peckham et al. (2017) reported mixed results on the effectiveness of smoking cessation programmes, with some studies indicating positive, and some negative, outcomes. Differences have been attributed to the varied settings, diagnoses, delivery modes, and fidelity of professionals delivering psychological interventions.

Therefore, it remains unclear what type of support – pharmacological, psychological or a combination of the two – is most effective for smoking cessation and for which patient group. It is also unclear whether long-term and intense face-to-face psychological interventions are more, less, or equally effective, when compared with brief or telephone-based interventions. Addressing these important questions has the potential to improve patient and clinician choice, and the cost effectiveness of interventions for smoking cessation. For example, if brief psychological interventions are effective, then patients could be offered cheaper and possibly safer treatments than pharmacotherapy.

This review of randomised controlled trials (RCTs) examined whether – and if so, which – psychological interventions are effective, either alone or with pharmacotherapy, in reducing smoking in adults with mental health problems. We asked five research questions:

RQ1. Are psychological interventions independently effective?

RQ2. Are psychological interventions plus NRT effective?

RQ3. Are psychological interventions combined with pharmacotherapy more effective than psychological interventions alone?

RQ4. Which psychological interventions are most effective?

RQ5. What is the impact of psychological interventions on clinical symptoms?

METHOD

This review followed the PRISMA statement for reporting systematic reviews (Liberati, Altman, Tetzlaff, Murlow, Gotzsche, Ioannidis, Clarke et al., 2009). Inclusion criteria were specified in advance and documented in a published protocol registered as (BLINDED) and available at (BLINDED) (Prospero, 2013). Methods of analysis were not decided in advance as it was unknown whether meta-analysis would be appropriate.

Search strategy

Research studies were identified by searching electronic databases, scanning contents and reference lists, and contacting relevant researchers where necessary. Databases were selected to best represent source material in the fields of health psychology and public health: These were CINAHL Plus, MEDLINE, AMED, PSYCHINFO via EBSCO Host, Embase via OVID, PUBMED and Cochrane Library. The limits used on all databases were 1999 to March 2019. Searches occurred between May 2014 and March 2019 and were limited to publications in English. Search terms included psychological interventions, smoking, cessation, and mental health problems. Full search terms are given in Appendix A (supporting information).

Two experts were contacted via email to ascertain whether they had any published or unpublished work relevant to the research questions that they were willing to share. One provided us with a previously published paper and the other did not respond. Grey literature was also searched using 'Open Grey'. The contents pages of the *Journal of Smoking Cessation* were screened for eligible papers from the journal's inception in May 2009.

Reference lists including studies on smoking cessation interventions with adults with mental health problems were also scanned.

Inclusion Criteria

Population: Studies were eligible if they included adults (over 16 years of age) who had been diagnosed with, and/or were currently receiving treatment, for a mental health problem recognised by DSM-IV or ICD-10 with the exception of addiction and substance-related disorders. Mental health problems are characterised by ‘a combination of abnormal thoughts, behaviours, emotions and relationships with others’ (World Health Organisation, 2014) and present as a wide array of diagnoses including depression, schizophrenia and anxiety. This review was restricted to individuals over 16 years of age, below which cessation interventions are unlikely to be offered. Studies were considered if people were clinically stable and treated in the community, at home, as in-patients or out-patients. Only studies involving people who reported being regular/daily smokers (i.e., five or more cigarettes a day) were eligible since 45% of people smoking fewer than five cigarettes a day tend to quit without intervention (Kenford, Wetter, Welsch, Smith, Fiore & Baker, 2005).

Type of study: Only RCTs and pilot RCTs were considered for their good internal validity and lower risk of bias than other study designs (Prospero, 2013). Published and unpublished RCTs were considered but only published ones met the inclusion criteria. Only studies conducted from 1999 onwards were included. According to Peckham et al. (2017), the first trial of a smoking cessation intervention in adults with mental health problems was published in the United States in 1999. Moreover, the release in 1998 of the white paper ‘Smoking Kills’ (The Stationery Office, 1998) resulted in the development of NHS Smoking Services across England. Prior to this, ‘stop smoking’ services were not compulsory so it is

unlikely that many cessation interventions were used by smokers with mental health problems.

Interventions: Studies involving psychological interventions for smoking cessation or relapse prevention were considered, including motivational interviewing, educational strategies, CBT, coping skills training, behavioural skills training, and thought restructuring (we refer to these as different ‘types’ of psychological intervention). Combination interventions, such as community-based counselling with nicotine replacement therapy (NRT) were eligible, as were studies that used pharmacotherapy as a comparison or control intervention to psychological interventions. We anticipated that these would be prominent in the literature given that NICE (2013) in the UK and DHHS (2008) in the US recommend the provision of pharmacotherapy and psychological treatments for smoking reduction in mental health services.

Trials involving exercise as the sole intervention were excluded as the focus of this review was specifically on psychological interventions. NICE (2013) recommendations for smoking cessation in people with mental health problems do not include physical activity as an intervention but focus primarily on pharmacotherapy and behavioural/psychological support. Despite the well-documented links between exercise and well-being, previous systematic reviews have found limited evidence for the effectiveness of physical activity on smoking cessation in healthy individuals (Ussher, Faulkner, Angus, Hartmann-Boyce & Taylor, 2019; Ussher, Taylor, West & McEwen, 2000) and those with alcohol addiction or physical health issues (Ussher et al., 2000). Moreover, due to the lack of staff resources, and environmental or physical risk management practices in psychiatric wards (Shattell, Andes, & Thomas, 2008), exercise-focused interventions may be difficult to implement for smokers with mental health problems. Physical activity is, therefore, unlikely to be routinely offered to those with severe mental health problems as a smoking cessation intervention.

Outcome measures: Primary outcome measures were changes in smoking behaviour and included: number of cigarettes smoked per day; 7-day point prevalence abstinence (i.e., abstinence from smoking for at least seven days); and continuous abstinence (i.e., abstinence for one month or longer). Objective physiological measures such as biochemically verified expired carbon monoxide were also included (Peckham et al., 2017). An intervention was considered effective on a certain outcome measure if the subsequent reduction in smoking was statistically significant at the .05 level. We also considered substantive changes that were non-significant, perhaps owing to small sample size. Given the putative cognitive benefits of tobacco use for patients with schizophrenia and the view that smoking cessation exacerbates psychiatric problems, measures of clinical symptoms and general functioning at baseline and follow-up points were also of interest, although these outcomes were not primary in this review (Taylor, 2014). Examples of outcomes measured include symptoms of depression, anxiety, negative affect, and cognitive functioning, as well as physical symptoms such as nausea, akathisia, headaches and tachycardia. Quality of life (QoL) was also included.

Study selection and data extraction

After importing results from each database to 'Refworks', titles and page numbers were screened for internal duplicity by the first author, using the 'exact duplicate' function. External duplicates were also checked using the 'exact duplicate' and 'close duplicate' functions. All study titles were screened by the first author and papers that did not reflect the nature of the review were excluded. All remaining abstracts were independently read by the first two authors. Papers meeting eligibility criteria were carried forward for data extraction.

A data extraction form was adapted from the Cochrane Review Group's data extraction template (Higgins, Altman, Gøtzsche, Jüni, Moher, Oxman, et al., 2011) and summarised the study, population, type of intervention, adherence and outcomes. Before the

data extraction process began, the first author pilot tested the form on one RCT and no changes were deemed necessary. The first two authors carried out the data extraction independently on all selected studies using full study reports. Information was extracted on: 1) participants' characteristics (including age, sex, ethnicity, number of cigarettes smoked per day, and specific mental health problem); 2) intervention type, setting, duration, mode of delivery and dosage (if involving pharmacotherapy); 3) length of follow up; and 4) type of outcome measure (i.e., number of cigarettes smoked per day, 7-day point prevalence, continuous abstinence, and change in CO expired). Any disagreements were resolved through discussion. Thirteen papers were included in the review after being assessed for full eligibility in the data extraction stage. Of these, one pilot RCT (Evins, Mays, Rigotti, Tisdale, Cather & Goff, 2001) and its subsequent RCT (Evins, Cather & Deckersbach, 2005) were both included as they were conducted separately and with different participants.

Assessment of bias in included studies

The Cochrane risk of bias tool (Higgins et al., 2011) was used to assess the internal validity and risk of bias across seven domains. Risk of bias for each domain, and an overall risk of bias (low, high, unclear) for each study, were independently allocated to each of the 13 eligible RCTs by the first two authors (Table 1). Comparison of the overall risk of bias for each of the 13 studies revealed perfect agreement (100%) between the two reviewers indicating excellent inter-rater reliability.

Data synthesis

Heterogeneity of the studies was assessed by the first two authors by blind inspection of the data extraction findings and characteristics of the included studies. Between-study variability was assessed in relation to participants' diagnoses; type of intervention; setting,

frequency, duration and delivery format of the intervention; sample size; time of follow-up; and outcome measures. Assessment of the between-study variability was guided by our research questions and the data extraction form used for the assessment of the included studies. There was marked heterogeneity in a number of study-specific variables: for example, sample sizes ranged from 9 to 151 participants per condition; duration of interventions ranged from 1 week to 24 weeks, whereas duration of individual sessions within an intervention ranged from five to 90 minutes; some interventions consisted of one single session and others of a total of 24 sessions; and some interventions offered group sessions, others individual, and one a combination of the two. There was also heterogeneity in the risk of bias and in the outcome measures reported: some studies reported continuous abstinence from smoking, others smoking reduction from baseline, and others 7-day point prevalence. In addition, time of follow-up ranged between studies from four weeks to one year post intervention. The result of this clinical and methodological heterogeneity was that, even when outcome measures and conditions were similar, one or more other confounding factors was likely to render comparisons and pooling of data across studies inappropriate. As the Cochrane Effective Practice and Organisation of Care (EPOC) (2017) group advises, “Reasons for not calculating an average effect across studies include: Unexplained heterogeneity that make the average effect difficult to interpret and potentially misleading [and] Differences in populations, interventions, comparisons or methods that would make the average effect across studies meaningless” (p. 1). For these reasons, the Research Questions are addressed here by presenting structured syntheses of the available evidence.

Data from the included studies were synthesised by considering change in smoking behaviour between 1) the target quit date and the end of the intervention and 2) the target quit date/end of intervention and post intervention follow up (short, medium and long term), with, where available or when calculation was possible, effect sizes and *p*-values. Short-term

follow up was any measurement of cessation taken up to 23 weeks post intervention/target quit date. Medium-term follow up referred to any duration between 24 and 51 weeks post intervention. Follow up at 52 weeks or more post intervention was regarded as long-term.

RESULTS

The electronic database searches yielded 6189 results in total, and the grey literature, hand journal and reference list searches elicited a further 11 results. After duplicates were removed a total of 5207 papers were screened for eligibility, and of those, 5126 were removed after title screening. Any papers that had ambiguous titles were put forward to the full text review stage, at which 81 papers were considered for eligibility. Of these, 68 papers were excluded due to failing to fulfil eligibility criteria and 13 were included in the final review (Figure 1). Table 4 (see supporting information) shows the reasons for exclusion of studies at the full text review stage.

No studies were excluded for having a high or unclear risk of bias. Of the six studies with high risk, sources of bias included: small sample size and differences in physiological measures taken between patients (Evins et al., 2001); no blinding of participants (Baker, Richmond, Kay-Lambkin, Filia, Castle, Williams, Lewin, et al., 2015; Gilbody, Peckham, Man, Mitchell, Li, Becque, et al., 2015; Williams, Steinberg, Zimmermann, Gandhi, Stipelman, Dooley Budsock & Ziedonis, 2010); incomplete outcome data (Morris, Waxmonsky, May, Tinkelman, Dickinson & Giese, 2011); randomisation procedure with allocation concealment bias (George, Ziedonis, Feingold, Pepper, Satterburg, Winkel, Rounsaville, et al., 2000); and inconsistent or missing information on use or dosage of NRT (Baker, Richmond, Haile, Lewin, Carr, Taylor, Jansons, et al., 2006; Steinberg, 2003).

Study characteristics

Table 2 summarises the key characteristics of the 13 studies included in this review. A total of 1497 participants were involved. All studies recruited participants with a severe mental health diagnosis, and all included patients with schizophrenia or schizoaffective disorder. Five also included participants with bipolar disorder, of which one (Morris et al., 2001) also included patients with anxiety or depression. Of the eleven studies that reported the setting of the intervention, ten recruited participants from outpatient / community mental health centres. Only one recruited participants from a secure psychiatric unit and continued with the intervention after their discharge to a community mental health centre. The majority of studies (77%) were conducted in the US, two in Australia, and one in the UK. The mean age of participants was 43.6 years, they smoked an average of 25.7 cigarettes a day, and the majority (70%) were Caucasian. Around 60% were male, a figure that reflects the higher prevalence of schizophrenia spectrum disorders and of smoking among American men (Centers for Disease Control and Prevention, 2015).

Information on the delivery of the psychological interventions was given in all except one study (George et al., 2000) with varying degrees of detail. In studies that provided such information, therapists were healthcare professionals (e.g., nurses, therapists and psychologists) trained in the delivery of the psychological interventions.

Table 3 summarises the key findings from the included studies. The results columns include the measures most commonly reported: abstinence (continuous abstinence and/or 7-day point prevalence), and reduction in smoking by at least 50%.

Narrative analysis

Question 1: Are psychological interventions independently effective? was addressed by two studies that compared psychological interventions with controls (Gilbody et al., 2015;

Steinberg, 2003) and one in which group counselling and Quitline plus NRT were compared with Quitline plus NRT (Morris et al., 2011).

Gilbody et al. (2015) compared patients with severe mental health problems participating in a bespoke smoking cessation programme – that included home visits and face-to-face support after unsuccessful quit attempts – with controls who were offered advice on NHS smoking cessation services. Participants in the intervention group were more likely than controls to have used NRT (44% vs. 19%) or Varenicline (4% vs. 0%). At one, six and twelve months, the intervention group had significant reductions in numbers of cigarettes smoked per day, and at one and six months significantly greater reductions than the control group, in which the reduction was significant at six months only. Although at 12 months group differences between proportions of quitting participants (36% vs. 23%) were not significant, when adjusted for sex, age, baseline number of cigarettes smoked and alcohol consumed, the intervention group was almost three times more likely to have stopped smoking than controls (odds ratio 2.9, 95% CI 0.8-10.5).

Steinberg (2003) compared two treatment groups – Motivational Interview (MI) and psychoeducation – with a control group who received brief advice on quitting. Both interventions were associated with modest but significant reductions in mean numbers of cigarettes smoked per day 4 weeks post-intervention compared with baseline. The control group, in contrast, showed no reduction. A mixed ANOVA indicated no differences between the three groups, although paired t-tests suggest that, had the control group been larger ($n = 12$), or the ANOVA been limited to four weeks only (rather than one and four weeks), then both interventions would have been effective compared with the control group.

Morris et al. (2011) combined ten group counselling sessions with Quitline counselling (five telephone calls assisting with quit attempts and relapse prevention) and 12 weeks of NRT for patients with schizophrenia, bipolar disorder, depression and anxiety. They

tested this programme's effectiveness compared to Quitline with NRT only. At 24 weeks, the two groups showed similar significant reductions in mean number of cigarettes smoked per day, but 21% of those who received group counselling, versus 8% of those who did not, reduced this number by at least 50%.

Question 2: Are psychological interventions plus NRT effective? was addressed by two studies that compared the effectiveness of a psychological intervention combined with NRT versus standard care in inpatients (Prochaska, Hall, Delucchi & Hall, 2014) and outpatients (Baker et al., 2006) with a psychotic disorder. In Prochaska et al. (2014), the intervention group (motivation tobacco cessation + NRT) showed significantly higher 7-day point prevalence when abstinence rates were modelled over 18 months. In Baker et al. (2006), the intervention group (MI + CBT + NRT) showed significantly more continuous abstinence and 7-day point prevalence at 12 weeks follow-up, and marginally more continuous abstinence at 52 weeks. Reduction in the number of cigarettes smoked of 50% or more was significantly greater in the intervention group at 12, 24 and 52 weeks.

Smoking reduction was clearly linked with treatment session attendance (Baker et al., 2006). Patients who attended all ten MI/CBT sessions had better outcomes compared with those receiving standard care in: a) continuous abstinence at 12 weeks follow-up (21.4% vs. 4.0%), $p < .001$; b) 7-day point prevalence at 12 weeks (30.0% vs. 6.0%), 24 weeks (17.9% vs. 4.0%) and 52 weeks (19.0% vs. 7.0%), all $ps < .001$; and c) number of cigarettes smoked per day reduced by at least 50% at 12 weeks (57.1% vs. 16.6%), 24 weeks (41.4% vs. 18.5%) and 52 weeks (47.1% vs. 17.9%), all $ps < .001$. Moreover, NRT use was related to attendance: in the treatment group, approximately 90% of high attenders used NRT compared with 58.6% of low attenders.

Question 3: Are psychological interventions combined with pharmacotherapy more effective than psychological interventions alone? was addressed by four studies in which

CBT and pharmacotherapy were compared with CBT and placebo. Evins et al. (2001; 2005; 2007) administered either Bupropion or placebo for 12 weeks to participants with schizophrenia spectrum disorder. In two studies (Evins et al., 2005; 2007), they also received weekly CBT sessions for the same period, and in the third study (Evins et al., 2001) for the first 9 weeks. In Evins et al. (2007), all participants also received high-dose nicotine patches and gum.

In two of the studies (Evins et al., 2001; 2005), 7-day point prevalence abstinence in the CBT plus placebo groups even during treatment was negligible or absent. In the third study (Evins et al., 2007), 19% of participants in the CBT plus placebo group showed 7-day point prevalence, the difference between studies possibly indicating a small effect of NRT. However, in all three studies the CBT plus placebo groups showed clearer indication of reduction in numbers of cigarettes smoked per day. For example, at week 12 (when treatments were discontinued) the number of cigarettes smoked per day was reduced by 40%, and at 6 months by almost a quarter (23.6%) in one study (Evins et al., 2005), and by 11.9% in a later study (Evins et al., 2007). Further evidence of the short-term effectiveness of CBT is suggested by the CBT plus placebo group showing a 42% increase in expired-air CO between week 8, when CBT was discontinued, and week 12 (Evins et al., 2001).

A later study (Evins, Cather, Pratt, Pachas, Hoepfner, Goff, Achtyes et al., 2014) focused on relapse prevention following 12 weeks' administration of CBT and Varenicline. At that point, one group continued with both treatments, while the other switched to CBT plus placebo. At week 52, when the trials were discontinued, 15% of the CBT plus placebo group showed continuous abstinence, and at week 76, 10%. Reduction in number of cigarettes smoked was not reported in this study.

All four of the Evins studies reported higher rates of abstinence when CBT was combined with pharmacotherapy rather than placebo. In three studies (Evins et al., 2001;

2005; 2007), this effect was relatively short-lived and relapse rates were high; in one study (Evins et al., 2007), 77% had relapsed after 12 months. But in the latest study (Evins et al., 2014), when treatment continued for a year, 40% of participants taking Varenicline showed continuous abstinence at week 64, compared with 11% in the placebo group. Earlier studies (Evins et al., 2001; 2007) also report evidence of longer-term reduction in number of cigarettes smoked when Bupropion was administered: at 24 weeks four times as many in this group smoked 50% or fewer cigarettes daily as in the placebo group (Evins et al., 2007).

Question 4: Which psychological interventions are most effective? Steinberg (2003) and Steinberg, Williams, Stahl, Dooley Budsock and Cooperman, (2016) compared two different types of psychological interventions. They reported that reduction in number of cigarettes smoked daily did not differ between smokers having brief MI vs. psychoeducation (Steinberg, 2003), and that continuous abstinence did not differ between smokers who had brief MI with personalised feedback vs. interactive education (Steinberg et al., 2016). In Steinberg (2003), both interventions resulted in patients smoking approximately 20% fewer cigarettes at four weeks compared with baseline.

Three studies compared the effectiveness of two different types of intervention for smoking cessation, also including NRT (Baker et al., 2015; George et al., 2000; Williams et al., 2010). Two of these indicate that abstinence and reduction in number of cigarettes smoked daily did not differ between smokers receiving two different intensities of behavioural counselling (24 weeks vs. 9 weeks) or face-to-face healthy lifestyle sessions vs. telephone monitoring (Williams et al., 2010 and Baker et al., 2015 respectively). In contrast, George et al. (2000) reported that behavioural therapy with supportive counselling was more effective than specialised schizophrenia smoking treatment with 17.6% vs 10.7% ($p = .03$) of patients achieving abstinence at 24 weeks post intervention, respectively.

Baker et al. (2015) and Williams et al. (2010) reported that, regardless of intervention type, there were significant reductions from baseline in the number of cigarettes smoked at 15- and 52-weeks and at 17-weeks post-intervention, respectively. These two studies also found that, irrespective of intervention type, there was a significant association between the number of sessions attended and smoking cessation. Baker et al. (2015) reported that more smokers with high attendance (9-17 sessions) of face-to-face and telephone monitoring groups showed a reduction in cigarettes smoked of 50% or more at 15 weeks (51% vs. 16%) and 52 weeks (25% vs. 6.9%) than lower attenders. Similarly, Williams et al. (2010) reported that smokers who attended more than two-thirds of sessions were four-to-six times more likely than low attenders to be abstinent at three months post intervention (30% vs. 8% for Treatment of Addiction to Nicotine in Schizophrenia – TANS – and 43% vs. 7% for Medication Monitoring – MM).

Question 5: What is the impact of psychological interventions on clinical symptoms? With few exceptions (Evins et al., 2001; Gilbody et al., 2015), and regardless of intervention type, duration, intensity, or combination with pharmacotherapy and/or NRT, no negative effects on clinical symptoms were reported in the included studies (Table 5, supporting information). Four studies reported that, for patients in the intervention groups, there were no changes between baseline and follow-up scores in psychiatric symptoms (Baker et al., 2015; Evins et al., 2007; George et al., 2000; Williams, 2010) and psychosis, mood symptoms, and positive and negative symptoms in schizophrenia (PANSS) (Williams et al., 2010). Two studies reported that there were no serious adverse effects as a result of the intervention (Evins et al., 2007; 2014), and one that patients in the intervention group had a significantly lower likelihood of psychiatric hospitalisation than controls (Prochaska et al., 2014). Five studies reported either a trend towards (Evins et al., 2005) or a significant improvement in psychiatric, depressive and negative symptoms (Evins et al., 2001),

depression (Baker et al., 2006; 2015), mental functioning (Baker et al., 2006), and physical and mental health quality of life (QoL) (Morris et al., 2011) in the intervention groups.

In the earliest Evins et al. (2001) study, the group receiving CBT and placebo showed an improvement in positive symptoms but a worsening of depressive symptoms, and a non-significant increase in psychiatric symptoms. The CBT plus Bupropion group did better than the CBT plus placebo group on psychiatric and depressive symptoms. Gilbody et al. (2015) reported higher deterioration in mental health in a number of smokers in the intervention group compared with controls (15 vs 6), but the deterioration was related to the intervention for only three participants from each group.

DISCUSSION

Thirteen smoking cessation RCT studies published since 1999 were identified that involved psychological treatment of people with mental health problems. Of these, only three included control conditions for psychological interventions (Gilbody et al., 2015; Morris et al., 2011; Steinberg, 2003). Morris et al. (2011) reported that counselling with Quitline and NRT were more effective¹ than Quitline and NRT alone. In Gilbody et al. (2015), the intervention was confounded with NRT such that either the psychological intervention, or NRT, or both, were effective, and in Steinberg (2003) no differences were found, perhaps because the control group was too small ($n = 12$).

However, all of these three studies reported reductions in smoking from baseline – rather than in comparison with controls – and these are consistent with psychological interventions being effective. For example, in Steinberg (2003) both psychological interventions – MI and psychoeducation – led to 20% reductions in number of cigarettes smoked. Similarly, five studies (Baker et al., 2006; 2015; George et al., 2000; Prochaska et

¹ For each study's outcome measures see the narrative analysis and Table 3.

al., 2014; Williams et al., 2010) reported reductions in smoking when the psychological treatments were administered, as did Evins et al. (2005; 2007) when psychological treatments were administered without Bupropion, although these might reflect only the effect of NRT or of placebo. In contrast, Evins et al. (2001; 2014) reported no substantive reduction in smoking when pharmacotherapy was not used, indicating that CBT was ineffective in these studies. Similarly, the absence of substantive changes in Steinberg et al. (2016) suggest either that MI and interactive education are ineffective, or that they are ineffective in low dosages (a single 45-minute session).

The weight of the evidence from these 12 studies is therefore at least consistent with that of Morris et al. (2011) and indicates that a range of psychological interventions are effective in reducing smoking when used by smokers with mental health problems. Unfortunately, since none of these 12 studies included an adequate control group, this evidence can only be considered circumstantial. The answer to the first research question, regarding whether psychological interventions are effective, is therefore ‘probably’.

The second research question concerned whether psychological interventions plus NRT are effective. Two studies addressed this question (Baker et al., 2006; Prochaska et al., 2014). Although there was little evidence of increased abstinence in Baker et al. (2006), there was a clear and substantial difference in proportions of participants who reduced their smoking by 50% or more. Similarly, Prochaska et al. (2014) reported more abstinence when psychological treatment was combined with NRT compared with usual care. Although we cannot tell in either case whether the psychological treatment, or the NRT, or both, were effective, these two studies make a strong case for offering NRT when administering psychological interventions.

The third research question – are psychological interventions combined with pharmacotherapy more effective than psychological interventions alone? – was addressed in a

series of studies by Evins and colleagues. They showed that CBT plus Bupropion is more effective in reducing smoking than CBT alone (Evins et al., 2001; 2005; 2007), and that CBT with Varenicline effectively reduces relapse (Evins et al., 2014).

The fourth research question concerned which psychological interventions are most effective, and was directly addressed in five studies. Four reported equal effectiveness (Baker et al., 2015; Steinberg, 2003; Steinberg et al., 2016; Williams et al., 2010). Although George et al. (2000) reported that general behavioural therapy was somewhat more effective than specialised behavioural therapy, most of the evidence indicates that the different types of psychological intervention are approximately equally effective. Whether interventions incorporate MI, CBT, personalised feedback, psychoeducation, behavioural counselling or medication management, the evidence suggests that they all increase the likelihood of smoking reduction or abstinence in patients with mental health problems.

Perhaps this indicates a Hawthorne effect such that any intervention of any form is effective. A more optimistic explanation is that the feature that all these therapies have in common – namely, talking and thinking with skilled and supportive clinicians about smoking and its consequences – is equally effective, regardless of how it is structured and implemented. This explanation is consistent with the ‘common factor theory’, according to which different psychotherapy approaches have similar benefits because of the core ingredients they share: the formation of an alliance between therapist and patient; the creation of expectations through explanation of a problem and the treatment involved; and the consensus about health behaviours that patients are likely to adopt (Imel & Wampold, 2008; Wampold, 2015).

CBT, MI, behavioural counselling, personalised feedback and monitoring are examples of effective interventions in the reviewed trials that share these core psychotherapeutic ingredients, in particular the formation of an alliance between therapist and patient. This was

also reflected in Steinberg et al.'s (2016) trial, which indicated a positive association between patients' rating of their alliance with their therapist – through the client version of the Working Alliance Inventory (WAI-C) – and their reported motivation to quit, irrespective of intervention type. Nevertheless, the designs of the reviewed studies do not allow us to disentangle the effects of the different psychotherapeutic ingredients for smoking cessation in this group of patients and so this interpretation can only be tentative.

Our findings also provide some evidence of a strong dose-response relationship. Baker et al. (2015) and Williams et al. (2010) found better attendance leading to higher rates of abstinence and smoking reduction in all four of the conditions they reported. This evidence supports the view that psychological interventions are effective, although it might also be explained by better-motivated patients being those who are most likely to attend sessions and to succeed in quitting smoking. The initial evidence from three of the reviewed studies, which measured patient readiness to change and motivation to quit smoking (Prochaska et al., 2014; Steinberg, 2003; Steinberg et al., 2016), suggests that both are good predictors of engagement with smoking cessation interventions. It is also worth noting that one study indicated that psychological interventions can be effective even when patients score low on the readiness to change scale; Prochaska et al., (2014) reported that although at the start of their trial very few participants were ready and intended to quit smoking, abstinence increased during the intervention, indicating engagement in the quitting process.

It is also noticeable that in these three studies, interventions included small numbers of short sessions. For example, in Steinberg et al. (2016) participants had only one 45-minute session of either MI or interactive education. Had these interventions been more intense, over a longer period, then it is possible that they would have proven more effective. In contrast, Williams et al. (2010) administered 24 45-minute sessions to one of their behavioural

counselling conditions (TANS), compared with nine 20-minute sessions to their other (MM) group, but found them to be equally effective.

A similar point is that in some studies psychological interventions were administered to groups and in others to individuals. Further research is required to assess the relative clinical- and cost-effectiveness of these interventions according both to dosage (intensity and duration) and to mode of administration (to groups or individuals).

The fifth research question concerned the impact of interventions on clinical symptoms. The evidence reviewed here does not support the presumption made by some healthcare professionals that smoking cessation interventions may have adverse effects on the psychological state of smokers with mental health problems. On the contrary, most reviewed interventions resulted in either no change, or improvement in psychiatric symptoms. This is consistent with evidence from Peckham et al. (2017) and Taylor et al. (2014), both of which indicated that smoking cessation in people with severe mental health problems is associated with a significant reduction in adverse mental health symptoms and improvements in depression, positive affect, and quality of life. It is also consistent with evidence from the general population, in which smoking cessation is associated with improved mental health (Taylor et al., 2014).

Limitations and future research. Of the 13 studies, only two (Baker et al., 2006; Prochaska et al., 2014) were judged to have a low risk of bias overall. This point further reduces confidence in the findings of the remaining studies, and hence in our ability to draw clear and definitive conclusions regarding the answers to all research questions except the second (the effectiveness of psychological interventions combined with NRT), which both studies with low risk of bias addressed.

A second limitation is that there is too little evidence available to compare the effectiveness of interventions across mental health diagnoses that vary in nature and severity.

The reviewed studies did not provide such direct comparisons. However, we can be confident that the generally positive outcomes of psychological interventions apply at least to smokers with schizophrenia and / or schizoaffective disorder and bipolar disorder. This is because all 13 studies included participants with schizophrenia and / or schizoaffective disorder, and five also included participants with bipolar disorder. Only one study (Morris et al., 2011) included smokers with depression or anxiety (who made up approximately 50% of the sample) in addition to smokers with schizophrenia or bipolar disorder.

In this review, Morris et al.'s results were compared with those reported by Steinberg (2003) and Gilbody et al. (2015) because all three studies addressed the first of the research questions. Steinberg's and Gilbody et al.'s samples included smokers with schizophrenia or schizoaffective disorder, and Gilbody et al.'s also included patients with bipolar disorder. While direct comparisons of the studies' results are difficult because different outcome measures were recorded at different times, all three studies demonstrated reductions in smoking in the short and / or medium term in the intervention groups, suggesting that the participants' different diagnoses are unlikely to have had a great impact on the findings. Nonetheless, it is possible that smokers with schizophrenia are best treated using one type of intervention, and those with depression or anxiety using another. The heterogeneity of diagnoses and needs of people with mental health problems, and its implications for smoking cessation programmes, remain key issues for future investigation.

Third, the heterogeneity of the included studies in terms of type, duration and intensity of intervention, participant diagnoses, where participants were recruited from (i.e., inpatients or outpatients), and outcome measures, mean that meta-analysis or even meaningful statistical comparison between studies of intervention effectiveness is not yet possible given the available evidence. The result is that sample sizes are limited to those of individual

studies, and that therefore our conclusions should only be generalized to other populations and settings with particular caution.

Future researchers are encouraged to help address each of these points, and in particular to design properly controlled experiments that enable us to assess the independent effectiveness of psychological interventions in this population. Other important questions that cannot yet be answered given the available evidence concern the relative effectiveness of interventions according to who they are delivered by (e.g., psychologists, psychiatrists, or other health care professionals), how they are delivered (e.g., to groups or individuals, in clinical settings or at home, face-to-face or by phone), and to whom (according to type and severity of diagnosis).

Conclusion. The available evidence is consistent with a range of psychological treatments of smoking by people with mental health problems being independently effective. But much of this evidence is circumstantial, and only one of the 13 studies reviewed here addressed this issue directly. Our understanding of which of these treatments are effective, how they should be administered, and to which mental health populations, remains poor. Considering the implications for the wellbeing of the high proportions of smokers with mental health problems, further research – in the form of properly designed RCTs – is urgently required.

However, there is good evidence that some psychological interventions are effective when used in combination with NRT or pharmacotherapy. Effective interventions probably include CBT, MI, behavioural counselling, personalised feedback and monitoring, and the available evidence suggests approximately equal effectiveness. A key psychotherapeutic ingredient might be the formation of an alliance between therapist and patient. It is also clear that there is a strong dose-response relationship: increased attendance predicts improved outcomes, although telephone-based and relatively brief interventions seem to be as effective

as more intense and longer-term ones. We can be confident, too, that there are few negative psychological or physical side-effects of these treatments. On the contrary, these must be weighed against the reports of positive side-effects plus, of course, the unquestionable benefits to the short- and long-term wellbeing accrued by almost everyone from reducing or quitting smoking.

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Table 1: Risk of bias for included studies

Author	Risk of bias domains							Overall risk
	Randomisation	Allocation concealment	Blinding of Ps	Blinding of outcomes	Incomplete outcome data	Selective outcome reporting	Other bias	
Baker et al. (2006)	Low	Low	Low	Low	Low	Low	Low	Low
Baker et al. (2015)	Low	Unclear	High	Low	High	Low	Low	High
Evins et al. (2001)	Unclear	Unclear	Low	Unclear	Low	Low	High	High
Evins et al. (2005)	Unclear	Unclear	Low	Unclear	Low	Low	Unclear	Unclear
Evins et al. (2007)	Unclear	Unclear	Low	Low	Low	Low	Low	Unclear
Evins et al. (2014)	Low	Low	Unclear	Low	Low	Low	Low	Unclear
George et al. (2000)	High	High	Unclear	Unclear	Low	Low	Unclear	High
Gilbody et al. (2015)	Low	Low	High	High	Low	Low	Low	High
Morris et al. (2011)	Unclear	Unclear	Unclear	Unclear	High	Low	High	High
Prochaska et al. (2014)	Low	Low	Low	Low	Low	Low	Low	Low
Steinberg (2003)	Unclear	Unclear	Unclear	Low	Low	Low	Unclear	Unclear
Steinberg et al. (2016)	Low	Unclear	Unclear	Low	Low	Low	Unclear	Unclear
Williams et al. (2010)	Low	Unclear	High	Unclear	Low	Low	High	High

Table 2. Characteristics of included studies

Study ID	N	Country	Setting	Mental health diagnosis	Mean age years	Male %	White %	Baseline mean cigarettes/day
Baker et al. (2006)	298	AUS	Research centre, community clinics, and patients' homes	Non-acute psychotic disorder with >50% schizophrenia or schizoaffective disorder	37.2 ^a	52.0 ^a	NR	1: 31.0 2: 30.0
Baker et al. (2015)	235	AUS	Primary care and mental health centres	Schizophrenia spectrum or bipolar disorder	41.6 ^a	59.0 ^a	NR	1: 29.9 2: 27.2
Evins et al. (2001)	18	US	Urban community mental health centres	Schizophrenia	1: 42.7 2: 45.5	1: 55.6 2: 66.7	88.9 ^a	1: 30.0 2: 38.0
Evins et al. (2005)	53	US	Urban community mental health centres	Schizophrenia or schizoaffective disorder depressed type	1: 45.5 2: 46.0	1: 71.4 2: 76.0	NR	1: 25.4 2: 34.2
Evins et al. (2007)	51	US	Urban mental health centres	Schizophrenia	1: 43.6 2: 44.8	NR	NR	1: 24.7 2: 28.1
Evins et al. (2014)	87	US	Community mental health centres	Schizophrenia, schizoaffective disorder, or bipolar disorder	1: 45.7 2: 51.4	1: 66.0 2: 60.0	1: 72.0 2: 75.0	1: 22.1 2: 24.2
George et al. (2000)	45	US	NR	Schizophrenia, schizoaffective disorder	1: 36.6 2: 41.6	1: 70.6 2: 64.3	1: 58.8 2: 64.3	1: 29.7 2: 29.5
Gilbody et al. (2015)	97	UK	Primary care and mental health centres	Schizophrenia, schizoaffective disorder or bipolar disorder	1: 47.3 2: 46.4	1: 70.0 2: 51.0	NR	1: 26.5 2: 23.3
Morris et al. (2011)	123	US	Urban and rural community mental health centres	Schizophrenia, bipolar disorder, depression, anxiety, other	43.0 ^a	1: 41.0 2: 42.0	1: 77.0 2: 85.0	1: 19.8 2: 21.0
Prochaska et al. (2014)	224	US	Secure acute psychiatric centre	Schizophrenia spectrum disorder, unipolar and bipolar disorder	1: 39.9 2: 39.9	1: 55.8 2: 64.0	1: 65.5 2: 64.9	1: 18.9 2: 19.0
Steinberg (2003)	78	US	Outpatient centres	Schizophrenia, schizoaffective disorder	43.8 ^a	68.0 ^a	77.0 ^a	26.5 ^a
Steinberg et al. (2016)	101	US	NR	Schizophrenia, schizoaffective disorder, bipolar disorder	1: 42.6 2: 43.5	1: 55.0 2: 57.0	1: 59.0 2: 63.0	1: 18.3 2: 21.3
Williams et al. (2010)	87	US	Outpatient mental health facilities	Schizophrenia, schizoaffective disorder	1: 43.5 2: 47.1	1: 64.4 2: 61.9	1: 64.4 2: 66.7	1: 22.5 2: 22.5
Total for all studies	1497	77% US	69% community mental health centres	All studies: schizophrenia and schizoaffective disorder; 46% also bipolar disorder	43.6	60.6	70.1	25.7

NR. Not reported; ^aInformation available for the whole sample only

Table 3. Summary of results

Study ID	RQ	Condition 1, 2, 3	n	Frequency (duration) etc.	Continuous abstinence %				7-day point prevalence %				Reduction from baseline (% >50% or mean no. cigarettes, <i>italics</i>)				
					Week	Con 1	Con 2	<i>p</i>	Week	Con 1	Con 2	<i>p</i>	Week	Con 1	Con 2	Con 3	<i>p</i>
Baker et al. (2006)	2	1: MI + CBT + NRT + as control 2: Control - treatment as usual + smoking cessation booklets	147	1: 8x1-hour individual (10wks)	12	10.9	4.0	1vs2 =.02	12	15.0	6.0	1vs2 =.01	12	43.5	16.6		1vs2 <.001
			151		24	5.4	2.0	1vs2 =.11	24	9.5	4.0	1vs2 =.06	24	29.9	18.5		1vs2 =.02
					52	3.4	0.7	1vs2 =.09	52	10.9	6.6	1vs2 =.19	52	31.3	17.9		1vs2 =.007
Baker et al. (2015)	4	1: 'Healthy lifestyles' (MI + CBT + CR) + NRT 2: Telephone monitoring + NRT	122	1: 17x90-min face-to-face 2: 1x90-min face-to-face 16x10-min phone calls	NR	NR	NR	NR	15	11.0	12.0	1vs2 NS	15	31.0	42.0		1vs2 = .099
			113		NR	NR	NR	NR	52	6.6	6.2	1vs2 NS	52	16.0	19.0		1vs2 NS
									15	49.5	50.4		15	49.5	50.4		1: <.001; 2: <.001; 1vs2 NS
																1: <.001; 2: <.001; 1vs2 NS	
Evins et al. (2001)	3	1: CBT + Bupropion SR 150 mg/d 2: CBT + placebo	9 9	1 & 2: 9x1-hour group (9wks)	NR	NR	NR	NR	4 ^a 24 ^a	33.3 11.1	11.1 2.0	NR NR	12 24	66.7 33.3	11.1 11.1		NR NR
Evins et al. (2005)	3	1: CBT + Bupropion SR 300 mg/d 2: CBT + placebo	25 28	1 & 2: 12x1-hour group (12wks)	NR	NR	NR	NR	5 14 12 ^b	36.0 8.0 16.0	7.0 3.6 0	1vs2 =.016 1vs2 NS 1vs2 =.04	4-12 14 18 24	48.2 74.0 42.4 14.6	40.0 50.8 36.2 23.6		1: NR; 2: NR; 1vs2 =.002 1: NR; 2: NR; 1vs2 =.018 1: NR; 2: NR; 1vs2 NS 1: NR; 2: NR; 1vs2 NS
Evins et al. (2007)	3	1: CBT + NRT + Bupropion SR 150mg/d 2: CBT + NRT + placebo	25 26	1 & 2: 12x1-hour group (12wks)	NR	NR	NR	NR	8 12 24 52	52.0 36.0 20.0 12.0	19 19 8 8	1vs2 =.014 1vs2 NS 1vs2 NS 1vs2 NS	4-12 4-24	74.7 33.8	44.5 11.7		1: <.05; 2: <.05; 1vs2 NR 1: <.05; 2: NS; 1vs2 NR
Evins et al. (2014)	3	1: CBT + Varenicline 2: CBT + placebo	40 47	1 & 2: (52 wks) 12x1-hr cessation group 15x1-hr relapse prevention group	12-52 12-64 12-76	45 40 30	14.9 10.6 10.6	1vs2 =.004 1vs2 =.003 1vs2 =.03	52 64	60.0 45.0	19.2 12.7	1vs2 =.001 1vs2 =.002	NR	NR	NR		NR
George et al. (2000)	4	1: Group behavioural therapy + supportive counselling + NRT 2: Specialized schizophrenia smoking cessation + NRT	17 28	1 & 2: 10x1-hour group (10wks)	12 24	35.3 17.6	35.7 10.7	1vs2 =.69 1vs2 =.03	NR	NR	NR	NR	NR	NR	NR		NR
Gilbody et al. (2015)	1	1: Bespoke smoking cessation + usual Care (SCIMITAR) 2: Control - usual care	46 51	1: 8-10x30-min individual 2: Advice on NHS smoking cessation services incl Quitline	52	36	23	1vs2 = .22	NR	NR	NR	NR	4 26 52	30.6 36.8 24.2	16.7 22.6 21.0		1: .001; 2: NS; 1vs2 <.001 1: <.001; 2: .04; 1vs2 <.001 1: .03; 2: .10; 1vs2 = .07
Morris et al. (2011)	1	1: Telephone Quitline + community counselling + NRT 2: Telephone Quitline + NRT	62 61	1: 5 phone calls + 10 group counselling (NR) 2: 5 phone calls (NR)	NR	NR	NR	NR	NR	NR	NR	NR	24 24	21.0 23.4	8.0 24.8		1vs2 =.045 1: <.01; 2: <.01; 1vs2 NS
Prochaska et al. (2014)	2	1: Motivation tobacco cessation treatment + NRT 2: Control - usual care	113 111	1: In-patient; 1 computer intervention + 1x15-30min, individual counselling Post hospital; 1 computer intervention at 3 & 6 mths	NR	NR	NR	NR	12 24 52 78 12-78	13.9 14.4 10.9 20.0	3.2 6.5 10.9 7.7	1vs2 =.003 1vs2 =.046 1vs2 =.087 1vs2 =.006 1vs2 =.018	NR	NR	NR		NR
Steinberg (2003)	1, 4	1: Brief MI 2: Psychoeducation (PE) 3: Control - advice on quitting	32 34 12	1 & 2: 1x40min; 2x15min + individual (4wks) 3: 1x5min, individual (1wk)	NR	NR	NR	NR	NR	NR	NR	NR	1 4	7.39 19.28	9.2 22.0	9.4 -0.31	1: NS; 2: NS; 3: NS 1vs2vs3 NS 1: <.05; 2: <.01; 3: NS 1vs2vs3 NS
Steinberg et al. (2016)	4	1: MI + personalized feedback 2: Interactive education (IE)	49 49	1 & 2: 1x45min, individual (1wk)	4	16.3	10.2	1vs2 =.37	NR	NR	NR	NR	NR	NR	NR		NR
Williams et al. (2010)	4	Behavioural counselling 1: Treatment of Addiction to Nicotine in Schizophrenia (TANS) + NRT 2: Medication Management + NRT	45 42	1: 24x45min, individual (26wks) 2: 9x20min, individual (26wks)	17 31 52	15.6 15.6 13.3	26.2 19.0 14.3	1vs2 =.22 1vs2 =.78 1vs2 =.90	NR	NR	NR	NR	17	46.7	46.7		1: <.001; 2: <.001 1vs2 NS

^aPoint prevalence period not reported; ^b4-week point prevalence; NS = non-significant; NR = not reported; RQ = Research Question (see narrative analysis)

MI = Motivational Interviews; CBT = Cognitive Behavioural Therapy; NRT = Nicotine Replacement Therapy; CR = Contingent Reinforcement

Figure 1. PRISMA Flow diagram summarising the results of the search

