Negative reinforcement explanation for smoking facilitate smoking cessation

The progress made towards answering this research question will now be considered by revisiting each of the studies in turn to summarise their main findings as well as to assess their strengths and limitations, along with suggestions for future work. The thesis will then be drawn to a close with some overall conclusions, suggestions for future research and a discussion of the role of theory in the current thesis.

Study 1: The association between smoking and quitting smoking outcome-related cognitions and abstinence: a systematic review.

Main findings:

The search strategy yielded 27 studies which included 173 relevant analyses.

Overall there was little evidence that either smoking or quitting smoking outcome-related cognitions were reliable predictors of abstinence.

In terms of the relative power of prediction between smoking and quitting smoking outcome-related cognitions, where significant associations were found, there was some evidence to suggest that abstinence was more often predicted by smoking-outcome related cognitions than by quitting smoking outcome-related cognitions.

There was some evidence to suggest that the outcome-related cognitions targeted by the negative reinforcement explanation for smoking were associated with abstinence from smoking. Along with addictive outcomes, smoking for negative reinforcement was the outcome most frequently associated with smoking.

None of the other outcome-related cognitions targeted by the explanation was found to be reliably associated with abstinence, although in some cases this was due to an absence of evidence rather than evidence of an absence of association.

Strengths:

A broad number of outcomes, for both smoking and quitting smoking, both positive and negative, and their association with abstinence following an attempt to quit smoking were identified.

The review used a stringent measure of abstinence from smoking, as included studies had to report associations between variables of interest and biochemically-validated smoking cessation.

All included research was based on a clinically-relevant and homogenous sample of smokers making an attempt to quit smoking, the vast majority of whom received some form of treatment.

Weaknesses

The primary weakness of the review was the heterogeneity of included variables originating from different theoretical positions, so it may have been inappropriate to combine them into a single review.

Restricting the review to published, peer-reviewed research only and the lack of a meta-analysis to determine the strength of association between the variables and interest and abstinence limited the robustness of the findings.

The choice of population may have been incorrect, as some theory suggests outcome-related cognitions may lose their predictive power in individuals who have already formed an intention to perform a behaviour.

Suggestions for future work:

The first recommendation would be for future studies to specifically address the association between smoking and quitting smoking outcome-related cognitions and abstinence.

Investigators studying these variables would be advised to include a measure of value in their assessments as generally speaking, motives, with an inherent assessment of value, were more frequently associated with abstinence than basic measures of beliefs or expectations.

Future studies on this topic could also be improved by increasing their length of follow-up, using the more stringent measure of continuous rather than point-prevalence abstinence and by improving the quality of reporting with complete reporting of all results, not just those which were significant.

Study 2: Development of a measure to assess acceptance of the negative reinforcement explanation for smoking.

Main findings:

Initial exploratory factor analyses (EFA) revealed that a five-factor solution corresponding to the five core points of the negative reinforcement explanation for smoking best described the data. The removal of poorly performing or overlapping items was used to create a shorter, 12-item form of the NRESS. EFA of the short form NRESS yielded three factors: a general factor combining an evaluation of and motivation for smoking (NRESS-GE);

an expectation of rapid recovery from dependence (NRESS-RE); and an evaluation of the ease of reinstatement of dependence following cessation (NRESS-EA).

This three-factor solution was verified in the second sample. Factors were validated with reference to criteria of concurrent and criterion-based validity. Internal consistency and test-retest reliabilities were satisfactory.

It did not prove possible to devise a measure to capture the cognitions representing Core Point 3 of the explanation as intended.

Strengths:

The strengths of the two studies described in this chapter include the use of separate populations for exploratory and confirmatory factor analyses, large sample size, evidence of content, construct and concurrent validity, and insights into the reliability of the measure.

Weaknesses:

The primary weakness of the studies is the potentially inappropriate choice of sample, given that the scale is to be used with a clinical population of smokers seeking treatment to aid cessation.

Also, the study failed to capture the cognitions representing Core Point 3 of the explanation: The subjectively experienced positive effects of smoking upon perceived stress, mood and concentration are primarily a misattribution of the relief of discomfort caused by falling blood nicotine levels or other neuro-adaptations caused by smoking. This may reflect an inability to adequately operationalise the cognitions, or the core point may

be too subtle or not meaningful for smokers and therefore may not comprise a core belief of the negative reinforcement explanation for smoking.

Suggestions for future work:

Future work is required to determine whether smokers differentiate between possible causes of the effects of smoking in the manner outlined by the negative reinforcement explanation for smoking.

Future studies may also consider whether the cognitions measured by the NRESS are associated with abstinence from smoking, or whether these variables are primarily reflections of nicotine dependence.

Study 3: Development and preliminary evaluation of a cognitive smoking cessation intervention aimed at communicating the negative reinforcement explanation for smoking

Main finding:

Results from the study suggested that the intervention designed to communicate the negative reinforcement explanation for smoking was highly acceptable to participants and was feasible to conduct as part of a one-hour specialist smoking cessation clinic session.

Strengths:

The design of the intervention was guided by a theoretical model of communication which evidence has shown is suitable for changing beliefs such as outcome expectations.

Evidence was sought not just for the potential effectiveness of the intervention but also for important process variables, acceptability to participants and feasibility of implementation, both of which are important considerations for novel, pilot interventions.

Weakness:

It may have been advisable to run further pilots before proceeding to a larger-scale trial in order to further refine both experimental and control interventions and other aspects of the trial procedure.

Suggestion for future work:

Future studies should aim to formally evaluate the effectiveness of the intervention using an increased sample size based on a power calculation informed by previous research.

Study 4: Evaluation of a cognitive smoking cessation intervention aimed at communicating the negative reinforcement explanation for smoking: a cluster-randomised controlled trial

Main findings:

The intervention aimed at communicating the negative reinforcement explanation for smoking, offered as an adjunct to standard care, failed to significantly alter smokers' targeted cognitions or lead to a reduction in urges to smoke.

Some evidence of a small effect was found, however, on lowering both positive outcome expectations for the benefits of smoking (d= 0. 20) and post-cessation urges to smoke (d= 0. 21 for the total sample, d= 0. 26 for

the abstinent sample), although calculated significance values indicated a strong probability that the detected effects were due to chance.

Strengths:

The trial was pragmatic, testing the potential impact of the intervention alongside existing evidence-based treatments in a clinical setting. The trial population comprised a diverse sample of dependent smokers seeking treatment for smoking cessation.

The trial was methodically rigorous, although there is a possibility that an insufficient sample size may have been targeted. The trial also had a clear theoretical rationale.

The intervention designed to communicate the negative reinforcement explanation for smoking was novel and theory based. Clear hypotheses were framed and tested. Furthermore, the intervention was designed according to theoretical principles (ELM) appropriate for the aims of the intervention, i. e. changing smokers' outcome-related cognitions.

Weaknesses:

The primary weakness of the current study was the insufficient sample size. The power calculation should have been based on a similar, less potent intervention.

Scale reliabilities for the shortened NRESS were poor.

It is possible that the wrong primary outcome was chosen and that a more cognitively derived assessment of smokers' urges to smoke should have been used.

Suggestions for future work:

Given the absence of an effect on targeted cognitions or urges to smoke, prior to any further work being conducted it is necessary to determine first, what role, if any, the cognitions targeted by the negative reinforcement explanation for smoking play in the prediction of urges to smoke and abstinence from smoking.

Even if evidence of a small potential benefit is found, further work to refine the intervention may be warranted, given the intervention can be delivered at low cost, proved easy to integrate into the standard group treatment run at the NHS specialist smoking cessation services and was well accepted by both clinicians and smokers, as was demonstrated by the pilot study presented in Chapter 5.

Study 5: Cognitive predictors of urges to smoke and abstinence from smoking.

Main findings:

There was no evidence that the core cognitions reflecting acceptance of the negative reinforcement explanation for smoking, as measured by the NRESS, were associated either with urges to smoke or with abstinence from smoking.

There was, however, evidence for an association between the cognitions primarily targeted by the explanation, namely positive outcome expectations

for the benefits of smoking and urges to smoke, in keeping with Social Cognitive Theory, the models of relapse to smoking outlined in Chapter 2 and the hypotheses of the cluster-randomised controlled trial outlined in Chapter 6.

Self-efficacy was the sole cognitive predictor of abstinence from smoking (at four weeks), and was also found to drive participants' ratings of positive outcome expectations for quitting. This finding suggests that it may be the most important cognitive determinant of behaviour in the current sample, i. e. dependent smokers seeking treatment for smoking cessation.

Strengths:

Not only were variables included in the analysis based on theory and evidence, but cognitive variables were entered into the regression after nicotine dependence and medication used during treatment which provided a robust test of the association between these cognitive variables and study outcomes.

The analyses also used prospective data and objective assessment of behaviour (CO-validated smoking cessation) meaning that robust conclusions of questions regarding causation and prediction could be found.

Weaknesses:

Overall, the reliability of the NRESS subscales was poor, prohibiting the use of T1 variables and necessitating evaluating NRESS-EA as individual items.

For the multiple regression analysis predicting urges to smoke, the sample size was lower than what has been recommended as a minimum

requirement to achieve valid results based on the number of variables included.

Suggestions for future work:

Although targeting positive outcome expectations for smoking in a sample of dependent smokers attempting cessation may be of little use in the short-term, there may be scope for an intervention targeting these variables to reduce rates of relapse by making smokers more satisfied with the outcomes afforded by quitting. Alternatively it might help smokers to ‘ recycle’ their quit attempt more rapidly. As well as further refining the intervention, future work could focus on investigating whether the intervention has beneficial effects, both in those who remain abstinent and those who fail to quit, across a longer follow-up period.

Future research could also investigate whether an intervention targeting positive outcome expectations for smoking is effective for those with lower levels of dependence on nicotine.

The theoretical context of the research presented in the current thesis

Social Cognitive Theory

Social Cognitive Theory (SCT) was chosen as the explanatory framework for the current thesis for two main reasons: first outcome expectations are prominent in the model, and these are similar to the smoking and quitting-smoking outcome related cognitions central to the negative reinforcement explanation; second, SCT has frequently been applied to research in drug

use including smoking, and features prominently in a number of models of smoking behaviour and relapse (e. g. Niaura, 2000; Marlatt, 1985).

Other theories or models of behaviour could also have been chosen, not least the Theory of Planned Behaviour described in Chapter 2 and Weiner's Attributional Theory (1985). This theory proposes that people tend to attribute causes to behaviours and occurrences along three dimensions: locus of causality (locus); stability and causality. The theory suggests that, depending on where a given causal attribution lies along the three dimensions, different outcomes can be expected. Causal attributions for illness have been associated with preventive health behaviours and even with health outcomes (Shiloh et al., 2002). As was mentioned in Chapter 7, nicotine dependence can be viewed as a chronic condition requiring ongoing care and long-term follow-up (Fiore et al., 2000). Therefore, as with other illnesses, it is possible that the beliefs people hold about the reasons or causes of their dependence, may impact on the outcome of an attempt to quit smoking, and therefore, accepting the negative reinforcement explanation for smoking could conceivably facilitate smoking cessation in this manner. For example, Wright et al. (2007) found that smokers who attributed their smoking to genetic factors had lower perceived behavioural control than those who saw genetic factors as playing no role, although these smokers did not subsequently have a significantly lower chance of quitting.

As it was beyond the scope of the current thesis to directly compare these models, it is impossible to say whether either of them would have provided a better or worse explanatory framework than Social Cognitive Theory. Given

the small, albeit non-significant, effect of the intervention on both positive outcome expectations for smoking and urges to smoke, as described in Chapter 6, and the subsequent association between these variables in the analyses described in Chapter 7, it can be claimed that Social Cognitive Theory provided a good framework for explaining the potential role of the negative reinforcement explanation for smoking to facilitating smoking cessation. Each of these findings was in line with study hypotheses.

Furthermore, although there was no subsequent association between abstinence and positive outcome expectations for smoking, or any of the outcome-related cognitions measured by the NRESS, there was an association between abstinence and self-efficacy. Through recourse to Social Cognitive Theory, conclusions with strong face validity were drawn based on the theorised relative importance of outcome expectations and self-efficacy in a population of dependent smokers attempting cessation. Bearing all this in mind, it must be considered that Social Cognitive Theory performed well as an explanatory framework.

The role of nicotine dependence

Two questions that have recurred throughout the current thesis remain unanswered: “ What is the relationship between cognitions and nicotine dependence?” and “ What is the relative importance of each in predicting smoking cessation?” A number of the findings reported in the systematic review, particularly regarding the outcomes associated with smoking, were incompatible with what would be expected by Social Cognitive Theory. Instead, findings suggested that it may ultimately be nicotine dependence determining the outcome of their attempt to quit smoking as opposed to

smokers' cognitions. Some of the findings in the questionnaire development studies detailed in Chapter 4 were also compatible with this hypothesis. These findings posit the question: are cognitions independent predictors of abstinence from smoking, as hypothesised in the current thesis, or ultimately, does level of dependence on nicotine determine abstinence, and are smokers' cognitions mere reflections of this dependence?

Whilst it could be suggested that, as was put forward in the previous chapter, the incongruent (as per Social Cognitive Theory) associations between smoking outcome-related cognitions and abstinence could be due to these being redundant predictors of abstinence in challenging situations, as quitting smoking is with those who are more dependent on nicotine. However, studies have also found an inverse relationship between self-efficacy and nicotine dependence (Berg et al., 2008b; John et al., 2004) and so it remains unclear, not only what is driving what, but also what is more important, first, in determining subsequent behaviour and second as a target for intervention. If nicotine dependence determines cognitions, then perhaps nicotine dependence is a more worthy target of intervention: the current focus in NHS specialist smoking cessation services.

Comprehensive theories of behaviour

Recently, West (2005) has developed a theory of motivation (PRIME theory) to serve as a basis for a comprehensive theory of addiction in order to explain how the multiple influences on behaviours such as smoking interact to determine behaviour. These multiple influences include, but are not limited to, nicotine dependence and cognitions such as self-efficacy and outcome-related cognitions.

The theory, along with other recent theories of behaviour such as Strack & Deutsch's (2004) Reflective-Impulse Model (RIM) represent an important development from rational, social cognitive models such as Social Cognitive Theory which assume that behaviour is the result of a deliberative appraisal process (Hoffman et al., 2009). These more recent theories move beyond these assumptions by outlining how behaviour is also driven by an impulsive system, which takes input from, amongst others, physiological processes such as nicotine dependence. As was mentioned in Chapter 2 the proportion of adults smoking in the population in the UK has remained unchanged at 22% in recent years following a period of gradual decline since the 1970s (UK National Statistics, 2009). The remaining population of smokers may have characteristics that are associated with smoking persistence and quit attempt failures (George & O'Malley, 2004), indicating that they may be more difficult to treat with existing approaches. These novel, more complex models of behaviour have great potential to determine the primary drivers of smoking behaviour as a basis for developing more effective smoking cessation interventions.

Concluding remarks

The body of research presented in the current thesis focused on answering a single research question: Does acceptance of the negative reinforcement explanation for smoking facilitate smoking cessation? Based on the studies presented to this point, the answer would appear to be that it does not, at least not in the circumstances of the trial described here, in a population of moderately dependent smokers, during the initial phase of quitting.

There may be some scope for an intervention aimed at communicating the negative reinforcement explanation for smoking to be effective if it can successfully decrease positive outcome expectations for the benefits of smoking. Whilst targeting these cognitions may make little difference in dependent smokers during the initial quitting phase, it remains possible that changing the way they perceive the benefits of smoking might help those with low levels of nicotine dependence to quit and more dependent smokers to maintain abstinence, once initial abstinence has been achieved, by making them more satisfied by the outcomes afforded by quitting.

Ultimately, however, any potential facilitating role for communicating the negative reinforcement explanation for smoking on abstinence from smoking must be viewed with scepticism. The evidence presented in this thesis not only suggests that the association between the outcome-related cognitions targeted by the explanation and abstinence is small, meaning that the potential benefit of an intervention that targets these cognitions is also likely to be small, but also that this type of intervention appears to be particularly unsuited to the target population of smokers. There are two reasons for this, first, their level of dependence on nicotine and resulting lack of control over their smoking is likely to make self-efficacy the cognition most worthy of target and second, due to the likely education level of attendees at the NHS specialist smoking cessation services, cognitive interventions in general are unlikely to be effective. It appears therefore, that withdrawal-oriented therapy, which uses nicotine replacement or other pharmacological treatment to ease withdrawal discomfort, and group processes to assist

people in remaining abstinent throughout the difficult initial period, as is currently offered through the NHS is a worthwhile strategy.

However, given the low success rate of even this approach, the apparent lack of applicability of social-cognitive models to the current context and the unclear relationship between nicotine dependence and social-cognitive variables such as self-efficacy (see above), and motives and outcome expectations for smoking (see Chapter 3), more comprehensive models of behaviour incorporating the influence of each are warranted and may help in the design of more effective interventions. This is likely to become increasingly important as the number of smokers in the population decreases, and remaining smokers become increasingly difficult to treat.