

**Preventing smoking among 9-10 year old
primary school children: evaluation of
SmokeFree Sports.**

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Abstract

Smoking in childhood is a predictive risk factor for smoking in later life and increases the likelihood of early mortality from smoking-related morbidities. Preventing the uptake of smoking in childhood is an important public health priority (Public Health England, 2014a). Evidence suggests physical activity participation may be protective against smoking uptake in children and thus physical activity is recommended as an active component for future smoking prevention efforts (Audrian-McGovern et al., 2013). Therefore SmokeFree Sports (SFS) was designed to explore whether physical activity could be used as a vehicle to prevent children within deprived neighbourhoods from starting to smoke. The research within this thesis forms part of a wider programme of research and evaluation of SFS. The aims of the research conducted within this thesis were to (1) explore the influence of social factors (mother, father, sibling and friend smoking) on preadolescent (aged 9-10) boys and girls cognitive vulnerability (e.g. smoking-related intentions, attitudes and refusal self-efficacy) towards smoking, (2) explore the feasibility and acceptability of SFS with primary school settings from the perspectives of children, teachers and coaches, and (3) examine the impact of SFS on preadolescents cognitive vulnerability towards smoking and explore perceived intervention impact from the perspectives of children, teachers and coaches. To address and answer the research questions within this thesis a mixed-methodological approach was undertaken.

In 2012, a cross-sectional study involving 43 primary schools in Merseyside, England was conducted to explore the influence of social factors on preadolescent boys and girls cognitive vulnerability towards smoking (n

=1143; 50.7% girls; 85.6% White British). Children completed a questionnaire that assessed their smoking-related behaviour, intentions, attitudes, and refusal self-efficacy, as well as parent, sibling and friend smoking. Data were analysed using multilevel linear and logistic regression models, adjusting for individual cognitions, school and deprivation level. Findings showed that social factors were associated with children's cognitive vulnerability towards smoking, with the smoking behaviour of siblings and friends being identified as important influences. Further, whilst the majority of 9-10 year old children living in deprived communities had high non-smoking intentions and refusal self-efficacy, a substantial proportion displayed pro-smoking attitudes that could be addressed through smoking prevention efforts. Research suggests that physical activity participation is protective against youth smoking initiation (Audrian-McGovern et al., 2013) and increased smoking (Horn et al., 2013). Therefore, SFS, a UK multi-component initiative that aimed to deliver smoking prevention education to primary school children (aged 9-10 years) through the medium of sport and physical activity was developed and piloted in among 9-10 year old children in primary schools across Merseyside, England.

In the preliminary phase to piloting the city-wide SFS intervention, a formative study was employed in three primary schools situated in Liverpool City and North. Children received six weeks of coaching activities (football and dance) for two hours each week. Key messages surrounding the effects of smoking on health and sporting performance were incorporated into activity sessions. Children also received SFS branded materials, attended a

SFS launch and celebration event, and were encouraged to sign a pledge to be smoke free. In total, forty-five children (51% boys; 93% White British) participated in focus groups (n= 6 single sex and n= 3 mixed sex groups), and Year 5 teachers (n=3; 3 male) and SFS coaches (n=5; 3 male) participated in semi-structured interviews. Findings from this formative study revealed schools were a suitable setting to deliver SFS. Further, the use of physical activity as a mechanism to deliver smoking prevention education was considered acceptable by children, teachers and coaches but further modifications were made to ensure its acceptability and aid effectiveness for a larger SFS pilot study.

This formative study was therefore integral to the development of SFS pilot intervention which included compulsory and optional components delivered by multiple implementers, including SFS coaches and primary school teachers. In 2013, a non-randomised SFS controlled-trial was conducted among Year 5 children (n=972; 50.7% Female) in primary schools across Merseyside, England. Schools were clustered into intervention (n=32) and comparison groups (n=11). Outcome measures that were employed in the cross-sectional study (Study 1) were assessed again at post-intervention (2-weeks from intervention end) and again at follow-up (approx. 12 months post intervention). Quantitative findings indicated that the SFS intervention did not impact on children's non-smoking intentions, which remained high across both groups. However, qualitative data revealed that SFS reinforced children's opinions about smoking and made them more determined not to smoke. Further, children in the intervention schools displayed significantly

more negative attitudes towards smoking at post-intervention and at follow-up than those in the comparison group. Whilst no significant intervention effects were found for refusal self-efficacy at post-intervention, positive intervention effects were observed at follow-up. These findings may lend support for physical activity as one strategy for smoking prevention efforts targeted at preadolescent children residing in deprived neighbourhoods.

In summary, the research within this thesis examined the influence of social factors on preadolescent's cognitive vulnerability towards smoking, and explored the feasibility and acceptability of a novel smoking prevention intervention that used physical activity to deliver smoking education to UK primary school children, and examined its impact on preadolescent's smoking-related cognitions. Utilising physical activity to deliver smoking prevention education appears to work at least as well as smoking prevention delivered through class-based learning. Importantly, teachers and coaches viewed physical activity as an acceptable method to engage children in smoking prevention. Nevertheless, strategies to increase the sustainability of SFS and embed intervention components into the school curriculum require further investigation.

Publications, reports, conference and seminar outputs from the PhD

Scientific publications

McGee, CE, Trigwell, J, Fairclough, SJ, Murphy, RC, Porcellato, LA, Ussher, M, & Foweather, L. (2015). Influence of family and friends on preadolescent children's smoking-related cognitions: a cross-sectional study. *BMC Public Health*, 15;225 doi:10.1186/s12889-015-1513-z

McGee, CE, Trigwell, J, Fairclough, SJ, Murphy, RC, Porcellato, LA, Ussher, M, & Foweather, L. (2015) Impact of SmokeFree Sports on preadolescents smoking-related intentions, attitudes and refusal self-efficacy. [under review BMC Public Health]

Reports

Foweather L, Trigwell J and McGee CE (2013). SmokeFree Sports: Final Project Report. Liverpool: Liverpool John Moores University.

Trigwell J, McGee CE, and Foweather L (2013). SmokeFree Sports Project Report: Year 3: Liverpool: Liverpool John Moores University.

Trigwell J, McGee CE, Murphy R, Hilland T and Foweather L (2012). SmokeFree Sports Report: Year 2. Liverpool: Liverpool John Moores University.

Conference and seminar presentations

McGee CE, Trigwell J, Murphy RC, Fairclough SJ, Ussher M, Porcellato LA & Foweather L (2014). Evaluating the impact of SmokeFree Sports: a school-based physical activity smoking prevention intervention for primary school children. European Conference on Tobacco or Health, Istanbul, Turkey, 26-29th March 2014 [poster].

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Chapter 1

Introduction

Chapter 1

Introduction

1.1 Background information

Although the proportion of 8-15 year olds in the United Kingdom (UK) who have ever smoked has declined from 18.7% in 1997 to 6% in 2013 (Health Survey for England, 2014), around 207,000 start smoking every year (Hopkinson et al., 2013). Smoking poses many health risks, including various forms of cancer, cardiovascular disease and respiratory disease, and imposes a significant financial and social burden on society (Health and Social Care Information Centre, 2013). Therefore smoking prevention remains an important public health priority (Public Health England, 2014). Efforts to delay or prevent children from starting to smoke are needed because the earlier a child starts to smoke, the less likely they are to quit the habit as an adult, and the more likely they are to die prematurely from a smoking-related disease (Public Health England, 2013).

Factors associated with smoking uptake in children are varied and complex. These include having parents, siblings and or friends who smoke (Milton et al., 2004; Bricker et al., 2006; Leonardi-Bee et al., 2011), having positive attitudes towards smoking (Fuller, 2013), living in a low income household and residing in a socially deprived neighbourhood (Milton et al., 2008). Although smoking behaviour of preadolescent children is low (0.3% ever smoked at age 8-10 years) smoking patterns begin prior to experimentation with the development of attitudes and beliefs (Porcellato et al., 1999).

Smoking preferences can be indicated by children's intentions to engage in smoking (Andrews et al., 2003; Hampson et al., 2007; Andrews et al., 2008). According to the Theory of Planned Behaviour (TPB) (Ajzen, 1991), intentions are the result of a reasoned process influenced by an individual's smoking-related cognitions such as attitude (the overall evaluation of smoking) and self-efficacy efficacy expectations (a person's confidence in their ability to stay a non-smoker and to refuse a cigarette) (Ajzen, 1991; Topa & Mariano, 2010). However, little is known about the factors that influence smoking-related intentions and individual cognitions in primary school children.

Many authors postulate that smoking prevention interventions should prevent or delay smoking (Kelder et al., 1994), implying the need to target children between the ages of 9-12 (O'Loughlin et al., 1998; Hopfer et al., 2010). This is supported by the National Institute for Clinical Excellence (NICE, 2010) which stipulates that smoking prevention interventions would be most effective if started in primary school. Nevertheless, school-based prevention programmes have predominately targeted secondary school pupils (Thomas et al., 2013). Moreover, the available evidence-base for primary school smoking prevention interventions is largely non-UK, which limits their relevance to a UK setting.

1.2 The local context

The research reported in this thesis was conducted in Liverpool and Knowsley, two local authorities within the North West of England. According

to the Index of Multiple Deprivation (IMD, 2010), over half (52%) of the very highest IMD ranks (1%) are in the North West of England, with Liverpool being ranked the most deprived local authority, and Knowsley the fourth most deprived in England (Department for Communities and Local Government, 2011). Adult smoking prevalence in Liverpool (22.9%) and Knowsley (23.4%) is higher than the national average of 21% (Health & social Care Information Centre, 2013). These differences in prevalence rates may be explained by family socio-economic status and living in areas of social deprivation. Research has found higher rates of smoking prevalence among lower socio-economic groups (Hiscock et al., 2012) and among those residing in areas of social disadvantage (Kuipers et al., 2013).

Smoking has been identified as the biggest single cause of inequalities in death rates between the rich and poor, and accounts for over half of the difference in the risk of premature death between social classes (Jarvis & Wardle, 2006; Jha et al., 2006). In Liverpool there is considerable evidence of smoking related inequalities. Within some areas of the of Liverpool, smoking prevalence is 30% or more, whilst in other better off neighbourhoods prevalence can fall below 10% (Christakopoulou & Dawson, 2013). Health inequalities related to morbidities associated to smoking across Liverpool and Knowsley are also evident. Estimated levels of premature smoking-related deaths are significantly worse than the UK average in both Liverpool and Knowsley (Public Health England, 2013). Therefore, smoking prevention efforts in areas of deprivation are needed to reduce health inequalities associated with smoking.

Reducing smoking prevalence is a key priority in Liverpool and to achieve this goal, SmokeFree Liverpool, supported by the former Liverpool Primary Care Trust (PCT), Liverpool City Council (LCC) and cross-sectoral partnerships adopted a comprehensive approach to tobacco control to tackle smoking-related inequalities, reduce smoking-related priorities, protect children from tobacco, and enforce smoking-related legislation and restrict the supply of illicit tobacco (Christakopoulou & Dawson, 2013). SmokeFree Liverpool received international recognition from the World Health Organisation (2011) for its effective tobacco control strategies and interventions, as well as its influential role in pursuing comprehensive legislation (Christakopoulou & Dawson, 2013, World Health Organisation, 2011). Liverpool Public Health has identified that children and young people are the next generation at risk from initiating smoking and of becoming regular smokers (Liverpool Health and Well Being Strategy, 2012-2015). Prior 'SmokeFree Liverpool' initiatives that sought to protect children and young people from smoking have included 'SmokeFree kids', which campaigned to reduce children's exposure to second hand smoke, 'SmokeFree families', which aimed to reduce children's exposure to second hand smoke in the home, and 'SmokeFree movies', which campaigned to de-glamorise smoking by removing it from youth rated films.

1.3 SmokeFree Sports

The research undertaken within this thesis forms part of a wider programme of research and evaluation of SmokeFree Sports (SFS). SFS was a smoking prevention intervention for children and young people under the 'SmokeFree

Liverpool' umbrella and was managed by Liverpool John Moores University in partnership with Liverpool PCT and LCC. Established in October 2010, SFS aimed to use the power of physical activity to prevent smoking among children and young people. The project was conceived because an increasing number of studies (Audrian-McGovern et al., 2003; Rodriguez & McGovern, 2005; Kaczynski et al., 2008; Audrian-McGovern et al., 2013) have shown sport and or physical activity participation to be protective against smoking uptake among youth and recommended it as a strategy for smoking prevention among youth. Sport is recognised as an educational platform to deliver and support health promotion messages, disease prevention and control efforts (Eime et al., 2008; Priest et al., 2008; Almond et al., 2013; Geidne et al., 2013). Using participatory approaches for delivery such as active game-based learning and activities with sports coaches, sport-for-health programmes can transmit health promotion messages and positively shape attitudes (Dubey et al., 2014; Romeo-Veillia et al., 2014). The use of sport to deliver smoking education has been previously trialled in the US and Canada with initiatives such as Tobacco Free Sports (The US Centers for Disease Control and Prevention, 2007), Tobacco Free Athletes (www.tobaccofreemaine.org) and Play, Live, Be Tobacco Free (www.playlivebetobaccofree.ca). However, to the author's knowledge, SFS was the first programme in the UK to use physical activity as a vehicle to deliver smoking prevention education.

SFS was a multi-component physical activity intervention, aiming to prevent smoking among children and young people, and included three phases. The

intervention was designed in accordance with National Institute of Health and Clinical Excellence (NICE, 2008) guidance and the Medical Research Council (MRC, 2008) framework for developing and evaluating complex interventions. Phase one of SFS (February-June 2011) was a community feasibility trial and involved five youth club settings who received 12 weeks of coaching activities (dance, dodge-ball and boxing) delivered by trained sports coaches (Romeo-Velillia et al., 2014). A formative evaluation demonstrated that the campaign helped prevent children and young people from starting to smoke and had positive benefits on their attitudes and knowledge about smoking (Romeo-Velillia et al., 2014). However, coaches reported challenges associated with its delivery in youth club settings and recommended it was trialled in more structured settings such as schools. Therefore, in phase two of SFS (February-April 2012), a school-based feasibility study was conducted with 9-10 year old children in three primary schools within Liverpool City and North to inform the development and aid effectiveness of a city-wide implementation. The city-wide intervention was piloted across Liverpool between September 2012 and May 2013 and forms the third and final phase of SFS. This thesis is based on research conducted during phases 2 and 3 of SFS.

1.4 Introduction to studies

The focus of this thesis was to examine the social factors associated with children's smoking-related intentions, attitudes and refusal self-efficacy, to explore the acceptability and feasibility of SFS within primary school settings

and examine the impact and perceived impact of SFS on smoking-related intentions, attitudes and refusal self-efficacy among UK primary school children. This is the first UK smoking prevention intervention delivered in primary schools that has used physical activity as a vehicle to deliver smoking education messages. This research aims to fill the significant gap in the UK evidence base as well as produce recommendations for policy makers, practitioners and researchers. See figure 1.1 for the flow of studies through the thesis and how they relate to each other.

- **Study 1** will examine associations between mother, father, sibling and friend smoking and smoking-related intentions, attitudes and refusal self-efficacy among 9-10 year old primary school children.
- **Study 2** qualitatively explores the acceptability and feasibility of SFS within primary school settings from the perspectives of children, teachers and coaches.
- **Study 3** measures the impact of SFS on children's smoking-related intentions, attitudes and refusal self-efficacy. Qualitative data, collected through focus groups and semi-structured interviews with children, teachers and coaches, is used to extend quantitative findings and to determine the perceived impact of the SFS intervention.

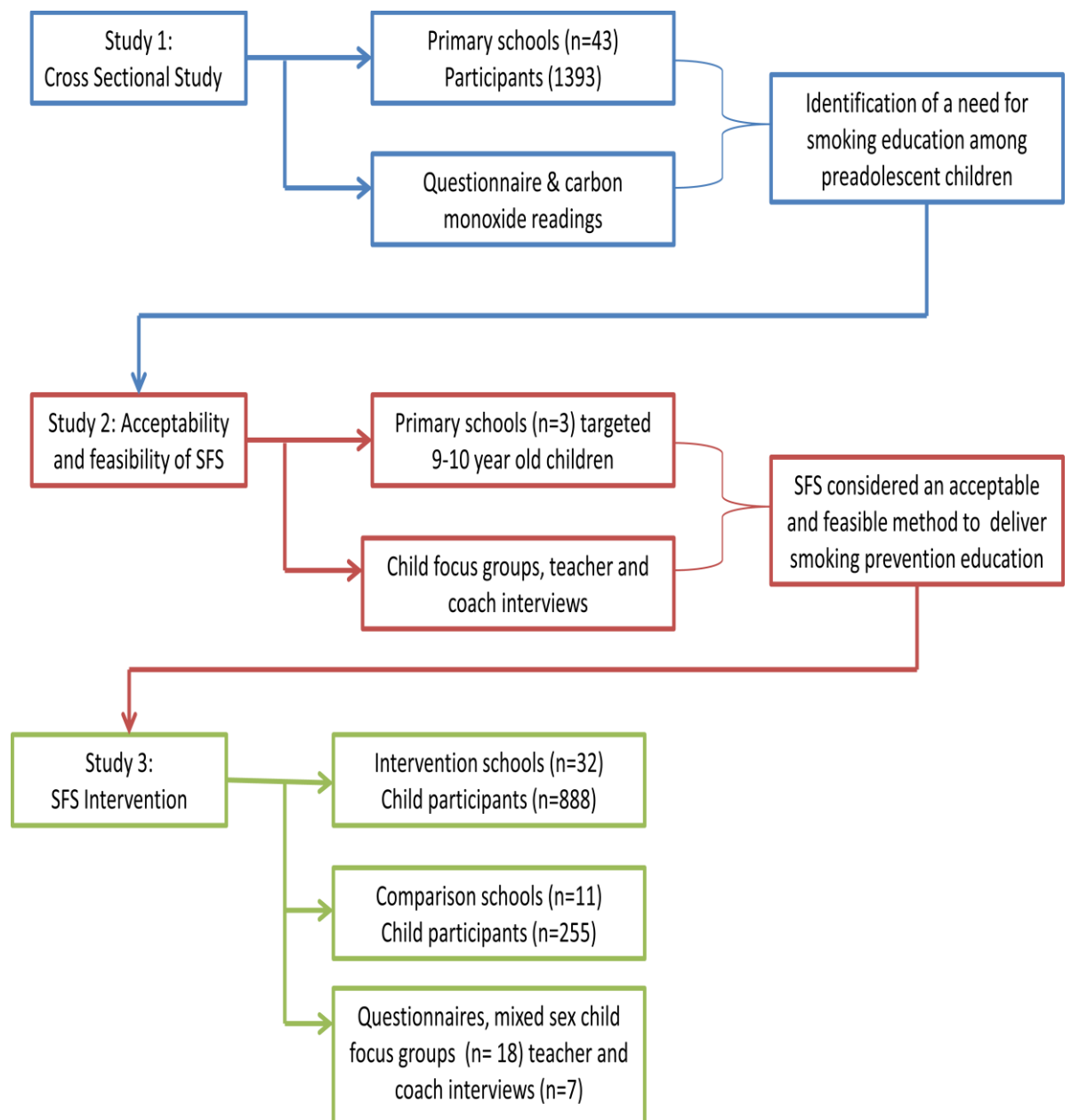


Figure 1 Flow of studies through the thesis

1.5 Structure of thesis

Chapter 2 (Literature Review) will set the scene with regards to the epidemiology of smoking and current policy, before outlining key theoretical concepts, evidence-based research related to school-based smoking prevention, physical activity as a mechanism for health promotion, and finishing with the aims and objectives of the thesis and the methodological approach. The overall research design is also outlined at the end of this chapter with more specific details of the research methods employed, described in relevant chapters. In **Chapter 3**, Study 1 is presented. This cross-sectional study aimed to examine the association between mother, father, sibling and friend smoking behaviours on children's smoking-related intentions, attitudes, and refusal self-efficacy. Study 2, reported in **Chapter 4**, set out to explore the acceptability and feasibility of the SFS intervention within a primary school setting from the perspectives of children, teachers and coaches as well as inform the development of a larger SFS definite trial. In **Chapter 5**, Study 3 presents an outcome evaluation of the SFS intervention using a mixed-methods approach to explore intervention impact and perceived intervention impact from the perspectives of children, teachers and coaches. **Chapter 6** provides a synthesis of the results from the three studies and provides recommendations for policy makers, practitioners and researchers.

1.5 Terminology

The terms 'children' and 'preadolescent' and 'adolescent' are used interchangeably within this thesis and generally refer to persons aged 16 and

under; 'children' refers to persons age 8 years and younger; 'preadolescents' refers to persons aged 9 to 12; and 'adolescents' refer to persons aged 13-16 years.

1.6 Thesis study map

Each study will begin with a thesis study map outlining the objectives and key findings of the studies. The purpose of this mapping exercise is to demonstrate where each study fits in to the overall thesis.

Chapter 2

Literature Review

Chapter 2

Literature Review

2.1 Smoking and health

Smoking is the single biggest behavioural risk factor for preventable illness and death in England (Healthy Lives, Healthy People, 2010). In 2013, 17% of all deaths of adults aged 35 and over were estimated to be caused by smoking (Health and Social Care Information Centre, 2014). Smoking cigarettes has been found to be associated with an increased risk of several cancers including lung, larynx, oesophagus, oral cavity and pharynx, bladder, pancreas, kidney, liver, stomach, bowel, cervix, leukaemia and ovarian cancers (www.cancerresearch.org). Further, smoking cigarettes increases the risk of respiratory (e.g. chronic obstructive lung disease), digestive (e.g. stomach and duodenal cancer) and circulatory diseases (e.g. Ischemic heart disease) (Health and Social Care Information Centre, 2014). The cost of smoking on the National Health Service (NHS) in England was estimated to be £5.2 billion in 2005-6 (Allender et al., 2009). According to research commissioned by ASH (action on Smoking and Health) the costs of smoking are much greater than just costs to the NHS, with the overall economic burden of smoking on society estimated to be £10.9 billion a year (ASH, 2014b).

Children who smoke are two to six times more susceptible to coughs and increased phlegm, wheeziness and shortness of breath than those who do not smoke (ASH, 2014). Further, smoking exacerbates asthma symptoms in

those already diagnosed, and increases the risk of asthma in children with no history of the condition (The Health and Social Care Information Centre, 2013). Early experimentation with smoking is highly predictive of regular smoking in adolescence (Gervais et al., 2006), as young people can show signs of nicotine dependence after just one puff on a cigarette (Fidler et al., 2006). The earlier a child begins to smoke, the less likely they are to quit the habit as an adult, and the more likely it is that they will die from a smoking-related disease (Royal College of Physicians, 2010).

2.2 Smoking prevalence

According to the Opinions and Lifestyle, Smoking Habits Amongst Adults Survey 2012 (Health and Social Care Information Centre, 2014), 20% of adults aged 16 and over were smokers in 2012, a rate that has remained largely unchanged in recent years, compared to 26% a decade earlier (Health and Social Care Information Centre, 2014). There is a clear social gradient in smoking rates among lower and higher socio-economic status groups; smoking rates are markedly higher among poorer people than among those who are better off. In 2012, 14% of men in higher managerial occupations smoked, compared with 33% in routine occupations (Health and Social Care Information Centre, 2014). According to the Health Survey for England (2014) smoking rates among 8-15 year old boys and girls have also substantially decreased between 1997 (boys 18% and girls 20%) and 2013 (boys 8% and girls 7%). In Liverpool, smoking prevalence among adults is estimated to be 25.4% (Chrisakopoulou & Dawson, 2013), which is higher than the national rate (Brown & West, 2014). Synthetic estimates report that

8.1% of males and 12.7% of females aged 15-16 years smoke in Liverpool (Beynon & Bellis, 2011), which is lower than the national average of 21% (Fuller, 2013). These differences in youth smoking prevalence may be attributable to SmokeFree Liverpool's provision of health promotion activities to reduce the numbers taking up smoking and specific actions to address second hand smoke (Christakopoulou & Dawson, 2013, World Health Organisation, 2011). Nevertheless, as smoking is an addiction largely taken up in childhood and adolescence, it is crucial to reduce the number of young people taking up smoking in the first place (Department of Health, 2011; Public Health England, 2014). Preventing children from starting to smoke is therefore important to avoid a lifetime of addiction, poor health, and social and economic consequences. One prevention strategy suggests starting smoking prevention programmes at primary school, before positive beliefs towards smoking are formed (NHS Centre for Reviews and Dissemination, 1999). Schools are already considered an effective setting for reaching large numbers of children and a focus on smoking prevention education fits naturally within their daily activities (Thomas et al., 2015).

2.3 The social patterning of smoking

Smoking is socially patterned with far higher prevalence in low socio-economic status groups (Laaksonen et al., 2005) and is the single biggest preventable cause of health-inequalities (Jha et al., 2006). Research suggests that children from less advantaged social and economic backgrounds are more likely to intend to smoke (Cremers et al., 2014) and

start smoking earlier than children from more affluent backgrounds (O'Loughlin et al., 1998). The relationship between smoking and social disadvantage for children is of particular significance because there are currently 3.5 million children living in poverty in the UK (Department for Work and Pensions, 2013). Under current government policies, child poverty is projected to increase from 2012/13 with an expected 600,000 more children living in poverty by 2015/16. This upward trend is expected to continue with 4.7 million children projected to be living in poverty by 2020 (Browne et al., 2013). Therefore, tobacco control initiatives should reflect the need to target socially deprived neighbourhoods with smoking prevention efforts as this could be a key strategy for reducing health inequalities related to smoking between deprived and non-deprived neighbourhoods (Kuipers et al., 2013).

2.4 Public health policy and guidance surrounding smoking prevention and cessation

Smoking prevalence is well established on the political agenda in the UK. The Government's tobacco control plan for England: '*Healthy Lives, Healthy People*' (Department of Health, 2011) has set out a framework for action at national, regional and local level, covering: stopping the promotion of tobacco, making tobacco less affordable, effective regulations, helping tobacco users quit, reducing exposure to second hand smoke, and effective communications. In this plan it also highlighted smoking as the single biggest cause of inequalities in death, and tackling tobacco use is central to achieving the Government's commitment to '*improve the health of the*

poorest, fastest' (Department of Health, 2011). It has set out three national 'ambitions' of reducing adult smoking prevalence from 21% to 18.5% by 2015, smoking rates among 15 year olds from 15% to 12% by 2015 and smoking in pregnancy from 14% to 11% by 2015 (Department of Health, 2011).

The Government suggests that local authorities can complement national action on legislation, regulation and taxation through; a) educating and informing people (especially children and young people about the risks of smoking, b) preventing access to illegal cigarettes and ensuring compliance with legislation on tobacco displays and c) ensuring there is access to local advice and services for those who want to quit (Department of Health, 2011). At a local level, 'SmokeFree Liverpool' was established in 2003 to take forward the objective of Liverpool First for Health Strategic Partnership to make Liverpool a smoke free city by 2008 (Christakopoulou & Dawson, 2013). Since then a number of programmes have been developed and implemented to prevent smoking uptake, reduce children's exposure to second hand smoke and reduce adult smoking prevalence through offering cessation services for those who want to quit (Christakopoulou & Dawson, J, 2013).

2.5 The development of smoking

Smoking patterns are described in a sequence of developmental stages influenced by multiple social, psychological and biological factors (Mayhew et

al., 2000). The first stage of smoking is described as the pre-contemplation stage. This is when children's attitudes, beliefs and intentions to smoke are formed and modified. At this point children, who are generally in their early years, have not started to think about smoking and as yet, are unaware of the positive aspects of starting to smoke. The second stage is known as contemplation or preparatory phase where children start to think about smoking, perceive some positive aspects of smoking (e.g., looking cool, tough and independent) and become aware of the social pressures to smoke which may come from role models in their social networks or the media. The third stage is the initiation phase, where children try smoking for the first time. At this stage, peers are likely to exert a stronger influence than parents. Early experimentation with cigarettes is often experienced as unpleasant, and may deter children from future smoking (Di Franzea et al., 2000; Urban & Sutfin, 2010). However, other children will persist and make the transition to the fourth stage that is described as the experimentation stage. During the experimentation stage repeated attempts of smoking are made. Children in this stage of smoking receive minimal pleasure from smoking, and are not yet fully committed to smoking in the future but still perceive positive aspects of smoking. Being part of a family where others smoke assists with ongoing access to cigarettes. In the fifth stage, adolescents progress to smoking on a regular basis. Smoking becomes more frequent and less sporadic. Some will smoke every weekend at parties or other gatherings and some will smoke most days of the week on the way to or from school. Not all smokers who have reached this stage will proceed to the next (Stanton et al., 1991; Goodard, 1992), where adolescents become established smokers and are

smoking daily or almost every day. In this stage adolescents are addicted and smoking cigarettes is perceived to fulfil a full range of psychological and physiological functions (Mayhew et al., 2000).

2.6 Behavioural antecedents

Smoking intentions

Intentions to smoke cigarettes (an individual's decision on whether to smoke in the future) has been found to be the most consistent predictor of smoking behaviour in children (Andrews et al., 2003; Conner et al., 2006; Hampson et al., 2007) and adolescents (de Vries et al., 1995; Choi et al., 2001). According to the Theory of Planned Behaviour (Ajzen, 1991), intentions are determined by attitudes (overall evaluation of the behaviour), subjective norms (perceived pressure from significant others to perform the behaviour) and perceived behavioural control, which is similar to Bandura's (1986) concept of self-efficacy. In a study among early adolescents, De Vries (1995) found that smoking-related cognitions (e.g. attitudes, self-efficacy) were largely exerted through intentions and intentions in turn, were most the most powerful predictor in explaining adolescents smoking behaviour. Since smoking prevalence of preadolescent children is low, smoking preferences can be indicated by measuring preadolescents' intentions to smoke (Conrad et al., 1992).

Smoking-related cognitions (attitudes, and refusal self-efficacy)

Attitudes are complex, multi-dimensional concepts, encompassing affective, behavioural and cognitive components (Rosenberg et al., 1960). The

affective component refers to the beliefs and ideas an individual has about or valuing of the object (e.g., good or bad). The behavioural component, sometimes called the conative aspect, refers to the way one behaves when exposed to an attitude object. In relation to smoking, children's beliefs and attitudes about smoking and smokers are learned through observing significant others in their social environment, such as parents, siblings and peers. Although children generally display negative attitudes towards smoking (Brook et al., 1999; Porcellato et al., 1999; Porcellato et al., 2005) their attitudes towards smoking become more favourable over time (Fuller et al., 2013). Having favourable attitudes about smoking is related to an increased risk of smoking uptake (Tyas & Pederson, 1998; Barber et al., 2005). Previous research has examined a broad range of beliefs to determine their influence on smoking initiation among children. These beliefs often span across a) perceptions of the costs and disadvantages smoking, b) perceived benefits of smoking or advantages of smoking, c) perceptions of social desirability of smoking and d) risks associated with smoking. For example, having the belief that smoking is dangerous, addictive, has a negative impact on health, and impacts on fitness have been found to reduce the likelihood of smoking uptake among children (Tyas & Pederson, 1999; Hrubá & Zaloudikova, 2008; Song et al., 2009). However, believing that smoking confers benefits such as helping to stay slim (particularly among girls), aiding relaxation, managing stress and alleviating boredom have been associated with smoking uptake in youth (Potter et al., 2004; Zapata et al. 2004; Mantler, 2012). Moreover, beliefs surrounding the social advantages of smoking have been linked to smoking uptake. For example, having the belief

that smokers are 'cool', (Watson et al., 2003; Mantler, 2012), that smoking among peers is common (Wang et al., 2011), and that peer and parents would approve of their smoking behaviour increases children's acceptability of smoking, thus increasing the likelihood of smoking initiation (Scalici & Schulz, 2014). Although children are generally aware of the risks associated with smoking (e.g., bad for health) they tend to underestimate the addictive nature of smoking and overestimate their ability to quit smoking if they started smoking (Grimshaw, 2003). A systematic review revealed that optimism and self-exempting beliefs about the likelihood of addiction, health risks, and consequences of smoking were associated with youth smoking behaviour (Mantler, 2012).

Refusal self-efficacy

Refusal self-efficacy refers to one's confidence in their ability to stay a non-smoker and the confidence to refuse a cigarette (de Vries et al., 1988; Engels et al., 1999). Self-efficacy has a central role in socio-cognitive theories including the theory of planned behaviour (Ajzen, 1991), and Bandura's (1986) social cognitive/ learning theory and have previously been used to explain smoking uptake in youth. Having low perceived refusal self-efficacy has been associated with a higher prevalence of smoking behaviour (Petraitis et al., 1995; Engels et al., 2005). Moreover, in a longitudinal study conducted by Hiemstra et al., (2011), decreases in children's refusal self-efficacy over time were found to be associated with adolescent smoking initiation.

2.7 Social influences on uptake of smoking in children

Smoking is a complex behaviour and previous smoking prevention research has primarily sought to identify predictors of smoking onset in children (Conrad et al., 1992). Social factors (parents, siblings and friends) have been identified as key influences on smoking uptake in children and adolescents (Wilkinson et al., 2008; Vitoria et al., 2009; Vitoria et al., 2011; Huang et al., 2013). The following section reviews the role that parents, siblings and friends play on children's smoking initiation and cognitive vulnerability towards smoking (e.g., intentions, attitudes and refusal self-efficacy).

Parents

Several studies have found parental smoking to be associated with higher rates of child and adolescent smoking initiation and escalation to regular smoking into adulthood (Bricker et al., 2006; Huang et al., 2013; Leonardi-Bee et al., 2011). Parental smoking and parental approval of smoking have also been associated with children and adolescents intentions to smoke (Vitoria et al., 2009; Scalici & Schulz, 2014). These associations may be related to a number of factors, including children observing and imitating the behaviour, beliefs, expectations and attitudes of their parents (Vitoria et al., 2011). Previous research with preadolescent children found that parental smoking was related to higher pro-smoking attitudes and norms (Wilkinson et al., 2008; Hiemstra et al., 2012). Similarly, Shuck et al. (2012) found parental smoking to be associated with more pro-smoking attitudes, perceived safety of casual smoking and temptation to smoke in response to smoking-related cues such as seeing someone smoke among a cohort of Dutch

preadolescent children (Schuck et al., 2012). Whilst parental smoking is consistently linked with higher rates of child and adolescent smoking initiation (Bricker et al., 2006), studies have shown that boys and girls may be influenced by these social factors differently (Liao et al., 2013). Gilman et al. (2009) found that the effects of parents smoking on offspring differed by sex, with a stronger effect for fathers' smoking on adolescent boys than girls (aged 12-17 years). Whereas, mother smoking has been associated with a greater influence on girls' smoking compared to boys (Sullivan et al., 2011). Whilst these studies demonstrate the influence of parental smoking on children's and adolescents smoking behaviour and smoking-related cognitions, there is a lack of research conducted among UK preadolescents. Further, little is known about whether mother or father smoking differently influences children's cognitive vulnerability to smoking.

Siblings

In addition to parental influences, sibling smoking has been found to be associated with early teenage smoking (Kelly et al., 2011) and escalation of regular smoking in adulthood (Leonardi-Bee et al., 2011). Since children have extensive social interaction with their siblings they may learn their behaviours through modelling the behaviour of their siblings (Bricker et al., 2006). Having a smoking sibling has also been found to be associated with preadolescent children perceiving more pros of smoking (Schuck et al., 2012), which may indirectly influence children's smoking uptake (Hiemstra et al., 2012). At present, limited research has examined the influence of sibling

smoking on children's smoking-related intentions, attitudes, and refusal self-efficacy, thus conclusions cannot be drawn about their influence.

Peers

'Peers' define a broad range of influential agents and include; classmates, friends, best friends, opposite or same sex friends, and boyfriends or girlfriends (Tyas & Pederson, 1998; p.413). For adolescents, peer influence is one of the strongest risk factors for smoking (Conrad et al., 1992; Buller et al., 2003). Smoking provides children with a common activity for bonding and breaking into new social situations (Walsh & Tzelepis, 2007). Peer smoking and friend offers to smoke have been found to predict various stages of the smoking trajectory including trial, experimentation and regular smoking (Flay et al., 1998). Peer smoking and the perception of peer norms have also been found to impact on adolescent's intentions to smoke and attitudes towards smoking (Vitoria et al., 2009; Zaleski & Aloise-Young, 2013; Saclici & Schulz, 2014). In a study of early adolescents (mean age 13 years) peers were found to influence girls smoking but not boys (Mercken et al., 2009), whereas others have found boys to be more strongly influenced by peers than girls (Urberg et al., 1991; Hoffman et al., 2006). Although previous research has primarily been conducted with adolescents, there is evidence to suggest that peers influence preadolescent's attitudes towards smoking (Schuck et al., 2012). However, little is known about the influence of peers on other smoking-related cognitions such as intentions and refusal self-efficacy among UK preadolescent children.

2.8 Conceptual theories

No single theory addresses all the complexities that comprise smoking behaviour, however, a number of concepts drawn from the psychological literature are helpful when planning work on behaviour change with individuals and can be used to structure and inform interventions (NICE, 2007). Some theories consider the behaviour of individuals within the context of their environment (Sallis et al., 2008). These models include the social cognitive theory (formerly known as the social learning theory) (Bandura, 1986) and ecological models (Sallis et al., 2008). Other models focus entirely on the individual, such as the Health Belief Model (Becker & Maiman, 1975) and the Theory of Planned Behaviour (Ajzen, 1991).

Social Cognitive Theory

The social cognitive theory postulates that personal factors, environmental factors and behaviour continuously interact (Bandura, 1986). The theory states that children's behaviour (e.g. smoking) may be directly acquired through modelling the behaviour of significant others (e.g., parents/friends). In addition, it is believed that outcome expectations and beliefs about the consequences of a behaviour (e.g., smoking) are formed in part from observing significant others modelling the behaviour.

Socio-ecological Model

Socio-ecological models recognise multiple levels of influence on behaviour, often including intrapersonal (knowledge, attitudes and beliefs), interpersonal (family, friends, peers), institutional (rules, regulations, informal structures),

community (formal and informal social networks, norms, and standards) and policy (laws that regulate or support healthy actions) (Sallis & Owen, 1997). A socio-ecological approach to smoking prevention in children asserts that continuous interactions take place between the child and their environment (Corbett, 2001). Child smoking initiation, addiction and maintenance are influenced by micro-level and macro-level factors that operate independently and synergistically (Corbett, 2001). The socio-ecological framework of health promotion posits that public health interventions implemented within and across multiple levels can have greater impact and create sustainable change than interventions focusing only on one level (Crozier & Miner, 2004; Kok et al., 2008). To address the phenomenon of childhood smoking prevention approaches need to focus on broad, distal level influences (e.g., social environment, peer groups and family processes) as well as micro-level influences such as individual traits, physiological responses, and psychological responses (Turner et al, 2004). Social ecological approaches are considered a useful framework for smoking prevention in children (Corbett et al., 2001).

The Health Belief Model

The Health Belief Model (HBM) focuses on the attitudes and beliefs of individuals (National Cancer Institute, 2005). A key feature of the HBM is that people have choices and are capable, when provided with information, of making informed decisions about their health (National Cancer Institute, 2005). The HBM is based on the premise that an individual will take a health-related action if they believe: (1) they are susceptible to a condition, (2) that

the condition would have serious consequences, (3) that taking action will help reduce their susceptibility to the condition, (4) that the benefits of taking action outweigh the costs and (5) they are confident that they can successfully perform an action (National Cancer Institute, 2005). In relation to smoking prevention, the HBM would predict a child would not start smoking (or helping those who do smoke do to quit) if their preference was to avoid the short-term effects of smoking (e.g., yellow fingers, stained teeth) or longer-term effects (e.g., lung cancer, heart disease), if they thought themselves to be susceptible to these effects, and if they believed not smoking would help them achieve this goal.

Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) is a framework used to understand factors that influence health behaviours. The TPB asserts that behaviour is determined by intentions to engage in that behaviour and intention in turn, is determined by attitudes, subjective norms and perceived behavioural control. Attitude toward a given behaviour are conceptualised as the overall evaluation of the behaviour. Subjective norm, which is social in nature, is a person's perception of social pressure to perform or not to perform a given behaviour. Perceived behavioural control, which is similar to Bandura's (1986) concept of self-efficacy, represents a person's evaluation about the ease or difficulty of adopting the behaviour. According to the TPB, a person is more likely to intend to perform a behaviour that he or she evaluates positively and believes significant others think they should engage in that behaviour. Although there is not always a perfect correspondence

between intentions and behaviour, a person will usually act in accordance with his or her intentions (Ajzen, 1991). This is supported by research on intentions and smoking behaviour among children (Andrews et al., 2003; McMillan et al., 2005; Hampson et al., 2007) and adolescents (Choi et al., 2001; Wakefield et al., 2004). The TPB is considered a useful theory when studying a behaviour that has not yet occurred (Ajzen, 1991). This theory has previously been utilised to examine smoking-related attitudes, beliefs, intentions, and behaviours among UK preadolescents (aged 11-12 years) (Higgins & Conner, 2003; Conner et al., 2006) and adolescents (aged 12-13 years) (McMillan et al., 2005) and is considered to be a sound framework to base future smoking prevention research (McMillan et al., 2005).

2.9 School-based smoking prevention interventions

Schools are considered an appropriate setting for smoking prevention because they can provide an efficient means of reaching large numbers of children (Wen et al., 2010) and provide an opportunity to 'set' healthy patterns of behaviour in childhood which may last throughout life (Pommier et al., 2010; Pearson et al., 2012). The effects of school-based smoking prevention interventions have been summarised in several systematic reviews (Wiehe et al., 2005; Flay et al., 2009). A recent Cochrane review on the effects of school-based smoking prevention programmes (Thomas et al., 2013) selected randomised controlled trials where students, classes, schools or school districts were randomised to intervention arms versus a control group, and followed up for at least 6 months. The school-based programmes

encompassed five types of intervention each based on a different theoretical orientation (information only, social competence, social influence, combined social competence and social influences and multi-modal programmes). One hundred and thirty-four studies met the inclusion criteria of the review, which revealed an overall significant effect on the onset of smoking at the longest follow-up (average 12% reduction in starting to smoke compared to the control groups). However, no overall effects on smoking behaviour were observed at follow-ups at 1 year or less (Thomas et al., 2013). Most major studies within the Cochrane review (Thomas et al., 2013) predominately included secondary school age pupils. Research, however, suggests that smoking prevention efforts may be better targeted at primary school children (Ausems et al., 2009; Hopfer et al., 2010; Crone et al., 2011) because smoking experimentation increases dramatically following the transition to secondary school (Fuller, 2013). Therefore, waiting until secondary school to intervene with smoking prevention can be too late, since by then adolescents may have developed deep-rooted smoking expectancies and norms (Stipek et al., 1999) and for some the behaviour is often underway (Fuller, 2013).

Children as young as four possess a fairly sophisticated understanding of the nature of smoking and believe non-smokers outlive smokers (Porcellato et al., 1999). Porcellato and colleagues postulate that smoking prevention education should be implemented to children (aged 4-7 years) during the early years of primary school. However, evidence regarding the most appropriate age to intervene with smoking prevention is mixed. Tobler et al. (2000) suggest that programmes implemented in the later development cycle

when children are in secondary school, when smoking is more prevalent, are more likely to show greater evidence of effectiveness. Others however, argue that prevention interventions demonstrate stronger effects on smoking behaviour and behavioural determinants when introduced among mid-to-late primary school children (Lloyd et al., 2000; Botvin et al., 2003; Hopfer et al., 2010). This is supported by the NICE guidance (2010) which stipulates that smoking prevention efforts would be most effective if started in primary school. In their guidance (NICE, 2010) on *school-based interventions to prevent smoking*, which is aimed at those responsible for preventing the uptake of smoking by children and young people under 19, five recommendations were given for school-based approaches:

1. The smoking policy should support both prevention and stop smoking activities and should apply to everyone using the premises (including the grounds).
2. Information on smoking should be integrated into the curriculum. For example, classroom discussions could be relevant when teaching biology, chemistry, citizenship and maths. Anti-smoking activities should be delivered as part of personal, social, health and economic (PHSE) and other activities related to Healthy Schools or Healthy Further Education status.
3. Anti-smoking activities should aim to develop decision-making skills and include strategies for enhancing self-esteem. Parents and carers should be encouraged to get involved and students could be trained to lead some of these programmes.

4. All staff involved in smoking prevention should be trained to do so.
5. Educational establishments should work in partnership with outside agencies to design, deliver, and monitor and evaluate smoking prevention activities.

Smoking Education in the UK National Curriculum

In the UK it is not mandatory to address smoking education in Key Stage 2 (pupils aged 7 to 11) of the National Curriculum (Department of Education, 2013), although it is at the schools discretion to include it within teaching personal, social, health and economic education (PSHE). However, PSHE, a non-statutory topic but a necessary part of primary school children's education is taught less and less in schools due to the demand from the Education Policy in England to maximise pupil's academic attainment (PSHE Association, 2013). This paucity in intervening with smoking prevention education in primary school may be related to school officials (and parents) concerns around programmes having an iatrogenic effect, and stimulating children's interest in and curiosity about smoking (Donovan, 2007). Another reason for the limited prevention interventions may be related to the potential negative labelling of schools, with head teachers fearing that the implementation of such programmes may be interpreted as the school having a smoking-related problem (Lloyd et al., 2000).

2.10 Evaluation of primary school interventions

This section will first outline measurement considerations concerning outcomes associated with smoking prevention before reviewing current

evidence for the effectiveness of school-based prevention interventions implemented among primary school children from the UK and elsewhere. Smoking prevention interventions that have been conducted in primary school that have measured both smoking behaviour and antecedents of behaviour will be reviewed. A comprehensive overview of evidence from primary school-based prevention interventions are provided in Evidence Tables 1, see Appendix 1.

Measurement of smoking prevention outcomes

To minimise measurement error it is important to determine if the measurement tools are valid and reliable (Field, 2013). Validity refers to whether a measurement tool actually measures what it sets out to measure and reliability reflects whether the measurement tool can be interpreted consistently across different situations (Field, 2013). School-based interventions where smoking behaviour is the primary outcome measure is typically assessed through self-reported questionnaires, with some using carbon monoxide breath reading or cotinine saliva samples to validate self-reports (Thomas et al., 2013). Smoking prevention interventions that seek to positively impact antecedents of smoking behaviour (e.g. intentions) typically use self-report questionnaires (Hopfer et al., 2010). Questionnaires are generally adapted from existing validated surveys previously used with same-age cohorts. For example, behavioural antecedents such as smoking-related intentions, knowledge and attitudes are often adapted from The Health Survey for England (2007) and or the Global Youth Tobacco Survey (2008). Further, to determine the internal reliability of questionnaire scale

items, Cronbach alpha is applied (Cronbach, 1951). Nevertheless, reliance on self-reported data may cause some measurement errors (i.e. socially desirable answers) but steps can be taken to avoid measurement error through guaranteeing participants confidentiality of responses and providing unique identification codes (Dolicini et al., 1996).

UK-based smoking prevention interventions

There are very few evaluations of primary school smoking prevention interventions that have been conducted in the UK. Where evaluations have been undertaken, they have largely focused on universal substance misuse programmes (cigarettes, alcohol and illegal drugs) and often report immediate intervention outcomes relating to smoking behaviour and or antecedents of behaviour (e.g., change in knowledge, attitudes, intentions and self-efficacy skills).

Project Charlie was implemented in three primary schools within inner city London, UK and targeted children (n=140) between the ages of 7 and 10 (Hurry & McGurk, 1997). Project Charlie was a broad classroom-based life skills programme, delivered by externally trained teachers, which aimed to prevent substance use (smoking, alcohol and other drugs) through focusing on peer selection, decision making, problem solving, self-esteem and providing information. The evaluation (Hurry et al., 2000) included a long-term follow-up of the primary school children who received the programme, to assess intervention impact on drug-related knowledge, attitudes, and behaviour on pupils when they reached secondary school (aged 13-14 years). Compared to children in the control group, Project Charlie children

were more able to resist peer pressure to use substances, had more negative attitudes towards substances and were less likely to have smoked cigarettes.

Starkey and Orme (2001) evaluated a Primary Drug Drama Project that involved an interactive drama production (delivered by actors) and workshop day for 10-11 year old primary school children. The programme aimed to make a positive contribution to each schools drug education programme and help pupils to explore attitudes and develop relevant skills (decision-making and ability to refuse peer pressure) and raise awareness of the consequences of different decisions. Findings from the 'draw and write' assessment activities revealed that the drama project was effective at increasing pupil's knowledge of specific drugs and decreasing stereotypical attitudes about drugs and drug users. However, findings should be interpreted with caution since teachers administered and collected questionnaires and evaluation tools (e.g. draws and write) among pupils. Backett-Milburn (1999) suggest that if a task is introduced by a classroom teacher, children may provide the information that they feel their teacher would want to see and consequently limit their responses to what they perceive to be socially desirable.

Smoking prevention interventions conducted outside of the UK

In total, 15 studies have evaluated the impact of school-based smoking prevention interventions among children aged 7-11; two studies focused on smoking behaviour outcomes (Storr et al., 2002; Wang et al., 2012); three interventions focused on smoking behaviour and antecedents of behaviour

(MaGahee et al., 2000; Botvin et al., 2003; Hanewinkel & Abhauer, 2004; Crone et al., 2011); eight studies addressed drug/substance use more broadly (e.g., cigarettes, smokeless tobacco and alcohol) and in combination with antecedents of behaviour (Chen & Lindsey, 2001; Ahmed et al., 2002; James & Chen, 2003; Hecht et al., 2008; Kupersmidt et al., 2010; Vincus et al., 2010; Andrews et al., 2011; Andrews et al., 2014; Isensee et al., 2014). These school-based prevention interventions varied in terms of content, duration and intensity and are discussed below.

A recent systematic review of US elementary school-based substance use prevention programmes relating to alcohol, tobacco, or other drugs (ATOD) (Hopfer et al., 2010) summarised the overall success in affecting substance use behaviours and related psychosocial factors (e.g., substance use attitudes, knowledge, perceptions of prevalence rates and resistance skills). Thirty published evaluation studies of twenty-four elementary school-based studies were reviewed which revealed 56% (n=15) of programmes significantly decreased ATOD experimentation. Most often prevention programmes demonstrated effects on increasing negative substance use attitudes, increasing knowledge, decreasing perceptions or prevalence rates, and improving resistance skills. Across the 30 evaluations, 19 studies (64%) conducted long-term follow-up assessments of 6 months or more after programme implementation.

Hanewinkel & Abhauer (2004) investigated the effectiveness of a teacher-led life skills approach to smoking prevention using a quasi-experimental control-group design. The aim of the programme was to promote fundamental social

competencies, coping skills and skills for resisting social influences to smoke. Children who received the intervention had increased levels of knowledge (OR=1.12, 95% CI 1.05-1.19, $p=.001$) and improvement in classroom atmosphere (OR= 1.24, 95% CI 1.01-1.51) than controls at follow-up (15 months post intervention). However, no significant differences were observed among the control and intervention groups for smoking-related susceptibility (a marker of intention), attitudes or consequences of smoking.

In the Netherlands, a cluster randomised controlled trial evaluated by Crone et al. (2011) examined the effects of a smoking prevention programme called 'But I don't smoke' which aimed to prevent children from starting smoking following the transition to secondary school. Overall the education programme had a limited effect at the end of elementary school. However, in the first year of secondary school (1 year after the intervention), intervention pupils were significantly less likely to smoke (OR=0.59, 95%CI 0.35 to 0.99), and had significantly greater intention not to smoke ($\beta=0.13$, 95% CI 0.01 to 0.24) than children in the control group. A sub-analysis of the secondary school data showed that these effects were only significant in girls, with female pupils in the intervention group significantly less inclined to start smoking ($\beta=0.21$, 95% CI 0.04 to 0.37) and to smoke (OR=0.44, 95% CI 0.24 to 0.81) than controls.

Summary of broader substance use prevention programmes

A US Drug Abuse Resistance Education (DARE) prevention curriculum adopted a social influence approach and specifically aimed to assist pupils in developing a skill set to prevent 10-12 year old children from substance use

(www.dare.com). Ringwalt et al. (1991) found the intervention had changed pupil's drug-related attitudes and their assertiveness but did not significantly influence lifetime involvement with cigarettes. In a later meta-analysis (West and O'Neal, 2004), DARE was considered ineffective in preventing alcohol, tobacco and illicit drug use among school-aged children. Given the lack of support from previous DARE evaluations on substance use outcomes, the curriculum received substantial revisions to promote active learning through enhancing student participation and was implemented in 17 US elementary schools to children aged 10-11 (Vincus et al., 2010). Similar to previous evaluations of DARE (Ringwalt et al., 1991; West & O'Neal, 2004), Vincus and Colleagues (2010) found no intervention effects on pupil's substance use outcomes (cigarettes, alcohol and marijuana) at one month following the final DARE lesson. However, the authors noted that pupil's baseline reports of lifetime cigarette and alcohol use differed markedly from the comparison to the intervention year and it is plausible that they masked other, unmeasured differences in the two cohorts that may have affected study outcomes (Vincus et al., 2010). It is recommended that interventionists who seek immediate or short-term effects should consider measuring antecedents of behaviour, while waiting for the results of longer-term follow-up on smoking behaviour (Andrews et al., 2011; Andrews et al., 2014).

In a randomised controlled trial, Botvin et al. (2003) evaluated the short-term effects (3 month follow-up) of an elementary version of the Life Skills Training intervention previously found to be effective in preventing adolescent substance use (Botvin et al., 2000). Children aged 8-11 years

were taught social resistance skills, general personal and social competence skills by trained teachers over three school years. The intervention aimed to affect substance use behaviour, attitudes, knowledge, and normative expectations. Compared to control pupils (who continued with their usual drug education), children who received the intervention reported higher anti-drinking attitudes, increased substance use knowledge and skills-related knowledge, lower normative expectations for smoking and alcohol use, and higher self-esteem.

Hecht et al. (2008) evaluated the immediate and short term effects of a 5th grade version of 'keeping it REAL', a universal prevention intervention that had previously been effective in reducing substance use among adolescents (Hecht et al., 2003). The aim of the teacher-led intervention was to enhance anti-drug expectancies, normative beliefs, refusal self-efficacy, decision making skills and resistance skills. Children in the intervention group received 10 lessons in grade 5 and two booster sessions in grade 6. Hecht and colleagues (2003) found the 5th grade curriculum to be no more effective than the control schools in changing pupil's refusal self-efficacy skills, substance use intentions, expectancies, normative beliefs or lifetime or recent substance use. The lack of intervention effects in this study may be in part attributable to the control schools receiving evidence based smoking prevention programmes during the intervention period, thus making it difficult to detect any changes on the outcome measures.

Andrews et al. (2011) investigated the short-term effectiveness of an ongoing computer-based substance use prevention intervention (delivered over two

school years) in a randomised controlled trial. The programme targeted etiological mechanisms that were predictive of future smoking including intentions and willingness to smoke and chew tobacco. At post-intervention, intentions and willingness to smoke and chew tobacco in the future significantly decreased compared to control pupils who continued with their usual tobacco prevention curriculum. The long-term effects of this computer-based intervention were evaluated by Andrews and colleagues (2014) when children were in grade 7 (two years following the grade 5th grade programme). Similar to the short-term findings reported by Andrews et al (2011), children in the intervention schools had lower intention and willingness to smoke and chew tobacco at the 2 year assessment than controls (Andrews et al., 2014).

Isensee et al. (2014) tested the effects of a two year teacher-led prevention programme based on the life skills approach and the social influence model on pupil's (mean age 10.37 years) smoking-related behaviour, attitudes, knowledge and refusal self-efficacy. Tobacco smoking at 6 month follow-up was lower in the intervention group compared to the controls (adjusted OR=0.63; 95% CI 0.41 to 0.96; p=0.026; p<0.05). Intervention participants had higher smoking related knowledge (adjusted β =9.38; 95% CI 6.73 to 12.04; p<0.001), greater change in attitudes towards a more critical perception of risks and disadvantages of smoking (adjusted β =0.10; 95% CI 0.03 to 0.16; p=0.002). However, no group differences were found for current smoking, perceived norms of smoking and self-efficacy to refuse cigarette offers. Finding no effect on current smoking may be explained by the young

age of the sample as very few pupils reported to smoking regularly. In addition, children in both groups considered themselves highly self-efficacious to resist cigarette offers at the outset of the study, decreasing the discriminative power of group comparisons. Further, the authors concluded that the possible null-effect for perceived norms may be due to the small part of the intervention (1 task out of 9) dealing with the topics of perceived norms.

2.11 Summary of school-based smoking prevention interventions

On the basis of these findings, it would appear that school-based smoking/substance use prevention can achieve a range of positive outcomes on behaviour and meaningful effects on antecedents of behaviour (e.g., intentions, attitudes, and refusal self-efficacy). Hopfer and colleagues (2010) concluded from their review that prevention interventions targeting precursors to smoking/substance use can be effective in bolstering protective factors and minimising risk factors. However, they also noted that researchers need to conduct longer-term evaluations of school-based prevention approaches implemented among primary school-aged children to determine the durability of programme effects (Hopfer et al., 2010).

Interventions that are underpinned by theories are useful since they can discern measurable intervention objectives and provide guidance for intervention strategies (MRC, 2008). Among the school-based studies, three focused on smoking prevention and antecedents of behaviour (McGahee et al., 2000; Hanewinkel & Abhauer, 2004; Crone et al., 2011) with the

remaining studies comprising of universal substance (alcohol, tobacco, marijuana, or other drugs) use prevention programmes. Interventions included a similar set of core curriculum components (e.g., information about smoking and substance use combined with interactive activities to increase knowledge, non-use intentions, and resilience skills). They used some form of multiple-session school curriculum that was underpinned by mechanisms derived from cognitive theories (e.g., Life Skills, Social Learning, Theory of Planned Behaviour), a trend that is similar to school-based smoking prevention interventions targeting adolescents (Thomas et al., 2013). Prevention programmes that adopt life skills, social influences, resistance skills or normative approaches have been found to be more effective than other approaches (e.g., multi-modal programmes and those with an information only approach). Programmes based on social competence (e.g. life skills) and social influences are considered the most effective in preventing or reducing smoking in adolescence (Thomas et al., 2013).

The prevention interventions reviewed were largely non-UK based and included a broad range of age groups. Prevention approaches started in first (n=2; aged 6-7) third (n=2; aged 8-9) fourth (n=1; aged 9-10) fifth (n=8; aged 10-11) or sixth grade (n=1; aged 11-12) and their duration varied from one day to three years. In a review of school-based prevention interventions, Stead & Angus (2004) concluded that there is no clear relationship between effectiveness and overall programme duration, intensity or number. However, evidence suggests that interventions that involve multiple sessions, with more intensive (longer) programmes associated with greater effectiveness

(Tobler et al., 2000; Botvin et al., 2003; Gottfredson et al., 2003). Further, some school-based studies included booster sessions (Crone et al., 2011; Andrews et al., 2011; Isensee et al., 2014) which may have enhanced the longevity of intervention effects (Botvin et al., 2003; Gottfredson & Wilson, 2003). The inclusion of booster sessions that are delivered months or years after the programme in order to repeat and refresh learned information have been assumed to be an important ingredient of effective programmes (Botvin et al., 2003; Gottfredson & Wilson, 2003) but the evidence is limited and inconsistent (Thomas et al., 2013).

Randomised controlled trials (RCT) are considered to be the 'gold standard' for evaluating interventions (MRC Guidance, 2014), but where an RCT is not feasible, effects may be captured through quasi-experimental methods (Handley et al., 2011). With respect to the design of interventions of the studies reviewed, six used random assignment experimental designs, three adopted a quasi-experimental design, five school-based studies acted as its own comparison group and one study did not include a control/comparison group. The three remaining studies included a longer-term follow-up of the latter studies (Hurry et al., 2000; Wang et al., 2012; Andrews et al., 2014). Some studies (Crone et al., 2011; Kupersmidt et al., 2014) conducted a power calculation and indicated that desired sample sizes were achieved. Research suggests that it is important to have adequate sample sizes, since it directly impacts the statistical power of the study (Thomas et al., 2013). Studies with an inadequate sample size increase the risk of drawing false-negative conclusions (Type II error) (Thomas et al., 2013), however most

school-based studies reviewed (13 out of 19) comprised of relatively large sample sizes (≥ 500 participants). Further, the majority of studies ($n=9$) randomised or assigned schools/classes rather than individuals to intervention conditions, although where schools/classes were assigned to different conditions observations were made on individual students ($n=3$).

Monitoring the implementation of any health programme is extremely important to avoid Type III errors (evaluating an intervention that was inadequately implemented) (Basch et al., 1985). Process evaluation measures in the school-based studies (Botvin et al., 2003; Hanewinkel & Abhauer, 2004; Kupersmidt et al., 2010) were limited to fidelity and dose of intervention implementation. More attention should therefore be given to process evaluation when evaluating future interventions and researchers should consider using the UK Medical Research Council guidance (2014) when developing and evaluating complex interventions. Another common limitation in the design of the school-based studies was that few had a long-term follow-up (Hurry et al., 2000; Hanewinkel & Abhauer, 2004; Crone et al., 2011; Andrews et al., 2014; Isensee et al., 2014). The available evidence points to the potential for long term effects of primary school interventions, but additional evaluations with a longer follow-up are required to determine the durability of intervention effects (Botvin et al., 2003; Hopfer et al., 2010). Despite some weaknesses in the research design and conflicting findings between studies, most school-based approaches demonstrated effects on smoking behaviour and antecedents of behaviour at short-term (<6 months) and longer-term (>6 months) follow-ups. However, caution needs to be taken

when generalising these findings because most studies were conducted outside the UK and it is unclear whether these findings are applicable to a UK setting.

2.12 Physical activity as mechanism for health promotion

Physical activity (PA) is associated with many health benefits, including reduced risk of hypertension, stroke and coronary heart disease (Chief Medical Officers, 2011). PA participation can contribute to children's physical, social, emotional and psychological development (Chief Medical Officers, 2011). Moreover, PA has been found to improve cognitive functioning, aiding children's learning through improved concentration (Norlander et al., 2005), attention (Mahar et al., 2011) and memory (Kamijo et al., 2011). Social ecological models (SEM) recognise individuals as embedded within larger social systems and describe the interactive characteristics of individuals and environments that underlie health outcomes (Sallis et al., 2008). In accordance with SEM, sport and physical activity have been suggested as a vehicle to deliver health promotion efforts (Eime et al., 2008; Priest et al., 2008; Almond et al., 2013; Giedne et al., 2013). Due to the inherent relationship between sport, physical activity and health, such activities may be a useful medium to deliver health promotion education into a child's environment (Eime et al., 2008).

In the UK, all children are required to participate in school physical education (PE) and over three-quarters participate in sport outside of school (Department for Culture, Media and Sport, 2013). Research suggests that

health-based PE is imperative for promoting children's knowledge and skills required to lead and sustain healthy lifestyle choices (Alfrey et al., 2012). PE could therefore be used as a platform to embed health promotion education, such as smoking prevention.

An increasing number of studies have found a consistent and negative relationship between physical activity and cigarette smoking, suggesting that individuals who participate in greater levels of PA are less likely to smoke or smoke fewer cigarettes (Audrian-McGovern et al., 2003; Larson et al., 2007). According to Audrian-McGovern (2013), PA reward (e.g., enjoyment) is one pathway which affects children's smoking susceptibility. Moreover, whilst social factors and identity are known risk factors in the progression of smoking habits (Fidler et al., 2003) it may be that the identities and social affiliations resulting from participation in physical activity are incompatible with smoking (Audrian-McGovern et al., 2013). Many authors advocate utilising PA as an active component in future smoking prevention interventions (Audrian et al., 2003; Audrian-McGovern et al., 2013), but it has not yet been trialled in UK smoking prevention efforts.

2.13 Evaluating health promotion interventions

The Medical Research Council (MRC) framework provides guidance for the development, evaluation and implementation of complex interventions to improve health (MRC, 2000; MRC, 2008). The guidance recommends initial feasibility and pilot phases be conducted to help inform recruitment and

retention of study participants, determine intervention acceptability, and aid intervention design and implementation of a larger trial (MRC, 2008; 2014).

It is important to identify whether or not interventions are effective, and this cannot be assumed (Bonnell et al., 2003). There are three broad types of evaluation which include; formative/process, impact and outcome (Hawe et al., 2003). Formative research allows concepts, programme materials and methods to be tested, and aids understanding whether the planned intervention is acceptable and appropriate for the target audience (Nutbeam & Bauman, 2006). Process aids our understanding of how programmes were developed and why programmes were (and were not) successfully implemented (Steckler & Linnan, 2002; Round et al., 2005; Hawe et al., 2003). Typically process evaluations includes evaluation of the intervention by measuring dose (amount of intervention that was delivered), reach (number of those who received the intervention), and fidelity (quality of the intervention that was delivered). In contrast, impact/outcome evaluation aims to determine intervention effectiveness in achieving changes in behaviour, knowledge or attitudes, or in health conditions, sustained behaviour change, morbidity and mortality (Round et al., 2003). Using a combination of process (qualitative) and outcome (quantitative) methodologies is considered imperative in health promotion evaluation (Brown, 2006).

Summary

Overall research suggests that the development of smoking-related intentions and individual cognitions precede smoking initiation among youth, yet there is a lack of research conducted in preadolescent children. Some of

the primary school-based prevention approaches reviewed here have been found to reduce the risk of smoking and positively impact on antecedents of behaviour. Intervening with preventative measures in primary school can offer the potential of producing greater impact on adolescent smoking behaviour. Nevertheless, there is a limited evidence base of UK primary school smoking prevention studies. Physical activity has been recognised as being protective against smoking uptake in youth, but whether physical activity can be used as a mechanism to deliver smoking prevention messages to UK primary school children has not yet been investigated.

2.14 Research aims and objectives

The aim of this thesis was to (1) examine the social factors associated with boys and girls smoking-related intentions, attitudes and refusal self-efficacy, (2) explore the acceptability and feasibility of SFS with primary school settings from the perspectives of children, teachers and coaches and (3) examine the impact of SFS on smoking-related intentions, attitudes and refusal self-efficacy among primary school children. SmokeFree Sports is the first UK based smoking prevention intervention delivered in primary schools that has used physical activity as a vehicle to deliver smoking education messages. It aims to fill the gap in the UK evidence base as well as produce recommendations for policy makers, practitioners and researchers.

- **Study 1** will examine associations between mother, father, sibling and friend smoking and smoking-related intentions, attitudes and refusal self-efficacy among 9-10 year old primary school children.

- **Study 2** qualitatively explores the feasibility and acceptability of SFS within primary school settings from the perspectives of children, teachers and coaches.
- **Study 3** examines the impact of SFS on children's smoking-related intentions, attitudes and refusal self-efficacy. Qualitative data, collected through focus groups and semi-structured interviews with children, teachers and coaches, is used to extend quantitative findings and to determine the perceived impact of the SFS intervention.

2.15 Methodological approach

The research design adopted within this thesis included a mixed-methodological approach that recognised the complexity of the research questions, which required outcome and formative/process measures. Mixed-methodology involves the combination of quantitative and qualitative approaches to answer a single question or a set of integrated questions (Patton, 2002; Tashakkori & Teddlie, 2003). Mixed methodology has been used in diverse ways by researchers to either a) improve accuracy of data, b) to produce a more complete picture by combining information from quantitative and qualitative data sources or c) to avoid biases intrinsic to single-method approaches thus compensating specific strengths and weaknesses associated with particular methods (Denscombe, 2008). An advantage of utilising mixed methodology research is that it balances efficient data collection and analysis with data that provides context (Creswell, 2009). The quantitative data quickly and efficiently captures

potentially large amounts of data from participants and the contextual information gathered through qualitative data facilitates understanding and interpretation of data (Creswell, 2009). However, challenges or disadvantages of mixed methodology come mainly from it being time consuming and expensive which may thus lead researchers working to tight budgets or time constraints to compromise sample sizes (Driscoll, 2007).

Whilst a mixed-methodological approach was undertaken within this thesis, it is important to note the arguments against integrating quantitative and qualitative research. It is suggested that these paradigms differ in terms of their epistemology (positivism vs. interpretivism), ontology (objectivism vs. constructionism) and principle orientation to the role of theory (inductive vs. deductive) (Bryman, 2008). According to others (Guba & Lincoln, 1994; Morgan, 1998), quantitative and qualitative are incompatible paradigms. Nevertheless, a 'pragmatic approach' is advocated as being a new guiding paradigm in social sciences and is postulated that the connections between research methods and epistemology and ontology are not deterministic (Bryman, 2008; Tashakkori & Teddie, 2003; Creswell & Plano Clark, 2011). A mixed-method conceptual framework developed by Greene et al (1989) includes triangulation, complementarity, development, initiation, and expansion. The benefits of combining both quantitative and qualitative paradigms in research include the breadth and depth of understanding and corroboration of findings, while offsetting the weaknesses inherent to using each approach by itself (Creswell & Plano Clark, 2011). There are three possible weighting options for a mixed methods design including (1) equal

priority, (2) quantitative priority and (3) qualitative priority (Creswell & Plano Clark, 2011). Deciding on these weighting options will depend on the relative importance of quantitative and qualitative data in the research study design. The research within this thesis involved the completion of three empirical studies with diverse methodologies in 'natural settings'. Specifically, study 1 and study 3 adopted a "quantitative priority" approach that used rigorous data analysis methods that adjusted for school-level clustering to explore the influence of social factors on children's cognitive vulnerability towards smoking and examine the impact of SFS intervention on children's smoking-related cognitions. However, a less dominant method in the research design of study 3 came from the qualitative research paradigm which was utilised to provide context and explanations for changes in outcome variables following the SFS intervention. However, a "qualitative priority" approach was used in study 2 to provide context and depth to inform the development of a larger SFS intervention for city-wide implementation among 9-10 year old primary school children across Merseyside.

2.16 Ethical considerations

Meetings were arranged with each school to discuss the project in detail. Given the nature of the research, the following ethical considerations were addressed:

- the necessity of codes to maintain school and pupil confidentiality
- the importance of safeguarding children against any psychological harm
- the provision of protocols in the event of distress

- the ownership of data collected
- the necessity of informed consent (and parent passive consent)

Permission to participate in the study was initially obtained from school head teachers, then parents and finally, the children themselves. Of the children whose parents allowed them to participate in the study, control over the decision to participate was ultimately that of the child. Of the minority of children whose parents opted them out from the study, most expressed a desire to participate.

Research with children

Children are a special population, and research with them requires special consideration in terms of methods, ethics and the relationship between the researcher and those who are being researched. Within this thesis the ethical issues addressed surrounded informed consent, confidentiality and anonymity.

Informed consent

Informed consent is a key consideration in ethical research, particularly research conducted with children. Gaining informed consent is regarded as central to ethical research practice. The Social Research Association defined informed consent as ...'*A procedure for ensuring that research participants understand what is being done to them, the limits to their participation and awareness of any potential risks they incur*' (Social Research Association, 2003). However, when working with young children, researchers are required to gain consent from appropriate adults and also gain assent from children

(National Children's Bureau, 2011). For the purpose of this research, passive consent was required whereby parents/guardians returned a slip only if they did not want their child to participate in the study (Ellickson & Hawes, 1989).

There is little consensus regarding whether active or passive consent should be employed (Jason et al., 2001). However, given that the research involved preadolescent children and that the research was conducted in schools, whereby consent has also been sought from gatekeepers, the use of passive consent is deemed appropriate (Jones et al., 2001). Given that the informed consent process is dynamic, continuous and reflexive (Davies, 2008), verbal and written consent by study participants were re-negotiated at each research stage and were informed that they could withdraw from the study at any time. Ultimately the biggest ethical challenges for researchers working with children are the disparities in power and status between adults and children (British Sociological Association, 2002). Consequently, researchers need to consider children's potential vulnerability to exploitation in interactions with adults, and adult's specific responsibilities towards children (Boddy & Oliver, 2010). To ensure children did not feel coerced into participating by the researcher, children were given time to decide away from the research team whether they wished to participate. Regarding the research incentives used within this study (described in more detail in the relevant chapters), they were used as a token to compensate participants for their time and effort in the study. Details on obtaining informed consent from participants can be found in Study 1 (Chapter 3).

Confidentiality and anonymity

Confidentiality and anonymity are important ethical considerations. In accordance with the British Sociological Association (2002), all study participants were informed how far they would be afforded anonymity and confidentiality at the outset of each study. The degree to which confidentiality and anonymity could not be assured depended on the data collection methods employed. In Study 1 and 3, children were assured by the research team that they would be assigned a code to maintain their confidentiality on the self-reported questionnaire. Conversely, in Study 2 and 3, anonymity and confidentiality was carefully negotiated with all study participants. Whilst all the identifiable data was removed to anonymise data, the nature of a focus group setting is such that confidentiality cannot be guaranteed. This issue was discussed with participants at the outset of Study 2 and 3.

2.17 Ethical approval

Ethical approval for this research study was obtained from Liverpool John Moores Research Ethics Committee. All procedures were in accordance with regulations and guidelines approved by the university ethics committee.

Chapter 3

Study 1: The influence of mother, father, sibling and friend smoking on 9-10 year olds smoking-related intentions, attitudes and refusal self-efficacy.

Thesis study map: Study 1

Study	Objectives
Study 1: The influence of mother, father, sibling and friend smoking on 9-10 year old primary school children's smoking-related intentions, attitudes and refusal-self-efficacy	Objective: <ul style="list-style-type: none"> To examine the association between social factors on boys and girls smoking-related intentions, attitudes and refusal self-efficacy.
Study 2: A formative study to explore the acceptability and feasibility of SFS within primary school settings	Objective: <ul style="list-style-type: none"> To explore the feasibility and acceptability of using SFS as a mechanism to deliver smoking education messages within primary school settings from the perspectives of children, teachers and coaches.
Study 3: Examine the impact of SFS on children's smoking-related intentions, attitudes and refusal self-efficacy	Objectives: <ul style="list-style-type: none"> To investigate the short-and mid-term effectiveness of SFS on children's smoking-related intentions, attitudes, and refusal self-efficacy Explore perceived impact of SFS from the perspectives of children, teachers and coaches.

Chapter 3

Study 1: The influence of mother, father, sibling and friend smoking on 9-10 year olds smoking-related intentions, attitudes and refusal self-efficacy

3.1 Introduction

Globally, between 82,000 and 99,000 young people start smoking every day (Schawb, 2011). Although the proportion of 8-15 year olds in the United Kingdom (UK) who have ever smoked has declined from 18.7% in 1997 to 6% in 2013 (Health and Social Care Information Centre, 2014), over 200,000 start to smoke each year (Hopkinson et al., 2013). Smoking poses many health risks, including various forms of cancer, cardiovascular disease and respiratory disease, and imposes a significant financial and social burden on society (Fuller, 2013). Therefore smoking prevention remains an important public health priority (Public Health England, 2013). Efforts to delay or prevent children from starting to smoke are needed because the earlier a child starts to smoke, the less likely they are to quit the habit as an adult, and the more likely they are to die prematurely from a smoking-related disease (Public Health England, 2013).

Primary school children represent an important cohort for smoking prevention as regular smoking is not yet established smoking prevalence is low (0.3% ever smoke at age 8-10 years) (Health and Social Care Information Centre, 2014). Although these children do not smoke, they may have developed intentions regarding future smoking (Andrews et al., 2003). In accordance with the Theory of Planned Behaviour (TPB) (Ajzen, 1991),

future intentions to smoke predict subsequent smoking behaviour (Andrews et al., 2003; Hampson, 2007). In turn, intentions to smoke are shaped by an individual's smoking-related cognitions such as attitudes (the overall evaluation of smoking) and self-efficacy expectations (a person's confidence in their ability to stay a non-smoker and to refuse a cigarette) (Ajzen, 1991; Conrad et al., 1992; Topa & Moriano, 2010; Porcellato et al., 1999). Research in adolescents has demonstrated that individual cognitions are formed by distal factors at the interpersonal level, such as family and peers (McMillian et al., 2005; Mercken et al., 2011). Less is known about the factors that influence preadolescent children's individual cognitions and such knowledge can be used to inform the development of smoking prevention interventions.

Bandura's (1986) social learning theory (SLT) postulates that smoking behaviour may be directly acquired through modelling the behaviour of significant others. Similarly, attitudes and values towards smoking are partly formed from observing others smoking (Bandura, 1986). In accordance with social learning theory, previous studies have shown parental, sibling and peer smoking to be significant risk factors for smoking uptake (Leonardi-Bee & Britton, 2011; Simons-Morton & Farhat, 2010). Previous research in US preadolescents has shown that having a family member that smokes is associated with more favourable implicit attitudes towards smoking compared with preadolescent children with non-smoking family members (Andrews et al., 2010). Similarly, research in Dutch preadolescent children found exposure to parental, sibling and peer smoking to be associated with

having more pro-smoking attitudes (Schuck et al., 2012). Additionally, parental smoking was related to perceived safety of causal smoking and temptation to smoke in response to smoking related cues such as seeing someone smoke (Schuck et al., 2012). Accumulative evidence suggests that there are gender differences concerning the influence of social factors on smoking uptake in adolescents (Sullivan et al., 2011; Liao et al., 2013). For example, mother smoking is reported to influence girls' smoking more than boys (Sullivan et al., 2011), whereas father and friend influences have been found to be stronger for boys than girls (Gilman et al., 2009; Hoffman et al., 2006). However, the influence of social factors on the antecedents of smoking behaviour in preadolescent boys' and girls' is less clear. Such knowledge may inform decisions surrounding the inclusion of gender-specific components in smoking prevention interventions targeted at preadolescent children.

Smoking is socially patterned, with high smoking prevalence among low socio-economic status (SES) groups (Hiscock et al., 2012). This is important as smoking is the leading cause of health inequalities (Jha et al., 2012). Addressing inequalities in tobacco use is therefore a public health priority (Department of Health, 2011) and socially deprived areas have been identified as an important target for smoking interventions (Thomas et al., 2008). SES is widely regarded as being an important determinant of smoking uptake in young people as children who live and go to school in socially deprived areas are more often exposed to smoking behaviour (Hiscock et al., 2012; Smith et al., 2009). Given that children who live in deprived

neighbourhoods are likely to include a predisposition to experiment with smoking (Lader & Meltzer, 2000), further insight into factors that influence smoking-related cognitions in these groups can provide additional knowledge to inform the development of interventions. A recent and large cross-sectional study of Dutch primary school children aged 10-11 years old found that the smoking behaviour of the father, mother and other family members was shown to be the most influential on the intention to smoke among children living in a low SES area, though more evidence is needed (Cremers et al., 2014).

To the authors' knowledge, the only published UK study that has been conducted with preadolescent children is the Liverpool Longitudinal Study (LLSS) (Milton et al., 2004; Milton et al., 2008; Porcellato et al., 2005). The city of Liverpool is one of five metropolitan boroughs in Merseyside, England, and is ranked among the most deprived local authorities in England (Department for Communities and Local Government, 2010). In the LLSS study, 8% of nine year olds had tried smoking, with rates rising to 21% at age 10 and to 27% at age 11. Smoking experimentation was higher amongst boys at age 10, and factors associated with children's smoking were parental and best friend smoking, curiosity, living in a low income family and residing in a deprived area. However, the LLSS was a largely qualitative study that included a small cohort of children from six primary schools in a localised area of Liverpool. Further, whilst the LLSS examined smoking uptake it did not examine factors associated with intentions to smoke and individual

smoking-related cognitions, which are important from a primary prevention perspective.

This paper seeks to extend the LLSS by conducting a large quantitative study and involving a regional population of 9-10 year primary school children from two metropolitan boroughs (local authorities) in Merseyside. Further, the research aims to add to the limited evidence base of studies investigating the influence of social factors on outcomes relevant for primary prevention (i.e. before smoking use or experimentation), in particular among low SES populations. Therefore, the present study aimed to examine the association between social factors (mother/ father/sibling/ friend smoking) and intentions to smoke and individual smoking-related cognitions (attitude toward smoking, refusal self-efficacy expectations) among preadolescent children from socially deprived areas of the UK. The study investigated social influences on these aspects of cognitive vulnerability toward smoking by gender, as at present there is only limited understanding of the reasons behind gender patterns in smoking (Amos & Bostock, 2009). Such information may inform decisions surrounding the inclusion of gender-specific components in smoking prevention interventions targeted at preadolescent children.

3.2 Design and Methods

Participants and procedure

This cross-sectional study presents baseline data collected from a smoking prevention intervention study called 'SmokeFree Sports', between

September-October 2012. SmokeFree Sports is a 7-month physical activity intervention involving coach and teacher training and the provision of sports activities, to prevent smoking among 9-10 year old primary school children in Liverpool, a city in Merseyside, England. The intervention has been described in detail elsewhere (Trigwell et al., 2014) and will be evaluated within a non-randomised controlled trial. Since the funding for the project required that the intervention be offered to all schools in Liverpool, randomisation of local schools was not possible; therefore, prior to the recruitment of schools, Liverpool was matched with Knowsley, another metropolitan borough in Merseyside, on the basis of population data, including adult smoking rates (Liverpool: 24.2%; Knowsley: 27.6%) (Public Health England, 2013), deprivation level (www.liverpool.gov.uk) and ethnic composition (Office for National Statistics, 2011). Children in the present study were therefore recruited through primary schools in Liverpool and Knowsley local authorities. Merseyside provides a unique context for the research as it has some of the most deprived local authorities in England (Department for Communities and Local Government, 2010). Furthermore, the health of children and young people in Liverpool and Knowsley is worse than the England average (Public Health England, 2013a; Public Health England, 2013b). Ethical approval for the study was granted by Liverpool John Moores University Research Ethics Committee (12/SPS/038).

In September 2012, all eligible primary schools (mainstream state schools; n=154), from Liverpool (n=104) and Knowsley (n=50), were invited to participate in the study. Schools received information about the project via

email and post. To enhance participation rates, schools who had not responded were followed-up with telephone calls. Following initial communication with each school, site visits were made by the research team to share information about the project with staff acting as study coordinators. Study information sheets were passed on to senior staff members and written consent was requested if they wished their school to participate. In total, 43 schools agreed to take part in the study (28%), including 32 (31%) from Liverpool and 11 (22%) from Knowsley. Schools that declined to participate provided diverse reasons for not taking part (e.g., too busy, key teacher on sick leave, already in receipt of external projects). In participating schools, all Year 5 children (aged 9-10 years; n=1393) were invited to take part. This age group was chosen because by age 11 almost one quarter of children will have tried smoking (NHS Information Centre for Health and Social Care, 2012). Furthermore, whilst it is not mandatory to address smoking education in Key Stage 2 (pupils aged 7-11 years) of the UK National Curriculum (Department for Education, 2013), the National Institute for Health and Care Excellence (NICE) (National Institute for Clinical Excellence, 2010) postulates that smoking prevention efforts would be most effective if they began in primary school.

To recruit children, the ethics committee gave approval for a passive informed consent procedure with parents/guardians provided with an opportunity to opt out of the study if they did not want their child to participate. Specifically, schools were given a stamped addressed envelope containing a participant information sheet and opt-out form to mail to parents.

Parents could opt their child out of the study by signing and returning the opt-out form or calling the research team. Following an opt-out deadline of at least two weeks, schools were visited to obtain child assent and collect baseline data. Parental consent and child assent were obtained for 1339 children (96% response rate). During data collection, 123 children were absent from class. Children were excluded from the study if they had a special class placement (e.g., learning disability), difficulty in speaking and or understanding the English language (n=33), or incomplete outcome measures (n=17). The smoking questionnaire was completed on school laptop computers using a web-based survey (www.surveymonkey.com). A member of the research team stood at the front of the class and guided children through the questionnaire and read questions aloud as required by children. To aid true and accurate responses, questionnaires were completed in silence and confidentiality was stressed to all participants. The online survey took children approximately 30 minutes to complete. Completed surveys were submitted by each child and responses were immediately transmitted to a secure electronic database for subsequent analysis.

Measures

Smoking questionnaire

A questionnaire was constructed using items adapted from questionnaires previously used with this age group (de Vries et al., 1988; Engels et al., 1997; World Health Organisation, 2008; National Health Service Information Centre, 2008). Demographic information measured included age (years),

gender (0 = boy; 1 = girl), ethnicity (1 = White British, 2 = White non-British, 3 = Mixed ethnicity, 4 = South Asian – Indian/Pakistani/Bangladeshi, 5 = Black – African/Caribbean/British, 6 = Chinese, 7 = Other descent, e.g. Arab) and SES. Home postcodes, provided by the children, were used to estimate SES. Postcode data was entered into ‘GeoConvert’ (www.geoconvert.mimas.ac.uk/), a free online tool that generates indices of multiple deprivation (IMD) scores. SES was defined using the home postcode, provided by the children, to generate indices of multiple deprivation (IMD) scores. IMD scores are a composite of seven domains of deprivation (income, employment, education, health, crime, access to services, and living environment) (Department for Communities and Local Government, 2008), with higher scores representing higher degrees of neighbourhood deprivation and therefore lower SES. Individual level outcome measures included intention to smoke and smoking-related cognitions such as refusal self-efficacy and attitudes toward smoking (collectively termed ‘cognitive vulnerability toward smoking’). Parent, sibling and friend smoking behaviour were assessed to examine the influence of social factors. Smoking behaviour of children was measured for descriptive purposes using a single item from the Health Survey for England (National Health Service Information Centre, 2008). Children were asked to indicate which of five stages of smoking best described them, from (1) ‘I have never smoked, not even one puff’ to (5) ‘I smoke at least once a day’. Responses were re-coded to ‘never tried smoking (not even one puff)’ (0), and ‘tried smoking’ (any experimentation with smoking) (1). As an indicator of smoking status, expired carbon monoxide (CO) concentrations were taken in private

and recorded using a piCOsimple Smokerlyzer (Bedfont Scientific UK, England) with a reading above 10ppm used as a cut-off for defining smokers (Bailey et al., 2013).

Individual cognitive vulnerability to smoking

Intention (not) to smoke was assessed using two items from the Health Survey for England (National Health Service Information Centre, 2008), 'Do you think you will smoke in the next month/year?', as well as an item designed by the research team 'Do you think you will smoke in secondary school?'. Responses ranged from 'definitely yes' (1) to 'definitely not' (4) and were summed to produce a total intention score (range 3-12). A high score on total intention indicated a strong intention not to smoke. Cronbach alpha for total intention showed good internal consistency ($\alpha=0.81$).

Refusal self-efficacy was measured using three items adapted from a nine-item self-efficacy scale in adolescents (de Vries et al., 1988). Pilot work with children indicated that the question and answer formats used within these items were developmentally inappropriate for 9-10 year olds and therefore each item was amended to reflect this age level. Items assessed the child's confidence in their ability to be a non-smoker and refuse cigarettes in different situations: 'How confident are you that you can stay (become) a non-smoker?' 'How confident are you that you could say no to a cigarette if someone offered you one?' and 'How confident are you that you could be a non-smoker if your friends smoke?' Responses consisted of Likert scales ranging from 'not confident at all' (1) to 'very confident' (5) and were summed to create a total refusal self-efficacy score (range 3-15). Cronbach alpha for

the combined scale showed good internal consistency ($\alpha=0.81$). A high score on the scale indicates a high level of refusal self-efficacy.

Attitude structure includes affective, behavioural and cognitive components (Rosenberg et al., 1960). For the purpose of this study, children's beliefs and knowledge about smoking were explored through the cognitive component of attitudes adapted from the Global Youth Tobacco Survey (GYTS) (World Health Organisation, 2008) and the Health Survey for England (National Health Service Information Centre, 2008), including 'Do you think smoking is bad for your health?', 'Once someone has started smoking, do you think it will be difficult to quit?', 'Do you think that it is safe to smoke for only a year or two as long as you quit after that?', 'Do you think the smoke from other people's cigarettes is harmful to you?'. An additional item 'Do you think smoking affects sport performance?' was developed by the research team. Responses ranged from 'definitely not' (1) to 'definitely yes' (4). A summary scale was created but internal consistency was low ($\alpha=.49$). Since the data for individual attitude items were positively skewed and distribution was not improved by statistical transformation, responses were collapsed into dichotomous variables for analyses: a definitive negative attitude towards smoking (i.e. 'definitely yes') was scored 1; the remaining response categories (i.e. 'probably yes', 'probably not' and 'definitely not') indicated a more favourable attitude towards smoking and thus were collapsed into a single group and scored 0. One attitude item ('Do you think that it is safe to smoke for only a year or two as long as you quit after that?') was reverse coded in order to maintain consistent scale direction for all items. An

additional attitude item, 'Do you think smoking makes you gain weight?' was also included from the Health Survey for England (National Health Service Information Centre, 2008). Responses for this item were collapsed into a dichotomous variable for analysis with 'no difference' scored 1 and the remaining response categories (i.e., 'lose weight' or 'gain weight') grouped and scored 0.

Parent, sibling and friend smoking behaviour

Perceived parent and sibling smoking behaviour were assessed using an item taken from the Health Survey for England (National Health Service Information Centre, 2008). Children were asked to select who in their family smokes from nine items (e.g., mum, step-mum, brother, uncle, cousin), and could enter additional family members who smoke if necessary. Since this study was concerned with the influences of immediate family members, only (biological) mother, father and sibling smoking behaviours were used in the analyses. Children with a smoking mother/father/sibling were scored 1. Children with a non-smoking mother/father/sibling were scored 0.

Perceived friend smoking was assessed using two items adapted from an existing survey (Engels et al., 1997) 'Do any of your friends smoke?' and 'Have any of your friends tried smoking?' Responses were 1= 'none of my friends', 2= 'a few of my friends', 3 = 'most of my friends', 4= 'all of my friends'. For subsequent analysis, items and responses were collapsed to create the dichotomous variable of: 'friends had not tried smoking (friends do not smoke and have not tried smoking; scored 0) or 'friends smoke' (friends smoke or had tried smoking; scored 1).

Analysis

Descriptive statistics were calculated for the whole sample and then by gender and reported as means (\pm SD) or proportions (%). Gender differences in means were examined using independent t-tests, with categorical variables tested using chi-square tests of association. Multilevel linear and logistic regression analyses were conducted to examine continuous variables and dichotomous outcome measures, respectively. To account for children being nested in schools, a 2-level data structure was used. Children were defined as the first level unit of analysis, and school was the second level unit of analysis. Separate analyses were conducted for boys and girls to assess associations between mother, father, sibling and friend smoking and intentions to smoke and smoking-related cognitions (i.e., refusal self-efficacy and attitudes toward smoking), adjusting for deprivation level. Each model was adjusted for other individual level cognitive variables (e.g. for the intention model, adjustments were also made for refusal self-efficacy scale and dichotomous attitude items) since these variables may be directly or indirectly related (Bandura, 1986; Ajzen, 1991). Regression coefficients in each model were assessed for significance using the Wald statistic. Analyses were performed using MLwiN 2.30 software (Centre for Multi-level Modelling, University of Bristol, UK) with statistical significance set at $P < 0.05$.

3.3 Results

Descriptive statistics and gender differences for the study sample ($n = 1143$; Mean age: 9.6 years, SD 0.3; 49.3% boys; 82% participation rate) are

presented in Table 3.1. A high proportion of the children were white British (85.6%), with the remaining children self-identified as black (4.1%), white non-British (1.6%), mixed race (2.8%), Asian (2.6%), Chinese (0.8%) or other non-British descent (2.5%). Over eight out of ten participating children lived within an area ranked within the top 20% for deprivation in England, with 75% within the most deprived decile (Department for Communities and Local Government, 2008). The majority of children (97.5%) reported to have 'never smoked'. CO readings were recorded for 82.7% of children (n=945). Children's self-reported non-smoking was confirmed by CO readings (Mean = 1.3, SD \pm 0.7); with all participant readings below 10ppm. Children's perceived smoking behaviour of family and friends is also shown in Table 3.1. Over half of children (57.3%) reported having at least one family member who smokes; 37.1% mothers, 39.0% fathers and 11.0% of siblings were current smokers. Around a sixth of children had at least one friend who smokes.

Whilst a high proportion of children (88.8%) agreed that smoking is 'definitely' bad for health, more favourable attitudes towards smoking were observed for the remaining attitude items (Table 3.1). Approximately six out of ten children indicated that they 'definitely' agreed that: 'it is not safe to smoke for a year or two as long as you quit after that', 'the smoke from other people's cigarettes is harmful to you' and that 'smoking effects sports performance'. Further, only half of children believed that it is 'definitely' difficult to quit smoking once started, whilst almost six out of ten children stated that smoking makes you either gain or lose weight. Gender

differences are also shown in Table 3.1. Compared to girls, boys had lower non-smoking intentions ($P=0.02$) and refusal self-efficacy ($P=0.04$). In addition, boys reported having more smoking friends ($P<0.05$), whilst a higher proportion of girls than boys believed that smoking is 'definitely' bad for health ($\chi^2 = 12.6$, $P<0.01$, $\phi = .10$). No other sex differences were observed.

Non-smoking intentions

Table 3.2 shows associations between social factors and non-smoking intentions. After adjustment for refusal self-efficacy, attitudes towards smoking and school and deprivation level, friend smoking was negatively associated with non-smoking intentions in both boys ($P<0.01$) and girls ($P<0.01$); sibling smoking was negatively associated with non-smoking intentions in girls ($P<0.01$) but a positive association was found in boys ($P=0.02$). Neither mother nor father smoking behaviour was associated with non-smoking intentions.

Refusal self-efficacy

Table 3.2 also shows associations between social factors and refusal self-efficacy. After adjustment for non-smoking intentions, attitudes towards smoking and school and deprivation level, friend smoking was negatively associated with refusal self-efficacy in girls ($P<0.01$) but not boys ($P=0.07$). Neither mother, father nor sibling smoking was associated with refusal self-efficacy.

Attitudes towards smoking

Table 3.3 presents associations between social factors and children's attitudes towards smoking, after adjustment for non-smoking intentions, refusal self-efficacy and school and deprivation level. Significant associations were observed for social factors and attitudes toward smoking on two out of six attitude items for boys; however, no associations were found in girls. Compared to boys with non-smoking friends, boys with smoking friends had lower odds of 'definitely' believing that smoking is bad for your health (Odds Ratio (OR) = 0.38, 95% CI: 0.21 to 0.69, $P < 0.01$) and the smoke from other people's cigarettes is harmful to you (OR = 0.57, 95% CI: 0.35 to 0.91, $P = 0.02$). In comparison to boys with a non-smoking sibling, boys with a smoking sibling had lower odds of 'definitely' believing that smoking is bad for your health (OR = 0.45, 95% CI = 0.21 to 0.98, $P = 0.04$). Mother, father and sibling smoking were not associated with any attitude items in boys or girls.

Table 3.1 Descriptive characteristics for the study participants

	All (n=1143) M±SD or %	Boys (n=563) M±SD or %	Girls (n=580) M±SD or %	P value
Demographics				
Age (years)	9.6±0.3	9.6±0.3	9.6±0.3	0.06
Ethnicity (White British)	85.6	86.1	85.0	0.75
Deprivation level (IMD)	54.8±16.8	54.4±16.7	55.2±16.9	0.42
Social Influences				
Mother smoking	37.1	35.1	39.0	0.18
Father smoking	39.0	39.3	38.8	0.87
Sibling smoking	11.0	9.9	12.1	0.25
Friend smoking [†]	16.4	21.7	11.2	<0.01*
Smoking Intentions				
Total non-smoking intentions (range 4-12)	11.7±0.9	11.6±1.0	11.8±0.7	0.02*
Self-Efficacy				
Total refusal self-efficacy (range 3-15)	13.6±3.1	13.4±3.3	13.8±3.0	0.04*
Attitudes towards smoking				
Smoking is bad for health ('definitely yes')	88.8	85.4	92.1	<0.01*
Safe to smoke year or two ('definitely not')	62.6	62.5	62.8	0.93
Difficult to quit once started ('definitely yes')	50.7	50.4	51.0	0.84
Others smoke harmful to you ('definitely yes')	64.3	62.5	66.0	0.22
Effects sports performance ('definitely yes')	55.8	56.8	54.8	0.49
Makes you gain or lose weight ('no difference')	42.1	43.9	40.3	0.23

Notes: IMD, Indices of multiple deprivation score [45]; (†) at least one friend smokes or tried. Independent t-tests and chi-square statistics were used to determine differences in means and percentages, respectively. *Significant difference (P<0.05).

Table 3.2 Summary of multilevel regression analysis examining associations between social factors and non-smoking intentions and refusal self-efficacy.

	Non-smoking intentions		Refusal self-efficacy	
	β (95% CI)	P value	β (95% CI)	P value
Boys				
Mother smoking	-0.03 (-0.20, 0.14)	0.70	-0.40 (-0.98, 0.18)	0.18
Father smoking	0.02 (-0.15, 0.18)	0.86	-0.25 (-0.74, 0.25)	0.33
Sibling smoking	0.32 (0.05, 0.60)	0.02*	-0.49 (-1.33, 0.36)	0.26
Friend smoking [†]	-0.57 (-0.77, -0.37)	<0.01*	-0.57 (-1.18, 0.04)	0.07
Girls				
Mother smoking	-0.04 (-0.15, 0.08)	0.53	-0.02 (-0.52, 0.49)	0.94
Father smoking	-0.01 (-0.13, 0.10)	0.81	-0.32 (-0.81, 0.17)	0.19
Sibling smoking	-0.38 (-0.55, -0.21)	<0.01*	0.43 (-0.33, 1.19)	0.26
Friend smoking [†]	-0.33 (-0.49, -0.17)	<0.01*	-1.14 (-1.86, -0.42)	<0.01*

Notes: β, Beta coefficient; CI, confidence interval; (†) at least one friend smokes or tried. Beta (95% CI) values reflect the associations between mother, father, sibling and friends smoking and (a) non-smoking intentions or (b) refusal self-efficacy. All models were adjusted for school and deprivation level; non-smoking intention models were also adjusted for refusal self-efficacy and attitudes towards smoking; refusal-self-efficacy models were also adjusted for non-smoking intentions and attitudes towards smoking. Values in bold denote significant association (P<0.05).

Table 3.3 Summary of multilevel binary logistic regression analysis for social factors associated with children's attitudes towards smoking.

Attitude item	Bad for health		Not safe to smoke year or two		Difficult to quit once started		Others smoke is harmful to you		Effects sports performance		Makes no difference to your weight	
Predictor	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Boys												
Mother smoking	0.87 (0.50, 1.54)	0.64	0.69 (0.47, 1.01)	0.05	0.75 (0.51, 1.09)	0.13	1.18 (0.78, 1.80)	0.44	1.36 (0.91, 2.04)	0.14	1.28 (0.88, 1.85)	0.19
Father smoking	0.68 (0.39, 1.17)	0.16	1.18 (0.82, 1.71)	0.37	0.96 (0.67, 1.37)	0.81	1.15 (0.77, 1.73)	0.48	1.02 (0.69, 1.50)	0.92	0.91 (0.64, 1.29)	0.59
Sibling smoking	0.45 (0.21, 0.98)	0.04*	0.95 (0.52, 1.76)	0.88	1.11 (0.60, 2.05)	0.74	1.85 (0.93, 3.69)	0.08	0.67 (0.35, 1.28)	0.23	1.19 (0.66, 2.14)	0.57
Friend smoking	0.38 (0.21, 0.69)	<0.01*	0.73 (0.47, 1.15)	0.18	1.13 (0.83, 2.08)	0.24	0.57 (0.35, 0.91)	0.02*	1.07 (0.66, 1.72)	0.80	0.65 (0.42, 1.02)	0.06
Girls												
Mother smoking	1.09 (0.52, 2.20)	0.82	0.69 (0.47, 1.02)	0.07	0.86 (0.59, 1.26)	0.44	0.81 (0.53, 1.24)	0.32	1.18 (0.78, 1.77)	0.43	1.13 (0.78, 1.64)	0.53
Father smoking	0.82 (0.41, 1.64)	0.58	1.00 (0.68, 1.47)	1.00	1.29 (0.89, 1.86)	0.18	1.33 (0.87, 2.03)	0.18	0.68 (0.46, 1.01)	0.05	1.12 (0.78, 1.60)	0.54
Sibling smoking	1.69 (0.55, 5.15)	0.36	1.75 (0.95, 3.21)	0.07	0.84 (0.47, 1.49)	0.55	1.04 (0.55, 1.95)	0.90	0.71 (0.39, 1.29)	0.26	0.92 (0.57, 1.47)	0.73
Friend smoking	1.30 (0.49, 3.46)	0.60	0.77 (0.44, 1.33)	0.35	0.85 (0.50, 1.47)	0.57	1.32 (0.72, 2.43)	0.36	0.96 (0.54, 1.69)	0.88	1.11 (0.65, 1.88)	0.71

Notes: OR, odds ratio; CI, confidence interval. OR (95% CI) values reflect the strength of association between mother, father, sibling or friend smoking on attitudes towards smoking. All models were adjusted for non-smoking intentions, refusal self-efficacy, and school and deprivation level. Values in bold denote significant association (P<0.05).

3.4 Discussion

The aim of the present study was to identify whether mother, father, sibling and friend smoking were associated with cognitive vulnerability to smoking among 9-10 year old children from deprived neighbourhoods in Merseyside, England. The results indicate that sibling and friend smoking may represent more salient influences on children's cognitive vulnerability to smoking than mother and father smoking. Moreover, some differential effects were observed by gender, suggesting that social factors may, in part, influence the antecedents of smoking behaviour in boys and girls differently. These findings extend the LLSS (Milton et al., 2004; Milton et al., 2008; Porcellato et al., 2005) and add to the limited evidence base in preadolescent children.

SLT proposes that behaviour, perceptions of behaviour and the environment interact to influence one another (Bandura, 1986). In accordance with SLT (Bandura, 1986), parents have previously been considered to be the most important influences on children during the primary school years (Viatro et al., 2004), while peer influences become increasingly more important during the adolescent years (Brook et al., 1999). In the present study, mother (37.2%) and father smoking (38.8%) was relatively high, which is reflective of the local context in Merseyside, where levels of smoking and deprivation are higher than the national average (Health and Social Care Information Centre, 2013; Communities and Local Government, 2011). Children of smoking parents are at a higher risk of having susceptible smoking cognitions (Porcellato et al., 1999; Andrews et al., 2010; Schuck et al., 2012; Brook et al., 1999; Hiemstra et al., 2012; de Leeuw et al., 2010) and initiating smoking

(Leonardi-Bee & Britton, 2011), especially those in lower socio-economic status groups (Cremers et al., 2014). However, in the current study, no associations were observed between mother or father smoking and children's non-smoking intentions and refusal self-efficacy. A possible explanation for the divergence in findings is that whilst this study examined independent influences of mother and father smoking, other studies (Porcellato et al., 1999; Andrews et al., 2010; Schuck et al., 2012; Brook et al., 1999; Hiemstra et al., 2012; de Leeuw et al., 2010) utilised a combined parental smoking variable for analyses. To check this, we conducted additional analysis using a combined parental smoking variable but found no further associations. Alternatively, whilst children are aware that their parents smoke, their exposure to smokers may vary (Schuck et al., 2012) as a result of regional public health campaigns to protect children from smoking such as "Take 7 Steps Out" (see www.tobaccofreeutures.org). In addition, smoking parents may communicate non-smoking expectations to their offspring or display disapproval of child smoking, which has been found to be protective against smoking intention and initiation (Leonardi-Bee & Britton, 2011; Cremers et al., 2014; Viatro et al., 2004; Sargent & Dalton, 2001; Cote et al., 2004). Nevertheless, further research is needed to examine the influence of mothers or father smoking behaviour on children's cognitive vulnerability towards smoking.

The results of the present study suggest sibling and friend smoking may be important influences on preadolescent children's cognitive vulnerability towards smoking. Friend smoking was negatively associated with non-

smoking intentions in both boys and girls, extending previous studies in adolescents that have found peer smoking to be related to smoking uptake (Simons-Morton & Farhat, 2010). The influence of sibling smoking, however, differed by gender; sibling smoking was negatively associated with non-smoking intentions in girls, which is consistent with the accumulative evidence (Leonardi-Bee & Britton, 2011). Conversely, a positive association was apparent in boys, suggesting that having a smoking sibling strengthened their non-smoking intentions. This finding was unexpected but may also reflect parent disapproval of sibling smoking and communication of non-smoking expectations (Sargent et al., 2001; Viatro et al., 2004) although more research is needed. Gender differences were also found in relation to refusal self-efficacy and attitudes toward smoking; friend smoking was negatively associated with refusal self-efficacy in girls but not boys. Further, boys with a smoking friend or sibling had less negative attitudes towards smoking regarding the health consequences of smoking and the harms of others' smoke though no associations were observed in girls. Boys reported having more smoking friends than girls, which may have contributed to these effects since children who perceive that many of their friends advocate or engage in smoking are more likely to develop pro-smoking attitudes (Schuck et al., 2012). Further, boys may assume that smoking is not as harmful, otherwise their friend/sibling would not smoke.

To the authors' knowledge, only one other study has concurrently examined the role of parent, sibling and friend smoking in shaping preadolescents cognitive vulnerability to smoking (Schuck et al., 2012). Using structural

equation modelling, Schuck et al. (2012) found no direct effects of parental smoking, sibling smoking or peer smoking on 9-12 year old children's susceptibility towards smoking. However, peer, sibling and, in particular, parent smoking was associated with perceiving more pros of smoking. Further, parent smoking was positively associated with perceived safety of casual smoking and cue-triggered wanting to smoke (Schuck et al., 2012). These findings are inconsistent with the current study and may reflect cultural differences and different methodologies employed. Future studies examining the influence of the social environment in preadolescents are warranted.

The findings observed for friend and sibling smoking on children's cognitive vulnerability to smoking could be attributed to several factors. Firstly, while children in the early primary school years are likely to spend a lot of time with their parents, it is probable that older children ages (ages 8 and over) spend more time with siblings (who share more similarities and social networks) and friends. The findings may therefore reflect the fact that friends and siblings increasingly represent children's predominant social environment, and are likely to be more proximal influences on children's vulnerability to smoking than parents. Second, peer and sibling smoking behaviour is likely to be less overt than parent smoking and as a consequence may be perceived by other children as exciting or cool and socially desirable (Andrews et al., 2008). Peer groups are known to share common attitudes and behaviours (Forgas & Williams, 2001; Kameda et al., 2005); smokers may communicate pro-smoking attitudes and approval of smoking initiation

(Lorenzo-Blanco et al., 2012), which in turn could influence intentions to smoke and smoking-related cognitions among children. Third, whilst the majority of children stated that they had never tried smoking (97.8%) around a sixth believed that they knew a friend that had. It is possible that children may have underreported their own smoking status, or perhaps, overestimated their friends smoking habits. Given that overestimation of smoking prevalence is related to smoking initiation in preadolescent children (Wang et al., 2011), overestimation of friend and sibling smoking by children in the current study may have influenced their cognitive aspects around smoking. Taken together, the results suggest that friend and sibling smoking behaviours may contribute to preadolescent children's cognitive vulnerability to smoking. However, more evidence is required and research is needed to determine the mechanisms associated with peer and sibling influence in preadolescence.

Encouragingly, most children displayed strong non-smoking intentions and refusal self-efficacy. Reflecting the high intention not to smoke, few children had tried smoking was low (2.2%) which is consistent with other studies in preadolescent children (Milton et al., 2004; Milton et al., 2008). NICE guidance (National Institute for Clinical Excellence, 2010) states that smoking prevention efforts may be more effective if started in primary school. Given the low rates of smoking experimentation, 9-10 year old children could be an appropriate cohort to target for primary prevention. While encouraging, results regarding children's high refusal self-efficacy should be interpreted with caution because children at this age may not have encountered

situations where they have been put to the test to resist influences to smoke from others (Hiemstra et al., 2012). Because decreases in self-efficacy have been associated with smoking onset and continuation in adolescents (Auseums et al., 2009; Hiemstra et al., 2011), efforts to maintain the strength of preadolescent children's smoking refusal self-efficacy skills may be effective in preventing them from starting to smoke. Previous school-based interventions that have taught adolescents to deal with direct pressure to smoke have demonstrated modest positive results on smoking behaviour (Crone et al., 2003; Thomas et al., 2013). Prevention interventions may also need to address children's attitudes toward smoking, as over a third of participants in this study did not recognise with certainty that short term smoking is not safe, that smoking is addictive, that others smoke is harmful, that smoking effects sport performance and that smoking *per se* does not influence weight. More positive attitudes toward smoking may predict intentions to smoke in the future and later smoking behaviour (Ajzen, 1991; Conrad et al., 1992; Topa & Moriano, 2010).

Previous research has called for further investigations into the need for gender-specific approaches to prevent smoking (Cremers et al., 2014). The current study found gender differences in the influence of social factors. In addition, compared with girls, boys were less likely to believe smoking is 'definitely' bad for health, and expressed lower non-smoking intentions and refusal self-efficacy. However, according to Cohen's (1988) magnitude of effect sizes, these findings suggest that there is a trivial to small effect size for non-smoking intentions and refusal self-efficacy among boys and girls. It

is however, possible that the statistically significant effects observed for boys and girls may, in part, be attributable to the large sample size of the current study. Nevertheless, qualitative research may prove useful in revealing the thought processes through which boys and girls form these smoking-related cognitions. Previous research with Dutch preadolescent children has reported it unnecessary to develop separate smoking prevention programmes for preadolescent children (Ausems et al., 2009). Given that the influences on boys' and girls' intentions to smoke were similar, the results of the present study provide tentative support to this statement. Nevertheless, intervention and prevention efforts aimed at preadolescents may benefit from tailored messaging that dispels the myths about the health consequences of smoking and exposure to smoke as well as strengthening refusal self-efficacy.

This study extends the smoking literature in preadolescent children by examining the influence of social factors (mother, father, sibling and friends) on cognitive vulnerability to smoking among a large sample of 9-10 year old children from deprived neighbourhoods. However, the study has a number of limitations. First, the analysis is based on a self-reported cross-sectional survey; therefore causal relationships cannot be established. In addition, the study examined influences on intentions to smoke and smoking-related cognitions, which may or may not result in smoking initiation at a later age (Cremers et al., 2014). Nevertheless, previous research demonstrates that these individual level factors are predictive of future smoking behaviour (Ajzen, 1991; Conrad et al., 1992; Topa & Moriano, 2010). Second, children

self-reported their smoking behaviour and cognitions, which introduces the possibility of under or over reporting because of recall or social desirability (Hiemstra et al., 2012). However, self-reported measures have been demonstrated to be accurate provided confidentiality is assured (Dolicini et al., 1996). Moreover, children's self-reported non-smoking status was confirmed using an objective measure of smoking. Third, direct measures of parental and friend smoking behaviours were not available, though previous research has demonstrated that children can reliably assess the smoking behaviour of others in their social environment (Glover et al., 2011). Fourth, this study only examined the influence of biological family members (mother, father and sibling) and did not assess the influence of parental structure (i.e. one-parent vs. two-parent families or step parents). Previous research has shown adolescents who live with both biological parents smoke less than those living in single-parent families (Brown & Rinelli, 2010). In addition, we did not collect gender-specific data on sibling smoking and therefore could not distinguish between the influence of brothers or sisters on the outcome variables. Finally, results are drawn from two deprived local authorities with high adult smoking prevalence, which limits the generalisability of results to other regions of England. However, given that smoking is socially patterned, findings can be generalised to similar urban areas with high levels of deprivation, where the need for smoking prevention is proportionally greater.

In summary, the present study showed that whilst the majority of 9-10 year old children living in deprived communities had high non-smoking intentions and refusal self-efficacy, a substantial proportion displayed pro-smoking

attitudes that could be addressed through smoking prevention efforts. Findings showed that social factors were associated with children's cognitive vulnerability toward smoking, with the smoking behaviour of siblings and friends being identified as important influences. Whilst some differential findings by gender were observed, these may not be sufficient to warrant separate intervention approaches. This knowledge may aid the development of future smoking prevention interventions, though further research is needed.

Chapter 4

**Study 2: The acceptability and feasibility of
SmokeFree Sports (SFS) within primary school
settings**

Thesis study map: Study 2

Study	Objectives
Study 1: The influence of mother, father, sibling and friend smoking on 9-10 year old primary school children's smoking-related intentions, attitudes and refusal-self-efficacy	<p>Objective:</p> <ul style="list-style-type: none"> To examine the association between social factors on boys and girls smoking-related intentions, attitudes and refusal self-efficacy <p>Key Findings:</p> <ul style="list-style-type: none"> Compared to girls, boys had lower non-smoking intentions, refusal self-efficacy, and were less likely to agree that smoking is 'definitely' bad for health Friend smoking was negatively associated with non-smoking intentions in girls and boys, Friend smoking was negatively associated with refusal self-efficacy in girls only Sibling smoking was negatively associated with non-smoking intentions in girls but a positive association was found in boys Boys who had a smoking friend had lower odds of 'definitely' believing that the smoke from other people's cigarettes is harmful and that smoking is bad for health Boys with a smoking sibling had lower odds of 'definitely' believing smoking is bad for health
Study 2: A formative evaluation to explore the acceptability and feasibility of SFS within primary school settings	<p>Objective:</p> <ul style="list-style-type: none"> To explore the feasibility and acceptability of using SFS as a mechanism to deliver smoking education messages within primary school settings from the perspectives of children, teachers and coaches
Study 3: Examine the impact of SFS on children's smoking-related intentions, attitudes and refusal self-efficacy	<p>Objectives:</p> <ul style="list-style-type: none"> To investigate the short-and mid-term effectiveness of SFS on children's smoking-related intentions, attitudes, and refusal self-efficacy Explore perceived impact of SFS from the perspectives of children, teachers and coaches.

Chapter 4

Study 2: The acceptability and feasibility of SmokeFree Sports (SFS) within primary school settings

4.1 Introduction

The findings from study 1 indicate that siblings and friends are important influences on 9-10 year olds cognitive vulnerability toward smoking and that many children still have misconceptions surrounding smoking harms and challenges. These findings therefore highlight the need for smoking prevention interventions targeted at preadolescent children.

Regular participation in physical activity (PA) is associated with numerous health benefits for children (Chief Medical Officers, 2011) as well as improving their cognitive functioning (Lees & Hopkins 2013). Research has shown that participation in PA may also be protective against youth smoking initiation (Audrain-McGovern et al., 2003; Kaczynski et al., 2008) and increased smoking (Horn et al., 2013). Whilst it is not fully understood how PA may prevent youth smoking uptake, one mechanism that may explain its protective effect is the enjoyment or the subjective reward derived from engaging in PA (Audrian-McGovern et al., 2013). Whilst PA and smoking are both linked to elevated mood, decreases in perceived stress and weight maintenance (Chief Medical Officers, 2011; Kassel et al., 2003; Potter et al., 2004), the positive feelings derived from PA could provide an alternative to smoking (Audrian-McGovern et al., 2003; Audrian-McGovern et al., 2013). Moreover, the inherent relationship between PA and health suggests that

smoking is incompatible with PA and, thus, provides a viable strategy for smoking prevention efforts in children (Audrian-McGovern et al., 2003).

A socio-ecological approach for smoking prevention indicates that multiple interactions take place between the child and their environment (Corbett, 2001). These interactions range from the individual to interpersonal, organisational, community and population factors affecting access and demand (Corbett, 2001). Due to the complex interplay of these factors on children's behaviour, it has been suggested that prevention strategies should include approaches directed at multiple levels of the socio-ecological model (Corbett, 2001). In accordance with the socio-ecological framework, youth sport has been advocated as a potential vehicle through which levels of PA might be increased among youth (Leek et al., 2011; Sacheck et al., 2011). Additionally, sport is recognised as an informational and educational platform to support health promotion messages, disease prevention and control efforts (Almond et al., 2013; Eime et al., 2008; Geidne et al., 2013; www.sportanddev.org). Given that primary school children are required to participate in PE, and over three quarters of children five to ten engage in sport outside of school (Department for Culture, Media and Sport, 2013), sport has the potential to reach and educate a large proportion of children at the school and community level. Additionally, sports coaches can empower children to make important healthy lifestyle choices through conveying appropriate prevention messages, teaching skills necessary to establish and sustain healthy behaviours (Glang et al., 2010; Mazzer et al., 2012). Previous programmes that have utilised sport and sports coaches as

mechanisms for tobacco control include Tobacco Free Sports (The US Centers for Disease and Prevention, 2007), Tobacco Free Athletes (www.tobaccofreemaine.org), and Play, Live, Be Tobacco Free (www.playlivebetobaccofree.ca). However, whilst these tobacco control programmes are non-UK-based this gap has been filled with the development of SmokeFree Sports (SFS), a UK multi-component initiative that aimed to deliver a smoking prevention intervention to children and young people through the medium of sport and PA.

In 2010, SFS was initially trialled in youth club settings to investigate the impact of a SFS intervention on children and young people's smoking-related behaviour, intentions and attitudes and to test intervention components and research measures (see Foweather et al., 2011; Romeo-Velillia et al., 2014; Hilland et al., 2014). Findings demonstrated that SFS helped prevent children and young people from starting to smoke and had positive benefits on their attitudes and knowledge about smoking. However, major challenges in delivering activities within youth clubs surrounded children's behaviour and attendance at activities and it was suggested that the intervention should be trialled in more structured settings, such as schools. Schools are considered an appropriate context for health education programmes due to existing infrastructure, staff, curricula, facilities, policies and environments that have the potential to promote healthy behaviours (Department of Education, 2013). In particular, several school based smoking prevention programmes have been developed and evidence suggests that they can be effective in preventing young people from starting smoking (Thomas et al., 2013).

Evidence suggests that interactive and innovative smoking prevention efforts are well received by children and young people, and are more likely to be effective than those solely focusing on information giving and fear-based approaches (Bauld et al., 2009). Additionally, using sports coaches to convey smoking education messages to children and young people have been shown to be a feasible option for smoking prevention efforts (Hilland et al., 2014). Therefore, utilising PA and sports coaches as a method for smoking prevention may offer an innovative strategy that is more appealing to children than typical classroom based learning.

The purpose of this study was to explore the acceptability and feasibility of a SFS primary school-based intervention from the perspectives of children, teachers and coaches. In line with the Medical Research Council (MRC) framework for the development and evaluation of complex interventions (Medical Research Council, 2008), a formative evaluation approach was undertaken, integrating process evaluation strategies to explore the acceptability and feasibility of SFS and to inform the design of a future definitive SFS trial. Formative research assists to test concepts, programme materials and methods, and to understand whether the intervention is accepted and appropriate for the target population (Nutbeam & Bauman, 2006). Practitioners should undertake formative research when designing novel health promotion initiatives to help develop and refine intervention protocols (Milton et al., 2011). By assessing individuals' beliefs, perceptions, behaviours and the environmental structures that may enhance or limit programme effectiveness, practitioners can better design programmes to

meet the needs of their target audience (Gittelsohn et al., 2006). Specifically, this formative evaluation focused identifying intervention components that worked well and elements of the intervention in need of improvement from the perspectives of children, teachers and coaches.

4.2 Design and Methods

Design

To assess the acceptability and feasibility of SFS a qualitative formative evaluation was employed through focus groups and interviews. Specifically, the formative evaluation focused on a) gaining insight into the appropriateness of SFS b) exploring intervention implementation, and c) identifying improvements for the development and implementation of a future SFS trial. Ethical approval for the study was granted by Liverpool John Moores University's Research Ethics Committee (12/SPS/004).

Recruitment and Participants

In February 2012, a convenience sample of three primary schools (n=7 Year 5 classes) situated in Liverpool City and North were recruited to test the acceptability and feasibility of a school-based SFS intervention for children in Year 5 (aged 9-10 years). This age group was chosen because evidence suggests that smoking patterns begin prior to experimentation, with the development of attitudes and beliefs (Porcellato et al., 1999), and by age 11, almost one-quarter of children will have tried smoking (NHS Information Centre, 2011). Liverpool provides a unique context for the research as it is one of the most deprived local authorities in England (The English Indices of

Deprivation, 2010). In particular, the City and North neighbourhood wards are the most deprived in Liverpool (Department for Communities and Local Government, 2010). Given that smoking is socially patterned with far higher prevalence rates in lower socio-economic status groups (Hiscock et al., 2012), disadvantaged areas would benefit from smoking prevention initiatives to reduce inequalities in health due to smoking.

Schools received information about SFS via telephone and email. Following initial communication with each school, site visits were made by the research team to share information about the project with Head Teachers. Written consent for school participation was obtained. To recruit children, schools were provided with information packs containing a participation information sheet and consent form to be sent home with children. Parents were asked to sign and return the consent form if they wanted their child to participate in the study. Following the opt-in deadlines, SFS researchers visited each school to obtain child assent. Parental consent and child assent were obtained for 165 children (98% response rate).

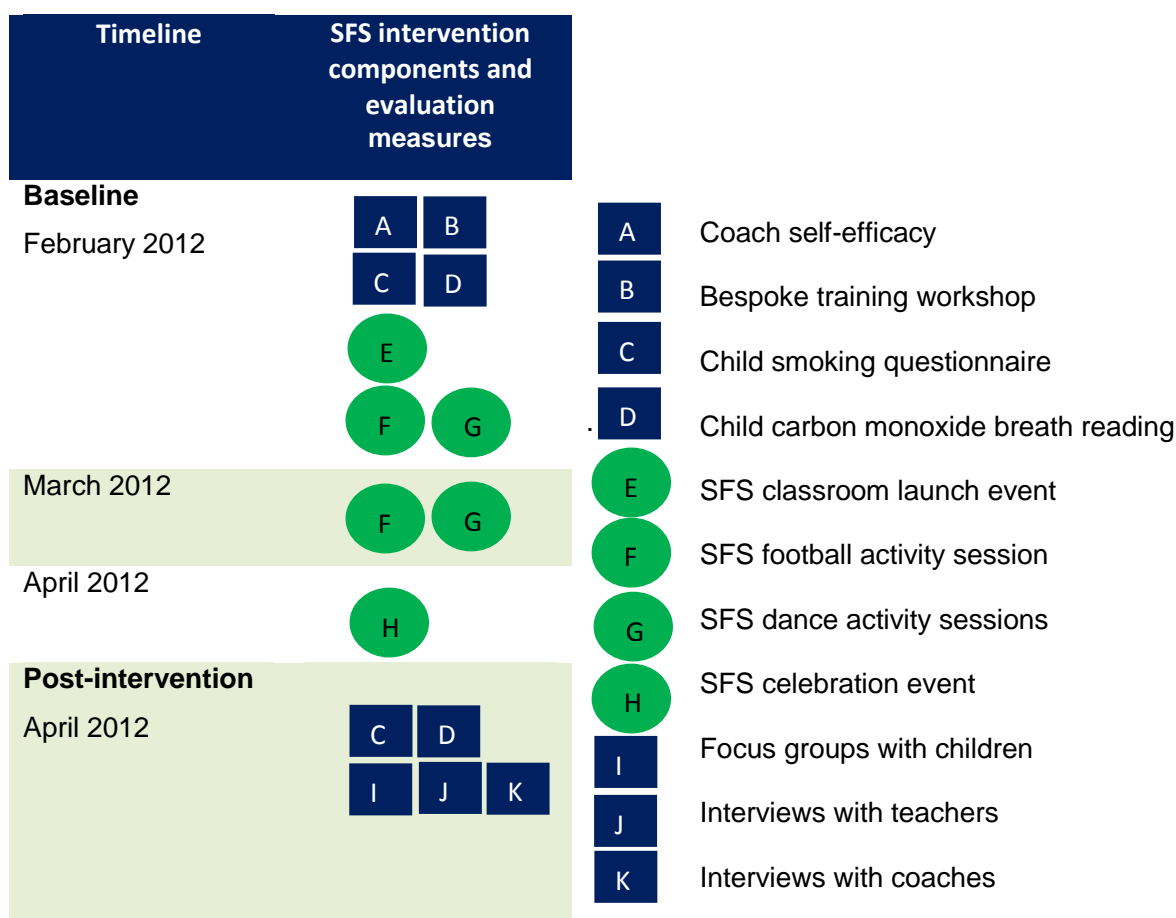
SFS employed coaches from Liverpool Football Club (n=3) and Merseyside Dance Initiative (n=2) to deliver SFS activity sessions and coaches from Liverpool City Council (n=2) to deliver SFS celebration event (hereafter termed SFS coaches). SFS coaches had between two and ten years coaching experience. Coaches that delivered SFS activity sessions (n=5; 3 male) as well as Year 5 teachers (n=6; 3 male) were asked to participate in interviews. All SFS coaches and teachers provided written informed consent and agreed to participate in interviews. Each Year 5 teacher selected a

sample of children for the focus groups based on the requirement that at least some of the children were articulate in the presence of an adult (Porcellato et al., 2002). Forty-five children (51% boys; 93% White British) participated in nine focus groups (n= 6 single sex and n= 3 mixed sex groups).

Description of SFS Intervention

SFS was initially established in October 2010 as a multi-dimensional community-based initiative that aimed to prevent smoking uptake and reduce smoking prevalence in children and young people (Foweather et al., 2011; Hilland et al., 2014; Romeo-Velillia et al., 2014). SFS school-based intervention was informed by the results from the SFS community feasibility study and was designed in partnership with steering group members from different partner organisations including representatives from Liverpool Community Health, Liverpool City Council, Merseyside Youth Association, Merseyside Sports Partnership and SportsLinx. The SFS school-based intervention aimed to use PA as a vehicle to prevent children from starting to smoke. The intervention was delivered for six weeks between February and March 2012 and intervention components are detailed below (see Table 4.1 for SFS activities and research measures).

Table 4.1 SFS activities and research measures timeline



Notes: Intervention components are represented by circles, with evaluation measures depicted by squares. Components delivered concurrently are displayed side by side, while those delivered consecutively are shown one beneath the other. Different components are labelled with different letters; see legend.

Bespoke coach training

In line with NICE (2010) recommendations outlining that staff working in smoking prevention in school settings should be sufficiently trained, SFS coaches (n=7) were required to attend a bespoke training workshop at the University. SFS coaches attended the training two weeks prior to the delivery of the intervention and a separate training workshop was delivered for the coaches (n=2) who delivered the SFS celebration event. The objectives of the training were to introduce coaches to: a) the SFS intervention, b) key facts relating to smoking prevalence, c) key messages surrounding the

impact of smoking on health, sport performance and PA, chemicals in a cigarette and the cost of smoking and d) practical suggestions of how to implement smoke free messages into coaching sessions.

The style of delivery, including timing and the information presented during the bespoke training was modified based on feedback received from coaches during the community feasibility study (Hilland et al., 2014). First, as coaches considered the training time consuming and consisting of too much information, the theoretical aspects delivered by the Liverpool Community NHS Trust SmokeFree Coordinator was reduced from 2 hours and 15 minutes to 1 hour 15 minutes by condensing and breaking information into clear topics (e.g., key facts about smoking, short and long term effects of smoking on health, relationship between smoking and PA). Second, coaches did not like the lecture-based format of the training, therefore other learning activities that were added including a) watching a four minute film from the Chemical Soup training tool kit to highlight the chemicals found in second hand smoke (<http://tobaccofreefutures.org/how-we-can-help-you/reducing-exposure-to-second-hand-smoke/chemical-soup/>), b) group tasks/discussions to embed key smoke free messages specifically into dance and football sessions, and c) the inclusion of more visual resources to demonstrate the health, fitness and cosmetic effects of smoking (e.g., tar and phlegm jars, blocked blood vessels, straws and stained teeth).

During the SFS activity sessions coaches were permitted to deliver dance routines and football drills of their choice. Coaches received a coaching manual, which included 10 key messages around the effects of smoking on

health and sport performance, recapped information that was provided during the bespoke training, as well as practical suggestions to promote smoke free messages within their activity sessions. Football coaches also received a coaching drill resource pack that they could use or adapt for their session. Coaches were given visual resources (e.g., tar and phlegm jars, blocked blood vessels and stained teeth) to aid delivery of messages within sessions and asked to encourage children to make a pledge to be smoke free. The smoke free messages and pledges were adapted from the tobacco-control programme from the US state of Maine, Tobacco Free Athletes (www.tobaccofreemaine.org.uk) and the football drills were adapted from the Centers for Disease and Control Prevention, SmokeFree Soccer Coaches Manual (www.cdc.gov/tobacco/youth/sports/coach_manual/index.htm).

Classroom-based launch event, coaching sessions and celebration event

Each Year 5 class (n=7) received a classroom launch event delivered by the SFS research team that lasted approximately 45 minutes. The purpose of the launch event was to introduce children to the SFS intervention and provide key messages through an interactive classroom based session (see Table 4.2 for SFS classroom-based launch event activities). Following the classroom launch event, children received six weeks of dance and football sessions delivered by SFS coaches for two hours each week during school hours and attended a celebration event (held at each school) to conclude the SFS intervention. The purpose of the celebration event was to re-cap key smoke free messages delivered and to distribute certificates to children for

signing the smoke free pledge. The celebration event lasted approximately 35 minutes and involved children participating in active games and a question and answer session relating to key messages from the SFS coaching manual. At the end of the celebration event all children received a SFS certificate for signing the SFS pledge together with SFS branded water bottles, draw string bags and pens for their participation in SFS.

Table 4.2 SFS classroom-based launch activities

Activity	Time	Description
SFS introduction	5minutes	SFS team delivered a short presentation regarding the aims of SFS and planned intervention activities.
Group task	5 minutes	Children participated in question and answer session surrounding their current knowledge of smoking, reasons why children smoke and the benefits from participating in PA and sport.
Chemical soup	10 minutes	Children were shown the <i>Chemical Soup</i> resource (see www.tobaccofreefutures.org). This interactive resource used fake hazardous liquids to raise children's awareness of the chemicals found in cigarette smoke. Some children had the opportunity to assist in making the chemical soup with the SFS team.
My Body Board	10 minutes	Children were shown the <i>My Body Board</i> resource to illustrate the impact of smoking on the body (see www.mybodyboard.co.uk). Some children had the opportunity to place the magnetic body parts onto the My Body Board Resource.
Visual resources	10 minutes	Resources including tar and phlegm jars, blocked blood vessels and stained teeth were used to prompt discussions with children to demonstrate the health and cosmetic effects of smoking.
SFS Conclusion		The SFS team concluded with details about the planned celebration event intervention and incentives to be given to children for participating in the project.

Procedure

Child focus groups, teacher and coach interviews were conducted in April 2012, within two weeks of the SFS celebration event (see Table 4.1 page 90 for SFS research measures timeline).

Child focus groups

Focus groups were used to explore children's perspectives of the SFS intervention. A focus group is a carefully planned discussion designed to obtain perceptions on a defined area of interest (Krueger, 1988). During focus groups the researcher relies on the group interaction to address the research questions (Morgan, 1997). Focus groups are considered to be suitable for use with children because they can create a safe peer environment that enables participants to question one another, pursue issues important to them, and encourages varied and in-depth discussions (Hilton, 2005; Bryman, 2008). Furthermore, the peer support provided in the small group setting may help redress the power of imbalance between the adult and child (Mauthner, 1997). Homogeneity with respect to gender is frequently recommended when conducting focus groups with children (Mauthner, 1997; Vaughn et al., 1996), however, other health related research with children has found a mixed-gendered approach to be acceptable in preadolescent children (Davies and Jones, 1996; Hill et al., 1999). Therefore, for the purpose of this study a mixed-gendered approach was undertaken.

A focus group schedule was developed by the research team, covering aspects of intervention components (i.e. launch event, coaching activities,

smoke free pledge, and celebration event), session implementation (i.e. experiences of coaching sessions and implementation of key messages), perceptions of coaches as deliverers, teacher suitability to deliver SFS, and views for improvement (see appendix 2 for focus group schedule). It is recommended that facilitated focus groups are conducted with four to six participants per group (Hoppe et al., 1995; Vaughn et al., 1996; Gibson, 2007). The rationale for this group size is that it should include enough participants to yield diversity in information provided, yet they should not include too many participants because large groups can create an environment where participants do not feel comfortable sharing their thoughts, opinions, beliefs and experiences (Onwuegbuzie et al., 2009). Therefore, each focus group (n=9; 3 mixed-gender groups and 6 single sex groups) consisted of five children and took place during school hours in private rooms away from interruptions and distractions. On selection, children were given a brief overview of the focus group topics and asked to re-affirm their assent. At this stage confidentiality was negotiated with participants; because of the group setting confidentiality could not be afforded to participants on the behalf of others in the group (Lewis, 1992).

Each focus group started with an introductory “ice breaker” activity by asking children to tell the group what their favourite sports were. The purpose of this exercise was to introduce children to the dynamics of a focus group and reduce children’s apprehension in talking in the presence of other children and adults (Porcellato et al., 2002). Children were informed that the focus group was not a test but an enquiry into their perceptions of SFS which were

considered vital to improve the programme. An important advantage of using focus groups with children is that the method acknowledges the participants as experts (Levine & Zimmerman, 1996). Facilitators' roles were to moderate the course of the discussion between children, stimulating and encouraging all children to contribute (Greene & Hogan, 2005). To ensure an accurate account of children's views, moderators were encouraged to probe participants to gain in-depth explanations and clarify meaning (Greene & Hogan, 2005). At the end of each focus group, participants were debriefed and given the opportunity to ask researchers questions. Each focus group lasted between 18-47 minutes and recorded using a Dictaphone.

Teacher and coach interviews

Face-to-face interviews (n= 2 paired, 2 single) with teachers (n=6) were conducted at school and interviews with coaches (n=5) occurred in a private room at the University. The semi-structured interview schedule included the same topics as the child focus group schedule, with additional topics covering a) bespoke training, to inform the content and delivery of future and training (coaches only), and b) resources needed to aid teacher delivery and sustainability (teachers only), in order to encourage wider school engagement (see Appendix 2 for interview schedule). The interview guides were designed to permit participants the latitude to respond freely but also ensured significant topics were covered in detail. To aid credibility of data, respondent checking took place throughout the interview by probing interviewees in order to gain in-depth explanations and clarify meaning. At the end of the interview, participants were given the opportunity to add

additional information that had not been covered in the interview guide. Each interview lasted between 15 and 55 minutes and recorded.

Analysis

Sound files from all focus groups and interviews were transcribed verbatim for analysis. Transcripts were imported into QSR NVivo 10 software and subjected to thematic analysis following a six phase approach (Braun & Clarke, 2006). Phase one (familiarisation with data) involved reading and re-reading transcripts and making note of initial ideas. Phase two (coding) involved listing recurrent themes and constructing an index of codes which were grouped into categories, some of which were pre-defined based on topics covered in the semi-structured topic guides. Phase's three to five involved further searching, reviewing, defining and naming of themes. The semi-structured topic guide increased the comparability of the data (Flick, 2006) and emerging themes were compared repeatedly across transcripts. A combination of inductive analysis and deductive techniques were used to generate categories, themes and patterns. During phase six (writing up) a thematic map of the analysis was generated and the main themes are presented as subheadings within the results section. To aid the credibility and trustworthiness of the results, analyses and interpretations of the data were discussed and checked with the research team. Focus group and interview data is presented using direct quotes from respondents, with figures used to provide context.

4.3 Results

PA as a mechanism to deliver smoking education

Teachers and coaches viewed PA as an acceptable method to engage children in smoking prevention education.

“I think the PE part of it engaged the children... it were a lot of background and information that [children] got and I don’t think they even realised they were picking it up as they saw it as games and you [SFS] coming in made it very fun for them [children], but it did get the message thoroughly [across] and they have remembered [the messages]” (Teacher 6, school 1, interview data).

“I think kids will listen to it [smoke free messages] more if there is a sporting aspect that runs alongside instead of just being lectured in a class.... so with it being outdoors, and the participating [in sports] and messages getting put across, I think that is the better way of doing it” (Coach 2, interview data).

Similarly, teachers and coaches regarded PA as a useful mechanism to deliver smoke free messages due to the inherent relationship between PA and smoking.

“Well I think it’s trying to get children to link the effects of smoking in their body in relation to sport and that if they smoke when they are older it’s going to have an impact on how well they can perform in sport and activities” (Teacher 4, school 1, interview data).

“I think it were interesting using like sport because it helps them [children] identify if they smoke there is certain things they can and cannot do later in life... so if they wanted to play football or they wanted to dance and not struggle... if they smoked... I think they understood that” (Coach 1, interview data).

In general, children and teachers felt that SFS offered a “*fun*” learning experience where smoking-related messages were demonstrated and ‘experienced’ through PA, thus, aiding children’s understanding.

“We done fun activities but he [coach] also showed you what it would be like if you were a smoker and you were doing sports to [show] like your heart would beat faster and you get more tired. We done like upbeat activities then we slowed down a bit and [that] showed us what it would be like if we did smoke” (Girl, School 3, (gp 2) focus group data).

“Through the exercises it showed them [children] how if they did chose to smoke they wouldn’t be able to do the exercises as well because of how it affects the heart, the blood vessels and the lungs” (Teacher 3, school 1, interview data).

Despite an overall positive review of SFS, viewing PA as a ‘novel’ approach to delivering educational messages, one teacher saw no added value of SFS when compared with usual classroom-based smoking education.

“I didn’t see a whole heap of difference between the messages that we deliver in here [class] and the way we do games in PE to what the smoke free [sports] stuff were doing”. (Teacher 3, school 1, interview data).

Coaches’ perceptions of the bespoke training and manual

Coaches described the training as “*insightful*”, “*interesting*”, “*useful*”, and “*enjoyable*” in that it were informative and refreshed their knowledge of smoking-related topics.

“I didn’t know much about it [smoking] and then I learned a lot like all about the stuff [chemicals] that’s in cigarettes and stuff I never knew anything about, so it helped a lot” (Coach 3, interview data).

Highlights of the training involved testing out the carbon monoxide monitor, the use of visual resources (including tar and phlegm jars, stained teeth, blood vessels and straws), and group activities with other coaches. Coaches commented that the workshop materials gave them a better understanding of the impact of smoking on the body. Furthermore, the group work was considered beneficial, providing an opportunity to share information and ideas for the delivery of smoke free messages through different PA and sports.

“You know smoking is never going to help, but the training I think, the little objects we used, I think they helped me understand like the effects they [cigarettes] can have on the body, and using the straws helped” (Coach 1, interview data).

“Because we worked along with dance teachers so it’s not just the footballing aspect, you can speak to the dance teachers and we’ll see what ways they relayed it [messages] to their children... It’s sort of picking up different tips from different sort of sides” (Coach 2, interview data).

Coaches also recognised the importance of the manual, using it as a resource to refresh their knowledge of key messages on completion of the training.

“We all had a mini little pack of stuff that we could go away with and use straight away, the information packs were really useful as something to go back to and refer to” (Coach 5, interview data).

Recommendations to improve the training and the manual were offered. In relation to the training, coaches suggested that practical demonstrations surrounding the delivery of smoke free messages through PA and sport would have been useful and felt that the inclusion of practical/ more group tasks throughout the training would help sustain concentration levels.

“The only thing it maybe it would be nice to maybe try a couple of the workshops materials, maybe you know just in a circle and just watch some of the idea’s” (Coach 5, interview data)

“Change it from board to practical, just mixing it up instead of all board and then a lot of practical at the end, because if you can keep us sort of on your toes, then you’re not going to sort of slip out and switch off a bit” (Coach 2, interview data).

Coaches stated that the manual could be improved with the inclusion of images that could be incorporated into coaching sessions to illustrate the impact of smoking on the body.

“The only thing I thought would have been useful were a picture of two different lungs, and like the effects of a smoking lung and what it looks like... a visual aid we can sort of implement into a session” (Coach 2, interview data).

Implementation of SFS

Children stated that they had received smoke free messages during the coaching sessions concerning the chemicals in a cigarette, physical and cosmetic effects of smoking and its impact on sports performance and were able describe activities undertaken and resources used (see Table 4.3 for mode of deliv

Table 4.3 Activities undertaken and resources used to convey smoke free messages

Dance activities and resources	Quotes
Dances/routines	<i>"We made up dances and we had to say what smoking does to your body, so someone would shout out it hurts your lungs, then it hurts your heart, and all the other things that you get from smoking" (Boy, school 3 (gp boys), focus group data.</i>
Raps	<i>"Nicotine, nicotine, is so mean, my favourite show is Mr Bean, tar, tar, drive your car away from that cigarette bar" (Boys, School 1, (gp mixed) focus group data.</i>
Activities/games	<i>"In dance when the music changed we represented the blood vessels and the arteries getting blocked to show what would happen inside your body if you smoked and it made you realise what you're doing to yourself if you smoke"(Girl, school 2, (gp girls), focus group data.</i>
Discussions	<i>"When we played like musical statues and like danced everywhere, then the [dance teacher] said you could do all that dead fast if you didn't smoke, but you wouldn't be able to do it if you did smoke because like it could take your breath away" (Girl, school 1, (gp girls), focus group data.</i>
Visual resources	<i>"Like all the phlegm and tar in the jar and showing us what would happen [if you smoke] and smokers would cough up half a jar [of phlegm] in two weeks" (Girl, school 1, (gp, girls), focus group data.</i>
Football activities and resources	Quotes
Football drills /matches	<i>"We learnt all the skills of football and we had a match and then he [coach] said at the end of the matches if you were to smoke then you wouldn't have lasted for the game" (Boy, school 2, (gp boys), focus group data.</i>
Liverpool Football and SFS ABC Acronym	<i>"The Liverpool one was attitude, behaviour and concentration" (Girl, school 2, (gp girls), focus group data. "SFS was artery, breathing and cash" (All children)</i>
Practical demonstrations	<i>"He got two volunteers, one jogging and one proper running and the one that was proper running was the smoker" (Boy, school 2, (gp boys), focus group data.</i>
Football specific discussions	<i>"We talked about Messi [footballer] not smoking and that he could last the whole game without like passing out or losing his breath, but for a smoker they'd last about 15 minutes cause they'd be out of breath" (Boy, school 1, (gp mixed), focus group data.</i>
Visual resources	<i>"They [coaches] showed us the jars [phlegm and tar], and they said that's how much phlegm a smoker would produce in a week" (Girl, school 3, (gp girls), focus group data.</i>

Perception of SFS coaching sessions

During the focus groups children stated that they enjoyed the SFS sessions because of the activities played and the smoke free raps they learnt during the dance sessions. Moreover, sessions were considered to be educational and provided children with an opportunity to participate in new activities.

“I liked the football because we always had a match at the end which was really fun” (Girl, school 2, (gp 2) focus group data).

Collectively, teachers and coaches gave a positive overview of the sessions, commenting that children appeared to enjoy the content, showed enthusiasm to participate in activities and being responsive in asking and answering coaches’ questions.

“The kids really enjoyed the football and it was really active and they never got a chance to go off tasks, they were all engaged, so that were really good” (Teacher 5, interview data).

“I felt that the material went down really well and everybody were engaged, everybody took part” (Coach 5, interview data).

Despite an overall positive review, negatives of the coaching sessions raised by children consisted of dislike of activity type, playing mixed-sex/ ability games, the repetition of activities [dance routines] and sedentary nature of some football sessions due to too many children per activity.

“There were some girls who don’t like football and some boys don’t like dance (Girl, school 2, (gp 2) focus group data).

“I’m not being mean or anything but it was girls against boys, and it wasn’t really a challenge for some us [boys] because some of the girls were just in

a world of their own, they were just going 'oh there's the ball what should I do ah' and they weren't kicking it" (Boy, school 2 (gp 3) focus group data).

Teachers discussed negative aspects of coaching sessions in more detail. One teacher felt that the dance sessions lacked structure, reporting they were at times '*unorganised*' and '*rushed*'. Further, teachers stated that on occasions too many smoke free messages incorporated into sessions and that the time allocated to learning the smoke free raps during the dance reduced children's time spent dancing.

"I think just because the dance teachers tried to get a lot of teaching them [children] about what's in cigarettes, why it is harmful, what it can cause and that distracted it really away from the actual dancing" (Teacher 4, interview data).

In relation to the smoke free messages delivered, limitations were discussed. One teacher commented that some messages were "*repetitive*" and on occasions "*different*" from coach to coach. Teachers recognised the importance of consistency in messages delivered across sessions and recommended using the same coaches to deliver the intervention.

"Our issue with the football is that it would have been nicer to have the same coaches each week because then they could have been on top of some the messages... sometimes they would repeat messages and there were one occasion when one coach said one thing one week and somebody else said a different message the next week... it were around the effects of one cigarette can take three minutes of your life but one coach said it were 11 minutes of your life... they were two different coaches so the kids were getting a bit confused" (Teacher 4, school 1, interview data).

Challenges in delivering SFS sessions within the school raised by coaches surrounded class size, disorganisation surrounding school timetable and unwanted interference from supply teachers.

“One session I think it was a supply teacher and unfortunately she kept telling the children to be quiet when I was trying to get them to talk so that was a bit tricky” (Coach 5, interview data).

Both teachers and coaches commented on the miscommunications between schools and viewed session cancellations to impact negatively on delivery.

Similarly, teachers commented on the difficulty of embedding SFS into the school timetable.

“School timetable is absolute nightmare but that’s not you [SFS] that’s us we’ve got three-form entry [school] and we’ve got no space” (Teacher 4, school 1, interview data).

Recommendations given by coaches and teachers surrounded themed based sessions to provide focus and structure to the delivery of the intervention, ensure consistent messages are received and prevent smoke free messages from being repeated and increases breadth of topics covered.

“If you want to reinforce the anti the smoking [message] it’s good try and base a week of sessions on the physical impact [of smoking] and the next week the psychological impact of smoking” (Coach 1, interview data).

“It is all very well saying we’re not going to smoke but we need to give them [children] strategies when there in that situation which they will be especially when they going to high school in year 7 and that could be the transition bit there on how they are going to say no and what they are going

to do... I think it's not enough just sort of saying no" (Teacher 4, school 1, interview data).

Teachers stated that by offering different sports and activities it would help keep the project fresh, if the length of intervention were to be increased or repeated with the same participants.

Launch and celebration event

Children recalled the launch and celebration event and enjoyed seeing the visual resources (e.g. tar and phlegm jars, stained teeth and blood vessels), participating in the Chemical Soup and My Body Board activities, celebration games (e.g. bench ball, domes and dishes) and receiving certificates.

Overall, children and teachers had a positive overview of the launch and celebration event and considered the introductory session prior to the coaching sessions and the celebratory closing event to be an acceptable structure to the intervention.

"It was a really fun thing to end it [SFS] with all those activities" (Girl, school 2, (gp 2), focus group data).

"I think whenever you do any project it's good to do like an excitement at the beginning and then a sort of celebration at the end" (Teacher 1, school 3, interview data).

Negative aspects raised by teachers regarding the launch and celebration event included too many children per activity [chemical soup] and difficulty for children to distinguish the celebration event from other SFS activities due to its active nature.

“If I were going to do something like [chemical soup] in class I’d probably get them making the soups instead of a whole big group thing because it’s difficult when you’ve got 60 [children] and for everyone to get really heavily involved” (Teacher 1, School 2, interview data).

“To the children it [celebration event] just looked like another activity, in terms of actually celebrating... somebody [a child] said to me ‘I thought we were having a celebration event’... to them [the children] it didn’t really register as a celebration, it just registered as another fun activity” (Teacher 3, School 1, interview data).

Teachers felt that the celebration event should have been an opportunity for children to show case what they had learned during SFS with other year groups and to receive a presentation of awards for their participation in the project.

“I think it would’ve been nicer to do as a whole [school year] and get them all together and maybe celebrate what they’d done” (Teacher 2, school 2, interview data).

“Little awards or things like that, you know for best answer, best female dancer, best male dancer, best footie player, you know most improved and things like that cos the kids love that” (Teacher 1, school 2, interview data).

Smoke free pledge

In all focus groups, children recalled signing the smoke pledge and were aware of the meaning behind signing it, pledging to remain/become smoke free.

“Well what you have to do is write your name so it means that you will never in your life ever smoke even if you want to” (Boy, school 1, (gp 1), focus group data).

In general, teachers and coaches considered the smoke free pledge as a positive component of the SFS project but were skeptical regarding its long term impact on children's future smoking behaviour.

"If they're offered a ciggie in five years' time [I don't think] that they'll go 'oh I signed a pledge, I'm not going to have that [cigarette], I don't think it'll [the pledge] make that much difference" (Teacher 1, school 2, interview data).

Perceptions of coaches as deliverers of SFS

Teachers were asked about the qualities of using sports coaches as deliverers of SFS. Overall, teachers considered coaches' as specialists in the delivery of sport and dance and thus deemed suitable to deliver SFS. In general, teachers gave a positive overview of SFS coaches, commenting on their ability to engage children in coaching sessions and praised their classroom management skills.

"I thought the coaches were really good to be honest you know they related with the kids straight away and got really involved. It's quite a challenging year group as there's quite a few kids who can be naughty but you know they [coaches] dealt with them fine" (Teacher 1, school 2, interview data).

In particular, teachers considered coaches as role models for children and felt the novelty of external coaches coming in to deliver PA sessions and having the power of the football club brand positively impacted on children's engagement, participation and learning experience.

"Coaches kind of put children off the idea of smoking and saying you know if you're not smoking you are going to be fitter; you're going to be better at football. Well not necessarily better at football but it is that kind of belief that

they will be able to practice more and I think that role model type thing is quite beneficial as well” (Teacher 4, school 1, interview data).

“It gives them [children] a spark when someone new comes in and you see them with their LFC [Liverpool Football Club] badges on and that always has the biggest impact, the kids love it, they thrive on it, and they think it’s different”(Teacher 1, school 2, interview data).

Teacher’s suitability to deliver SmokeFree Sports

Collectively, children, teachers and coaches believed that teachers could deliver smoke free messages during PE lessons.

“They [teachers] could [do it], it would just be like normal PE but it would be funnier and it would be [like] literacy put together with PE” (Girl, school 2 (gp 3), mixed focus group data).

“It’s [SFS] kind of made us think about how we can make that link, that anti-smoking link and actually put it through our [PE] lessons and I think we know that now as teachers were we wouldn’t have done it before” (Teacher 4 school 1, interview data).

“I think it could be delivered all the time really. I think it’s something that can be definitely [delivered] through PE [teachers], I mean.... yeah it makes sense definitely to do it through sport and exercise” (Coach 5, interview data).

Coaches felt that with the inclusion of PA session plans for teachers to follow or to modify would make SFS feasible for delivery by teachers.

“I think just to have some real clear guidelines and almost have a six week lesson plan that they [teachers] can change and develop and giving the key messages that need to be delivered” (Coach 5, interview data).

Similarly, due to teacher's time restraints and skill set to deliver messages through PE, teachers stated that it was necessary to receive training and resource packs including a manual, lesson plans and visual resources to aid delivery.

"I think if you can provide training for teachers as well and provide resources any school would do it really". (Teacher 5, school 3, interview data).

"If we had some more resources and the manual would be good" (Teacher 4, school 1, interview data).

"Lesson plans... I would say there is never teachers like planning I think from scratch... so if there were some plans then we [could] fully copy them and annotate as required... so yeah those would be very beneficial" (Teacher 3, school 1, interview data).

Notably, some teachers felt that the characteristics of a teacher (age, smoking status and lack of enthusiasm or confidence in PE delivery) may however negatively impact teachers' credibility when discussing the importance of being smoke free to children.

"I just think if some members of staff have got the moves and the skills [in PE] children will believe them won't they? Whereas if it's like a 50 year old teacher who smokes and is overweight they're [children] not going to really listen.... and the kids know which teachers smoke and it's [teachers] trying to tell them [children] not to do something that they [teachers] do" (Teacher 1, school 2, interview data).

Similarly, children discussed the smoking status of their teachers and stated that it would impact their teacher's credibility when discussing the importance of being smoke free.

“She’s [teacher] is sending letters home saying kids not to smoke, then she smokes and if they [children] see her smoke they’ll smoke as well... say if its nursery kids they don’t know any better and they copy of people don’t they” (Boy, school 2, (gp 3), focus group data).

Teachers were asked about the best time of day to train teachers to deliver smoking prevention education. To create a cultural awareness of SFS, teachers suggested providing in-house training during twilight sessions (i.e. during staff meetings after school) or training one or two teachers during school hours and getting them to feedback to other staff members.

“You could have [the training] on either a twilight session which [you could] come in after school or just have a 3 hour session during school day” (Teacher 5, school 3, interview data).

“In terms of one maybe two teachers would be released to go to wherever you’re having the course, and then come back and pass on your messages and teach the rest of the staff how to do that... I’ve done it with cooking and other people have done it with other things so it passes the message on and it spreads the message in that way” (Teacher 3, school 1, interview data).

Overall, children, teachers and coaches wanted to continue with SFS and would support a future SFS intervention.

Wider school engagement and sustainability of SFS

Teachers were asked about methods to encourage school involvement in future SFS initiatives. In general, teachers felt that it would be beneficial to tailor SFS toward the needs of individual schools.

“A little bit more tailored to the individual needs of that school I think that’s quite important because we have all got different tastes” (Teacher 4, school 1, interview data).

In particular, teachers felt that with joint planning with SFS project staff to ensure learning objectives are met for cross-curricular subjects/links would encourage school uptake and sustain future delivery of SFS.

“Just like through sciences and through circle time in PSHE because it then it will be cross-curricular and I think a lot of more people [schools] would take it on board because so many skills can be achieved in all these different areas.. I think that would be a major selling point really” (Teacher 6, school 3, interview data).

Teachers and coaches considered it necessary to target additional year groups as well as training teachers from different year groups to create a cultural awareness of SFS within the school environment.

“You would be better coming to a staff meeting and doing it then or doing it over a couple of twilights then you’re hitting all the staff, otherwise then your only hitting one teacher and then somehow they have to deliver it... they can’t and I then can’t go to every single class and teach that... there are 12 classes and if the message went across all 12 staff then they could do it” (Teacher 4, Teacher 1, interview data).

“The way the kids body develop and psychologically as well they might forget little bits so maybe like a re-emphasises [of messages] or like maybe develop the programme where you know your targeting year 3’s year 4’s and year’s 5 so you know how to develop it differently and entertain them in a way that it keeps re- emphasising this is why we’re here, this is what we’re doing, and this is what we hope to achieve” (Coach 1, interview data).

In particular, teachers felt that SFS messages need to be reinforced among children, increasing complexity of information each year.

“I think maybe every year coming in and doing something at a different level” (Teacher 4, interview data).

4.4 Discussion

The aim of this exploratory study was to examine the acceptability and feasibility of a SFS primary school-based smoking prevention intervention from the perspectives of children, teachers and coaches. To our knowledge SFS is the first intervention in the UK to use PA to deliver smoke free messages to children within a school setting. The data from this study will be used to determine the appropriateness of SFS, explore intervention implementation and identify improvements needed to design a definitive SFS intervention based on evidence based practice.

For the successful uptake and implementation of interventions it is important that they are viewed as acceptable by the target audience. Primary schools were considered a suitable setting to deliver SFS and the use of PA to educate children about smoking was considered acceptable. Children, teachers and coaches described SFS as fun, engaging and educational. Given that research supports the use of PA to increase academic performance (Centers for Disease control and Prevention, 2010; Donnelly et al., 2011; Reed et al., 2010) participation in PA for smoking prevention rather than classroom-based learning may improve children’s academic performance. Many researchers agree that the brain is activated during

physical activity and that movement is essential for learning (Blakemore, 2003; Davis et al., 2011; Reed et al., 2010; Jensen, 2008; Pellegrini & Bohn, 2005). The positive impacts of physical movement's on the brain have prompted the promotion of movement-based physical activity in the classroom (Jensen, 2008; Lengel & Kuczala, 2010; Reed et al., 2010). Embodied cognition theories assume that direct sensorimotor interactions with the physical world are essential for gaining knowledge and developing cognitive capabilities (Engel et al., 2013). For example, in a study with preschool children, those that combined physical movements with verbalisations as they solved a complex problem showed a deeper understanding of cause and effect (Boncoddio et al., 2010). Similarly, children who gestured whilst explaining their solutions to a maths problem demonstrated enhanced learning on subsequent problems (Broaders et al., 2007). Therefore, participation in PA for smoking prevention may offer an insight into how PA could facilitate children's learning.

Whilst coaches noted the bespoke training workshop improved their knowledge surrounding smoke free messages, changes to the training and manual were made. Similar to Hilland et al (2014), modifications include adding a practical element to the training where ideas of how to deliver smoke free messages through PA are practiced. Furthermore, coaches believed it would have been beneficial to have more resources to use in their activity sessions, such as images to illustrate the impact of smoking on health. Given that sports coaches learn best by doing (Gould, 2013), future

training workshops aimed at sports coaches would benefit from including practical experience of delivery (Nelson et al., 2013).

An overall positive review of sessions was provided, however, children and teachers recalled variations in the way in which SFS sessions and messages were delivered between coaches and across classes. Focus group data with children revealed on occasions messages received were not part of the prescribed intervention. Notably, coaches were allowed to deliver activities of their choice and where appropriate, integrate key smoke free messages within sessions. Coaches indicated they had been successful in implementing key smoke free messages. The messages conveyed by coaches surrounded the contents of a cigarette, physical effects of smoking (e.g., heart, lungs, fitness and recovery) and the financial implications of smoking through various channels (e.g. dance/raps, football drills, discussions). Previous community-based and primary school-based smoking prevention interventions have delivered similar smoking education messages (see Foweather et al., 2011; Hilland et al., 2014; Crone et al., 2011). Oakley et al. (2006) have previously highlighted the importance of conducting process evaluations to assess where, when and why variations in implementation occur. Assessing intervention fidelity can explain if negative outcomes are due an ineffective intervention or to unsuitable or incomplete delivery, and explain why interventions have succeeded or failed and how intervention changes may affect outcomes and the likelihood of the intervention being implemented with fidelity (Dusenbury et al., 2003). Therefore, future SFS trials should consider measuring intervention fidelity to

provide a comprehensive picture of programme integrity (Dusenbury et al., 2003).

SFS coaches recommended basing PA sessions around smoke free themes (e.g., health, social and environmental) to assist preparation of sessions, provide structure to sessions, prevent messages from being repeated, and to increase breadth of smoking-related topics. Having clear goals and specific programme procedures in place for the delivery of activities provides clear programme structure and may reduce deviations from the intended intervention content (Mihalic et al., 2008). However, without comprising critical components of an intervention, research suggests that building flexibility into programmes is essential for successful implementation (Jaycox et al., 2006). Therefore, future SFS trials should provide guidance to intervention deliverers on components that can be adapted without undermining critical components through providing initial training, ongoing support or detailed instruction manuals (Dusenbury et al., 2003).

Whilst children and teachers considered SFS components (i.e. launch event, coaching sessions and celebration event) to be an acceptable structure to the project, teachers asserted that the celebration event should be utilised to demonstrate children's smoking related knowledge with other year groups and present children with certificates for their participation in the project and or performance-related awards (e.g., for best male and female dancer). Collectively, teachers and coaches recognised communication and organisational challenges associated with delivering SFS through multiple agencies. Specifically, challenges included class size, unwanted interference

from supply teachers towards coaches, disorganisation surrounding school timetabling, and difficulty in integrating activity sessions into the school schedule. Whilst schools are regarded as optimal settings for relaying health education messages and implementing smoking prevention programmes (Thomas et al., 2013), previous school-based studies have reported similar barriers in implementing such programmes (Fagan & Mihalic, 2003; Mihalic et al., 2008; Sly & Glanz, 2008; Bauld et al., 2009). Therefore, this highlights the importance of engaging schools in the design of future SFS trials to overcome organisational barriers.

Overall, teachers considered coaches as specialists in the delivery of sport and PA as well as being important role models for children. Sports coaches are often viewed as role models for children because they can facilitate positive development in children's behaviours and attitudes (Cote et al., 2010; Langan et al., 2013; Peptitpas et al., 2005). Therefore coaches are in a prime position to support children's health and well-being through the delivery of health education messages (Glang et al., 2010; Mazzer et al., 2012). Whilst the advantages of using coaches were recognised, all participants believed teachers could potentially deliver smoke free messages during physical education (PE). However, given that few primary school teachers are PE specialists and lack confidence in their ability to deliver such lessons (Morgan, 2008; Alfrey et al., 2012), teachers considered it necessary to have training and support packages in place (e.g., training, manual, lesson plans and visual resources) to aid delivery. Teacher training is considered an essential element of programme fidelity and a critical aspect for the

successful implementation of school-based drug abuse prevention curricula (Dusenbury et al., 2003; NICE, 2010). Based on earlier findings from the SFS community feasibility study, Hilland et al. (2014) reported that community sports coaches can be successfully trained to deliver smoke free messages, but it is not known whether primary school teachers can be trained to deliver smoking prevention education through PA and this warrants further investigation.

Teachers believed that SFS could be a sustainable method for smoking prevention education within the school setting if the appropriate resources were available to aid delivery, the intervention was catered towards the individual needs of schools, and where possible was embedded into cross-curricular activities. If SFS is proven to be effective, utilizing teachers and the school infrastructure could be a cost-effective and sustainable mode of smoking prevention education in resource-poor settings, with the potential to benefit large numbers of children (Cortina, 2008). However, it is imperative that intervention staff consult with teachers whilst developing smoking prevention curricular to ensure that intervention implementation is acceptable and feasible for delivery within the school term (Sy & Glanz, 2008). School-based interventions often compete for class time with the demands of the educational curriculum and intervention success will depend on the recognition by school management of programmes utility and practicability within an already full school schedule (Gottfredson et al., 2002). Evidence suggest that health education programmes can be integrated across the curriculum (Bonell et al., 2014), thus SFS has the potential to compliment

curriculum time and academic goals if it were embedded into children's PE and or integrated with cross-curricular links such as Personal, Social and Health Education lessons. Integrating interventions into the school schedule, particularly finding a regular class for delivery is essential for programme adoption, implementation, and sustainability (Gottfredson et al., 2002). However, it is important that schools are not over-burdened and that they perceive the intervention to be useful, otherwise they are unlikely to make the necessary changes to their daily activities to fully implement the intervention or to even implement it at all (Fagan & Mihalic, 2003; Mihalic et al., 2008).

A major strength of the study is the triangulation between children, teachers and coaches, which decreases the risk of misinterpreted views and therefore potentially inaccurate data (Shenton, 2004). Further, focus groups with children allowed an insight into their perspectives of SFS, respecting the expert knowledge of the participant (Levine & Zimmerman, 1996). There are also several limitations of this study. Firstly, given that this was a qualitative formative evaluation, the impact of SFS was not assessed. However, the formative research enabled in-depth data to be gathered surrounding the acceptability and feasibility (Nutbeam & Bauman, 2006) of SFS from the perspectives of children, teachers and coaches. Secondly, primary schools were located in one deprived area of Liverpool thus limiting the generalisability of findings to other regions of Liverpool. Finally, process data on participants' perspectives of SFS were only collected post-intervention, which may have impacted on participant recall. Future research should

consider incorporating process evaluation procedures throughout the intervention period to ensure programme implementation and quality (Audrey et al., 2006). However, the results suggest that SFS is an acceptable and feasible method for delivering smoking prevention education to children within a primary school setting. However, further improvements to the content and delivery of a larger SFS intervention are needed (see recommendations below). Whilst the findings from Study 1 indicate that majority of Liverpool primary school children have not yet tried smoking, PA offers a potential strategy for smoking prevention education among primary school children. As schools are a platform for children's health education and have the potential to benefit a large number of children, results suggest that schools are ideal settings for the delivery of SFS.

Recommendations

Key recommendations for future practice and research include the following:

- A practical element of the bespoke training should be included where ideas of how to deliver activity sessions are practiced.
- Each activity session should be based on a SFS theme (e.g. smoking and health, smoking and sport performance, and smoking and social influences).
- The SFS celebration event should highlight the end of the intervention, showcase children's smoking related knowledge with other year groups, and be a forum to present children with certificates for their participation and performance related rewards.

- Develop training and support packages for teachers; ensuring that flexibility is built into the implementation plan that allows schools to tailor their approach to delivery.
- Consult teachers in the planning and designing of future SFS trials to identify effective ways to embed SFS cross-curricular links and ensure programme acceptability. Incorporate process evaluation measures during the intervention period to monitor programme implementation and quality.

Chapter 5

**Study 3: The impact of SFS on 9-10 year old
preadolescent's smoking-related intentions, attitudes
and refusal self-efficacy**

Thesis study map: Study 3

Study	Objectives
<p>Study 1: The influence of mother, father, sibling and friend smoking on 9-10 year old primary school children's smoking-related intentions, attitudes and refusal-self-efficacy</p>	<p>Objective:</p> <ul style="list-style-type: none"> To examine the association between social factors on boys and girls smoking-related intentions, attitudes and refusal self-efficacy <p>Key Findings:</p> <ul style="list-style-type: none"> Compared to girls, boys had lower non-smoking intentions, refusal self-efficacy, and were less likely to agree that smoking is 'definitely' bad for health Friend smoking was negatively associated with non-smoking intentions in girls and boys, Friend smoking was negatively associated with refusal self-efficacy in girls only Sibling smoking was negatively associated with non-smoking intentions in girls but a positive association was found in boys Boys who had a smoking friend had lower odds of 'definitely' believing that the smoke from other people's cigarettes is harmful and that that smoking is bad for health Boys with a smoking sibling had lower odds of 'definitely' believing smoking is bad for health
<p>Study 2: A formative study to explore the acceptability and feasibility of SFS within primary school settings</p>	<p>Objective:</p> <ul style="list-style-type: none"> To explore the feasibility and acceptability of using SFS as a mechanism to deliver smoking education messages within primary school settings from the perspectives of children, teachers and coaches <p>Key Findings:</p> <ul style="list-style-type: none"> The structure of SFS (launch event, coaching sessions, and celebration event) was considered acceptable by teachers: although it was suggested that the celebration event could be utilised to showcase children's smoking knowledge and present awards Overall, children, teachers and coaches provided a positive review of sessions. Activities delivered appeared to vary between classes. Moreover, it was reported sessions sometimes lacked structure and became repetitive, and teachers noted inconsistencies in the content of messages between coaches Schools were considered a suitable setting to deliver SFS, and the use of PA to deliver smoke free education messages was considered acceptable; Children, teachers and coaches believed teachers could deliver smoke free messages during PE lessons
<p>Study 3: Examine the impact of SFS on children's smoking-related intentions, attitudes and refusal self-efficacy</p>	<p>Objectives:</p> <ul style="list-style-type: none"> To investigate the short-and mid-term effectiveness of SFS on children's smoking-related intentions, attitudes, and refusal self-efficacy Explore perceived impact of SFS from the perspectives of children, teachers and coaches.

Chapter 5

Study 3: The impact of SFS on 9-10 year old smoking-related intentions, attitudes and refusal self-efficacy

5.1 Introduction

SmokeFree Sports (SFS) is considered an acceptable and feasible method to deliver smoking prevention messages to children within a primary school setting (see Study 2, Chapter 4 for further details).

Despite a general downward trend in smoking among adolescents over the past decade, the prevalence of smoking among youth continues to be problematic in the UK. According to the Health and Social Care Information Centre (2014), one-fifth of 11 to 15 year olds have tried smoking. Di Franzea et al. (2007) suggest that a person's first puff of a cigarette represents the beginning of a rapid process that leads to symptoms of nicotine dependence. The earlier children start smoking, the higher their chances are of becoming a regular smoker and the more difficult it becomes to quit (Tyas & Pederson, 1998). Many authors state that prevention efforts should be aimed at preventing or delaying smoking (Kelder et al., 1994), implying the need to target children between the ages of 9-12 years (O'Loughlin et al., 1998). This is consistent with recommendations by National Institute for Health and Care Excellence (NICE, 2010) to start smoking prevention interventions in primary school. Despite their young age, some preadolescent children develop intentions to smoke in the future, which increases their likelihood of subsequent smoking (Andrews et al., 2003). Intention, in turn, is determined by smoking-related cognitions such as attitudes, beliefs and self-

efficacy (Andrews et al., 2008; Otten et al., 2009; Song et al., 2009). Although smoking rates among primary school children are low (0.5% smokes daily at 11 years old), prior research (O'Loughlin et al., 1998) has indicated that the smoking onset process starts earlier among children living in low income, inner city neighbourhoods. Smoking rates are more prevalent among adolescents from low socio-economic groups compared to those from high socio-economic groups (Hanson & Chen, 2007) and it is likely that this difference is associated with higher smoking intentions (Cremers et al., 2014) or initiating smoking at a younger age (O'Loughlin et al., 1998). Therefore, starting a prevention programme in primary school could produce stronger and more durable prevention effects, particularly for children residing in socially deprived neighbourhood's, where the need for smoking prevention is proportionally greater.

School-based health programmes have the potential to be effective in preventing smoking uptake (Flay et al., 2009; Thomas et al., 2013) because they offer a distinct opportunity to access to large numbers of children and constitute an efficient delivery system for disseminating health promotion messages (Ringwalt et al., 2010). Intervening with prevention approaches during preadolescence is based on the notion that it is imperative to 'inoculate' children against smoking in order to generate resistance to future smoking (Evans, 1998), a notion that is based on the assumption that it is often easier to prevent a behaviour before it starts than it is to change a negative health behaviour once adopted (Spath et al., 2008). Several school-based studies that have evaluated preadolescent substance use prevention

programmes have found favourable results. In a systematic review of school-based substance use programmes (alcohol, tobacco and other drugs), Hopfer and colleagues (2010) found that most programmes increased children's knowledge of substance risks, increased negative attitudes towards substance use and decreased substance use intentions. Andrews and colleagues (2011; 2014) evaluated the short and long-term efficacy of a school-based computer-based smoking prevention programme and found that pupils who received the intervention had lower intentions and willingness to smoke in the future compared to pupils who did not receive the programme. Crone et al. (2011) examined the immediate and long term effects of a school-based education programme on smoking intentions, attitudes towards smoking, social influences to smoke and smoking behaviour. Children who received the education programme displayed more negative attitudes toward smoking but no differences were observed for smoking intentions and social influences to smoke between the two groups. However, one year after the intervention, children displayed significantly higher non-smoking intentions and smoked less than the control group. Whilst these prevention approaches demonstrate positive short and long-term effects on children's smoking-related intentions, attitudes, self-efficacy and behaviour, there is a lack of interventions conducted among preadolescent children from the UK. Moreover, previous preadolescent prevention approaches have predominately comprised of classroom-based education and included broad-based health promotion efforts.

Physical activity participation is considered to be protective against smoking uptake in youth (Kaczynski et al., 2008; Horn et al., 2013) and it is recommended that physical activity be considered as an active component of future smoking prevention protocols (Audrian-McGovern et al., 2003; Audrian-McGovern et al., 2013). School physical education (PE) provides a context for regular and structured physical activity participation (Fairclough & Stratton, 2005). Moreover, health-based PE is considered imperative for promoting knowledge and skills required to lead healthy lifestyles (Alfrey et al., 2013). Therefore school PE could be utilised as one avenue to deliver health promotion messages to children, such as smoking prevention. The use of physical activity as a mechanism to deliver smoking prevention education could provide an alternative strategy for preadolescent health promotion. Smoking prevention programmes that have incorporated interactive and participatory learning techniques to stimulate active participation of pupils have been found to be more effective than didactic and non-participatory prevention approaches (Botvin et al., 2007, Soole, 2008). From an educational perspective, the available evidence suggests that physical activity participation improves cognitive functioning, aiding children's learning through improved concentration (Norlander et al., 2005), attention (Maher et al., 2011) and memory (Kamijo et al., 2011). This has promoted some educational experts to propose techniques and guidelines to incorporate movement-based physical activity into the academic curriculum (Jensen, 2008; Lengel & Kuczala, 2010). Whilst it is recommended to incorporate physical activity into smoking prevention initiatives this has not been done in school-based prevention interventions.

Most major smoking prevention programmes are designed for adolescents (Thomas et al., 2013) and those that have targeted preadolescent children have been conducted outside the UK (Thomas et al., 2013). The present study aims to fill the significant gap in the UK evidence base by evaluating the impact of a unique multi-component intervention named SFS, which used physical activity as a mechanism to deliver smoking prevention education to 9-10 year old primary school children. Based on the feedback received from children, teachers and coaches (Chapter 4, Study 2) improvements to the content and delivery of a larger SFS definite trial were made. The purpose of this study was evaluate both the short and mid-term effectiveness of SFS on smoking-related intentions, attitudes and refusal self-efficacy among preadolescent children residing in one of the most deprived local authorities within the UK.

5.2 Design and Methods

Intervention effectiveness was assessed by means of a non-randomised controlled trial. Due to funding requirements it was not possible to randomise schools to the intervention; therefore schools were clustered into two groups:

1. Intervention group (Liverpool primary schools; n=32) received their usual smoking-related education plus SFS
2. Comparison group (Knowsley primary schools; n=11) continued with their normal smoking-related education. Whilst it is not compulsory to address smoking education in the Key Stage 2 of the UK National

Curriculum, it is at the schools discretion to include it within PHSE. However, details surrounding the delivery of smoking prevention in the comparison schools were not collated. The comparison schools were informed at the beginning of the study that they would be given the SFS training manual at the end of the intervention. They were not informed of the final contents of the intervention or the training manual at the start of the study.

Participants and procedures

Participants and procedures were as described in the cross-sectional study (see Chapter 3, Study 1). Briefly, 154 mainstream state primary schools across Liverpool (n=104) and Knowsley (n=50) local authorities were eligible for the study and were subsequently invited to take part. Forty-three primary schools (27.9%) across Liverpool and Knowsley consented to participate. Baseline data was collected in September and October 2012. Post intervention measures were completed immediately following the intervention in May and June 2013, and follow-up assessments were completed in May and June 2014 (approx. 18 months from baseline). Full details surrounding the flow of schools and participants through the study are provided in Figure 5.3.

Description of the intervention

SFS was a primary school intervention that used physical activity as a mechanism to deliver smoking prevention education to 9-10 year old children (Year 5). SFS was delivered in the 2012-13 academic cycle, between

October 2012 and May 2013. A schematic overview the intervention activities and research measures are shown in Figure 5.1

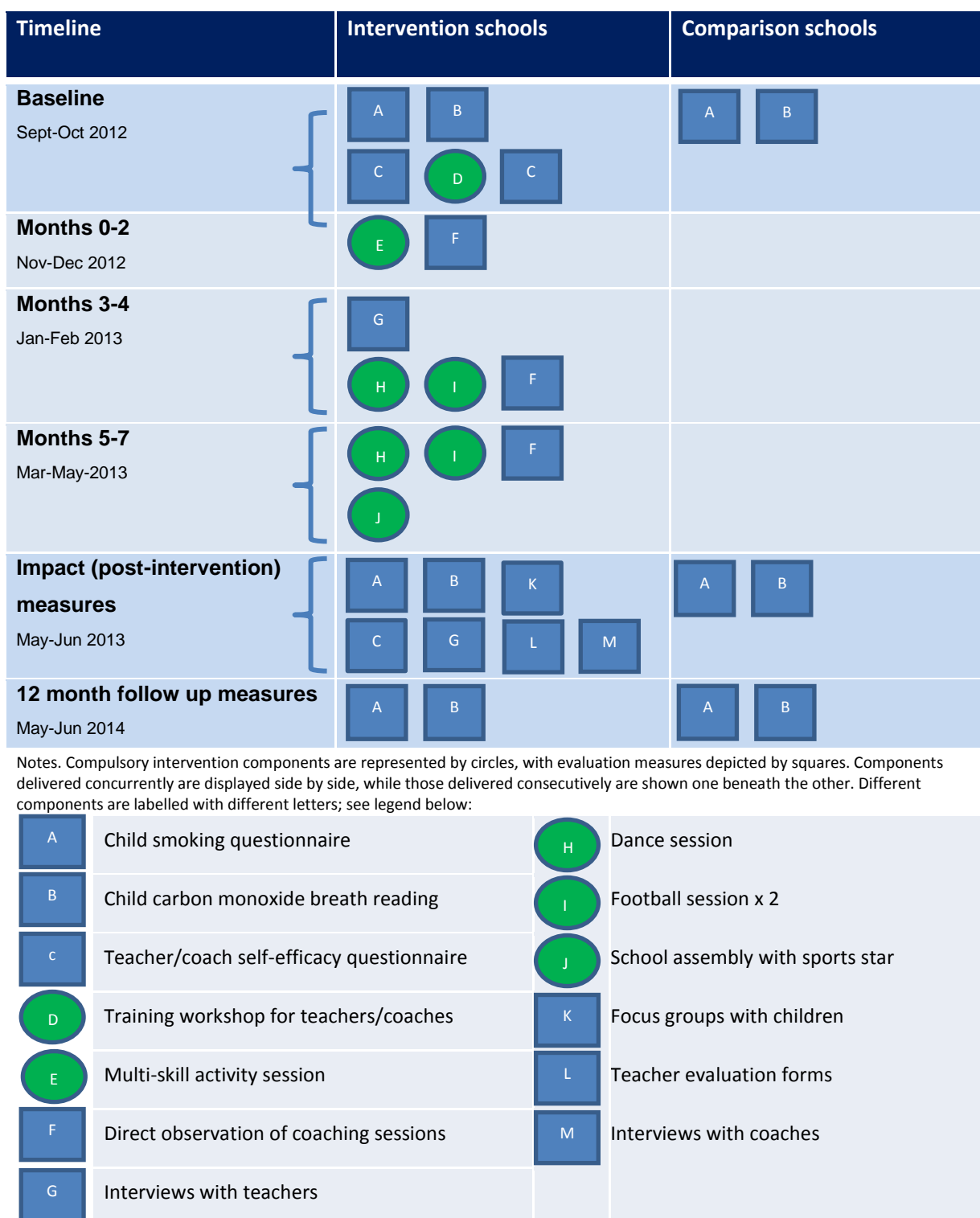


Figure 5.1 Schematic overview of SmokeFree Sports intervention and evaluation components

Partners and stakeholders

SFS was managed within the Physical Activity Exchange at LJMU in partnership with Liverpool PCT. In spring 2012, Physical Activity Exchange undertook a process of identifying and engaging stakeholders and partners who had a vested interest in the project outcome and could bring skills and resources to assist with intervention design and development. Upon inviting stakeholders and partners to take part, we discussed expectations for collaboration and assessed if these were within the objectives of SFS. Key stakeholders and partners invited to join the project included representatives from Liverpool City Council, Liverpool Community Health, the Centre for Public Health at LJMU, St George's University, Merseyside Sports, Healthy Stadia, Liverpool Healthy School's Team, Florence Melly Primary School, Everton in the Community, Liverpool FC Foundation and Alder Hey NHS Trust. Once the steering group was formed we discussed contributions and level of involvement of each stakeholder and developed a plan to obtain the commitment of stakeholders. Though some initial stakeholders withdrew from collaboration, new stakeholders were identified and invited to join the steering group to ensure the collaboration remained vibrant, bringing new skills and resources to the collaborative effort. A research sub-group was also established to guide the project evaluation.

Target population

Year 5 children (aged 9-10) were the focus of SFS city-wide primary school intervention because evidence suggests that smoking patterns begin prior to experimentation, with the development of attitudes and beliefs (Porcellato et

al., 1999). Furthermore, since the smoking behaviour of primary school children is low (0.3% smokes daily at ages 8-11years), preadolescents represent an important cohort to intervene with smoking prevention efforts. Although it not mandatory to address smoking education in Key Stage 2 of the UK National Curriculum (Department for Education, 2013), the NICE (2010) guidelines postulate that smoking prevention efforts would be most effective if they began in primary school.

Intervention design

Theoretical model

A socio-ecological model was used to guide the intervention components. This model recognises the importance of intrapersonal, interpersonal, organisational and policy structures on smoking behaviour and how they can both work independently and synergistically to impact behaviour (Kacznynski et al., 2008). In addition, a logic model was also used to guide the design of the SFS intervention (see Figure 5.3). A logic model attempts to convey visually the connection between programme activities and the programmes desired outcomes; that is, the *logic* of how the intervention elements might cause the programmes goals and objectives to be achieved (Nutbeam & Bauman, 2006). Logic models are often used in the planning and evaluation of health promotion projects (Goodstadt, 2005; Bartholomew et al., 2011) since they offer a visual representation of the programme's theory for change (i.e. how the intervention aims to prevent the onset of smoking among children) (Coffman, 1999) and a rationale for programme activities. The logic model displayed in Figure 5.2 represents the anticipated causal relationship

between the planned input (resources, project partners and formative work), activities (recruitment, development of resources and delivery of intervention components), outputs (number of participants recruited, and intervention activities delivered), outcomes (immediate and short/mid-term outcomes) and impact of the intervention (short and long-term impact of the intervention) (Coffman, 1999; The Health Communication Unit, 2007).

Intervention components

Intervention Deliverers

The SFS intervention was co-ordinated by two full time researchers at LJMU. SFS sub-contracted three partner organisations to support delivery of the intervention, including Everton FC in the Community, Liverpool FC Foundation and Liverpool City Council. These partner organisations supplied qualified sports coaches and instructors (termed SFS coaches hereafter) to deliver intervention components (as specified below). The SFS coaches had between two and ten years coaching experience. To increase the sustainability of the intervention, attempts were made to utilise primary school staff that delivered physical education (including class teachers, PE coordinators, teaching assistants and external sports coaches).

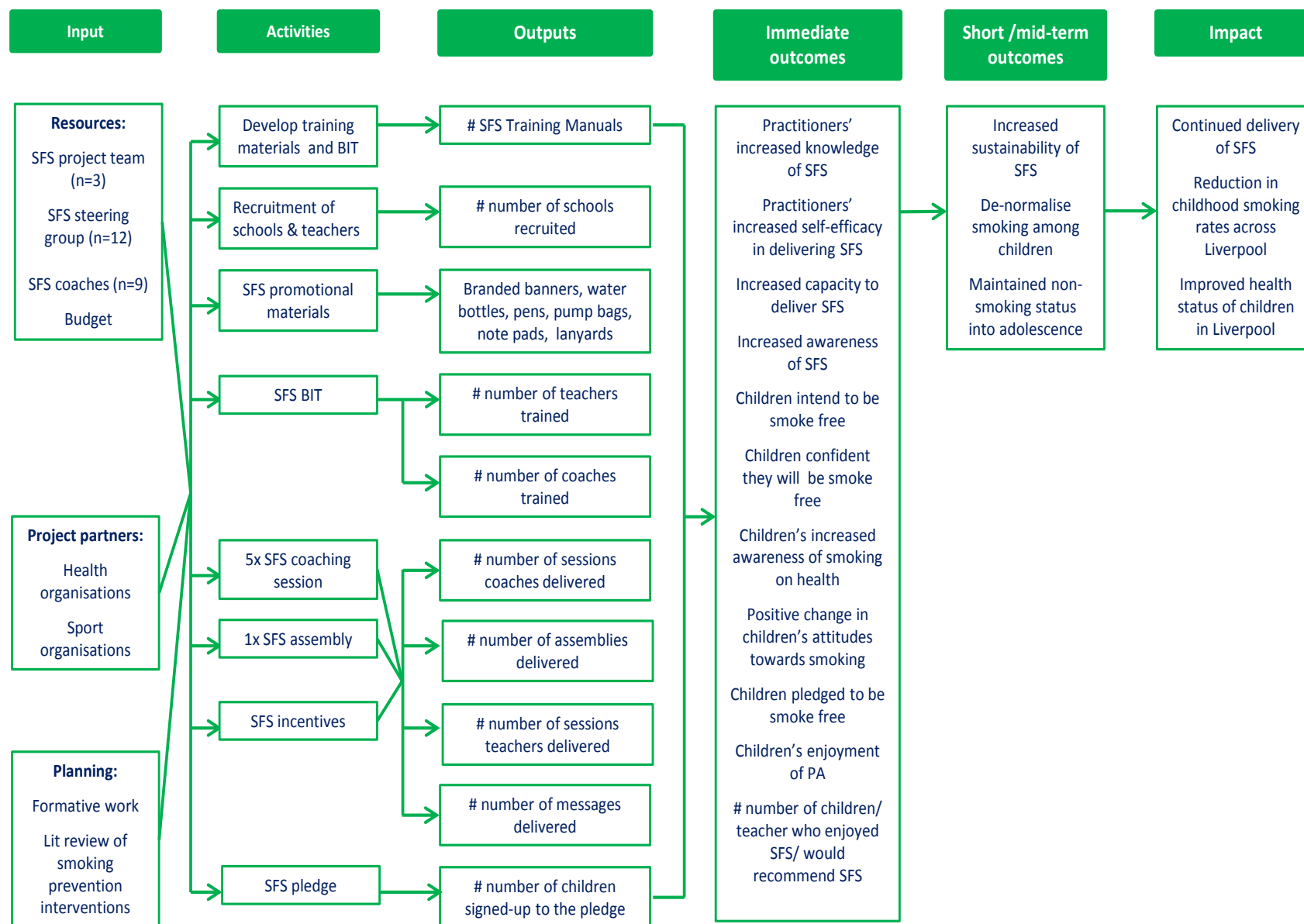


Figure 5.2 Logic model overview of SmokeFree Sports 2012-13 intervention

Training for SFS delivery

In line with NICE (2010) recommendations which stipulates staff who are working in smoking prevention should be sufficiently trained, SFS coaches and at least one teacher from each participating school were required to take part in a bespoke training workshop. The aim of the training was to provide coaches and teachers with the knowledge and skills necessary to deliver smoke free messages to children through physical activity. The training provided information about SFS intervention, as well as key facts about smoking relating to prevalence, social influences and its impact on health and sport. The training was delivered over three hours and comprised of two-hours of theory and a one hour practical session held within a local leisure centre during school hours. Training coaches and teachers to deliver health promotion education such as smoking prevention is considered imperative since many do not have the knowledge or the confidence to deliver smoking prevention messages or deliver physical activity sessions (King et al., 2010; Kealey et al., 2000; Morgan & Burke, 2008). According to Bandura (1997), self-efficacy beliefs are constructed by the individual through mastery experiences, vicarious experiences, verbal persuasion and emotional arousal. Previous SFS training workshops for coaches and teachers have demonstrated positive effects on self-efficacy to deliver smoke free messages to children through the medium of physical activity (Hilland et al., 2014; Garnham-Lee et al. under review).

Based on feedback received from coaches and teachers feasibility studies (Hilland et al., 2014; Study 2, see Chapter 4) the training was modified and

included practical demonstrations surrounding the delivery of smoke free messages through physical activity. During the training participants were informed of the SFS key messages to promote to children throughout activity sessions (see Table 5.1), and given tips on how to do this in a sensitive but effective manner through physical activity. The training was delivered between October 2012 and February 2013. Teachers completed the training by November 2012 and were asked to feedback information to colleagues. All SFS coaches received the training prior to delivering SFS sessions in schools. The theory components of the training were delivered by two members of the SFS research team, the Liverpool Community Health SmokeFree Coordinator and a trainee NHS Health Trainer, whilst the practical session was led by Liverpool City Council multi-activity sports coaches and a dance instructor.

Table 5.1 Examples of SFS key messages for delivery to children

•	Key Messages*
•	Smoking cuts down on fitness.
•	Smoking reduces the amount of oxygen you can take in.
•	A smoker's heart beats faster than that of a non-smoker.
•	A non-smoker can recover from strenuous exercise quicker than those who smoke.

*Additional messages were delivered during the delivery of sessions in accordance to SFS key themes

SFS training packs

To support the implementation of the intervention in schools, SFS coaches and teachers representing each school received SFS training packs, consisting of a SFS training manual and smoke free pledges for children. The training pack components were adapted from the Tobacco Free Athletes programme (www.tobaccofreemaine.org). The training manual summarised

information covered in the bespoke training and included ten session plans for delivery. Session plans were designed to cover at least one of the five SFS themes: 1) smoking and health, 2) smoking and sport performance, 3) the contents of a cigarette and financial cost of smoking, 4) smoking and social influences and 5) the benefits of participating in physical activity.

Research suggests that effective smoking prevention programmes are those that are guided by a comprehensive theoretical framework that target diverse mediating mechanisms (Botvin & Griffin, 2007). Thus, SFS was designed to target several mechanisms from diverse cognitive theories including the Health Belief Model (Becker & Maiman, 1975), Theory of Planned Behaviour (Ajzen, 1985) and Social Cognitive/learning Theory (Bandura, 1977). Moreover, the SFS themes were based on feedback received from coaches in the SFS formative study (see Chapter 4, Study 2) and from discussions with steering group members (e.g., academics, researchers, health practitioners and teachers). Once the themes and learning outcomes were agreed by project partners, session plans were designed by SFS coaches and initially reviewed by the SFS research team. On agreement of planned activities for each session between researchers and coaches, teachers reviewed the session plans, ensuring their usability and alignment with the National Curriculum outcomes for Key Stage Two. Session plans included learning and PE Curriculum outcomes, key messages for delivery and details of activities. Each session plan was designed to last for 60 minutes and included a 'SFS starter' (one or two warm-up activities), at least one main activity and a cool down. To engage children, each activity was

given a child-friendly name (e.g. 'Nicotine Attack'). See Table 5.2 for examples of activities included in the session plans.

Table 5.2 Example activity included in the training manual

Session type	Theme of session	Learning outcomes	SFS Key messages to be delivered	Example game
Multi-skill	Smoking and health	Describe the long and short term effects of smoking on health Recognize the advantages of being smoke free	Young smokers produce phlegm (Yuck!) more than twice as often as those who don't smoke	Clear it out! In teams ('non-smoker' vs. 'smoker'), children complete a hockey obstacle course by dribbling a large foam ball through a channel (made with ropes and slalom of cones). This represents the journey that phlegm takes down the throat and through the respiratory tract culminating in the lungs (represented using a hoop). Once through the obstacle course, children have to hit the ball into the hoop from a distance of around three metres (space dependant) until it stays in. The 'non-smoking' team then pick the ball up and run back with it, whilst the 'smoking' team must travel back not using their hands (with the ball between their feet) to show smokers difficulties in getting phlegm up.

* Note: Additional key message delivered in accordance with the SFS key themes

Teachers were also incentivised to independently deliver a minimum of five session plans to Year 5 classes over the 2012/13 academic year. Schools who met this requirement, and completed an evaluation for each session, received SFS branded sports equipment (sports cones and bibs) at the end of the intervention. Teachers were also asked to encourage children to sign the SFS pledge to be smoke free. It was recommended that children were given the opportunity to sign the smoke free pledge following the delivery of a SFS session delivered by a coach or a teacher.

SFS coaching sessions and assembly

SFS coaches delivered five coaching sessions during school hours at each intervention school between October 2012 and April 2013. Generally, SFS coaching sessions replaced usual PE lessons. Schools received one multi-skill (delivered by Liverpool City Council sports coaches), two dance (delivered by Liverpool City Council instructors) and two football sessions (one delivered by Everton in the Community and one by Liverpool FC Foundation coaches). Session plans were included in the training manual and were designed so that the five sessions delivered by coaches would cover information on all five SFS themes.

On completion of the SFS coaching sessions schools received a SFS assembly from a local sports star between April and May 2013 to celebrate children's participation in the intervention. During the assembly a member of the SFS research team re-capped smoke free messages through a question and answer session with children, prior to the local sports star discussing their sporting achievements and the importance of being smoke free. The assembly concluded with a question and answer session between the SFS sports star and children before each child received a certificate for participating in the project. Based on school preferences, assemblies were delivered to the whole school, all junior year groups or only Year 5.

SFS branded material

As an incentive to participate in the research, children received SFS branded water bottles, drawstring bags and pens. Children from comparison schools were given SFS branded material for participating in the study (water bottle

and drawstring bag). On completion of data collection at follow-up, children in comparison schools also received a SFS branded pen and each school received a SFS training pack.

Measures

Smoking questionnaire

To assess the impact of SFS on smoking-related intentions, attitudes and refusal self-efficacy, children completed a smoking questionnaire at baseline, post-intervention (two-week post-intervention) and again at follow-up (approx. 12 months post intervention). The questionnaire is described in the cross-sectional study (see Chapter 3, Study 1). To validate self-reported smoking behaviour, carbon monoxide (CO) concentrations in expired air were taken and recorded following children's completion of the questionnaire.

Focus groups with children

To produce more complete knowledge to inform theory and practice as well as providing stronger evidence through the convergence and corroboration of findings (Nutbeam & Bauman, 2006; Johnson & Onwuegbuzie, 2004), mixed-sex focus groups (n=18) were facilitated with children (n=95; 45% boys). Focus groups explored children's responses to the smoking questionnaire, appropriateness of the intervention, and improvements for future implementation. Key topics discussed included perspectives on the games delivered; recall of games and smoke free messages; quality of deliverers; and views for improvement of the intervention. For the purpose of this study, the topics reported will include; recall of games and smoke free

messages, and views for improvement of the intervention. The remaining topics are discussed elsewhere (Foweather et al., 2013). During the focus groups photographs of SFS games were used to help children recall activity type, a technique recommended by other researchers working with children (Morgan et al., 2002; Epstein et al., 2006). To aid the credibility of data, member checking of facilitators' interpretations took place throughout the focus groups. Each group comprised of five to six children, facilitated by a trained member of the research team (CM or JT), lasted between 30 to 50 minutes and audio recorded using a Dictaphone.

Interviews with teachers and coaches

Semi-structured interviews with teachers (n=20; 13 females) and coaches (n=7; 6 males) were conducted to explore their perceptions and experiences of the SFS intervention. Interviews with teachers took place within the school setting within two weeks of the intervention ending (defined as the delivery of a SFS assembly). Interviews with coaches were conducted face-to-face at coaches or researchers workplace (n=6) or via telephone (n=1) within three weeks of delivery completion. Semi-structured interview schedules were designed to cover all aspects of the SFS intervention, including training, SFS manual, coaching sessions and assembly, as well as their opinions surrounding qualities of SFS deliverers'. In addition teachers were asked about the delivery of their own sessions, and their school's engagement with the intervention. Opportunities were given at the end of each interview for teachers and coaches to make comments about topics that had not been covered. To aid the credibility of data, member checking of facilitators'

interpretations took place throughout the interviews. All interviews were audio recorded and lasted between 30 and 60 minutes.

Analysis

Prior to data analysis, questionnaires were collected and checked for normality using descriptive statistics. Multilevel linear and logistic regression analyses examined continuous and dichotomous outcomes measures respectively. A three-level data structure was initially conducted where children were defined as the first unit of analysis, class as the second level unit, and school as the third level unit (Twisk, 2006). Class and school were included as levels in the analyses to adjust for clustering which could influence the effect of the intervention on children's smoking-related intentions, attitudes and refusal self-efficacy (Twisk, 2006).

Separate analyses for boys and girls were conducted to assess intervention effects between baseline and post-intervention, and baseline and follow-up. 'Crude' exploratory models were initially constructed to determine whether class and schools were significantly influential to warrant their inclusion as levels. If they were not, these levels were removed resulting in models with two or three level data structures. 'Adjusted' analyses were completed using the final crude models and controlled for the effects of parental (mum and dad smoking), sibling, and friend smoking, and IMD, which are known to influence children's smoking intentions and cognitive vulnerability to smoking (Schuck et al., 2012; Cremers et al., 2014; see Chapter 3, Study 1). To determine whether the intervention effect was different for boys and girls, an

interaction term (labelled 'sex') with a dichotomous covariate was constructed. Regression coefficients in the models were assessed for significance using the Wald statistic with one degree of freedom. Data were analysed using MLwiN 2.30 software (Centre for Multi-level Modelling, University of Bristol, UK). Statistical significance was set at $p < 0.05$, and at $p < 0.10$ for the sex interaction term (Twisk, 2006). Child focus groups, teacher and coach interviews were transcribed verbatim, imported into NVivo 10 software, and subjected to thematic analysis (Marshall & Rossman, 2006). See Chapter 4, Study 2 for a description of the thematic analysis procedure.

5.3 Results

In total, 972 children were included in the final analysis (intervention $n=731$; comparison $n=241$). The CONSORT (Figure 5.1) shows the flow of schools and participants through the study. Two intervention schools withdrew from the study due to internal staffing issues, prohibiting collection of post-intervention and follow-up data at these schools. Participant retention ranged from 83% (baseline) to 79% (follow-up) in the comparison group. The intervention group's retention ranged from 84% at baseline to 69% at follow-up. However, the withdrawal of two intervention schools automatically excluded 17 children at post-intervention and 51 children at follow-up. Had the schools not withdrawn and assuming all the children would have continued through the study, the retention at follow-up would have been 75%.

Table 5.1 shows the baseline characteristics of children in the intervention and comparison schools. Overall, compared to children in the control schools, a higher proportion of children in the intervention group agreed it is definitely difficult to quit smoking once started ($P<0.05$). Further, significantly more girls in the intervention group had higher non-smoking intentions ($P<0.05$), agreed it is definitely difficult to quit smoking once started ($P<0.05$) and that the smoke from other peoples cigarettes is definitely harmful to health ($P<0.05$) compared to girls in the comparison schools. No significant differences ($P>0.05$) were observed on the remaining variables.

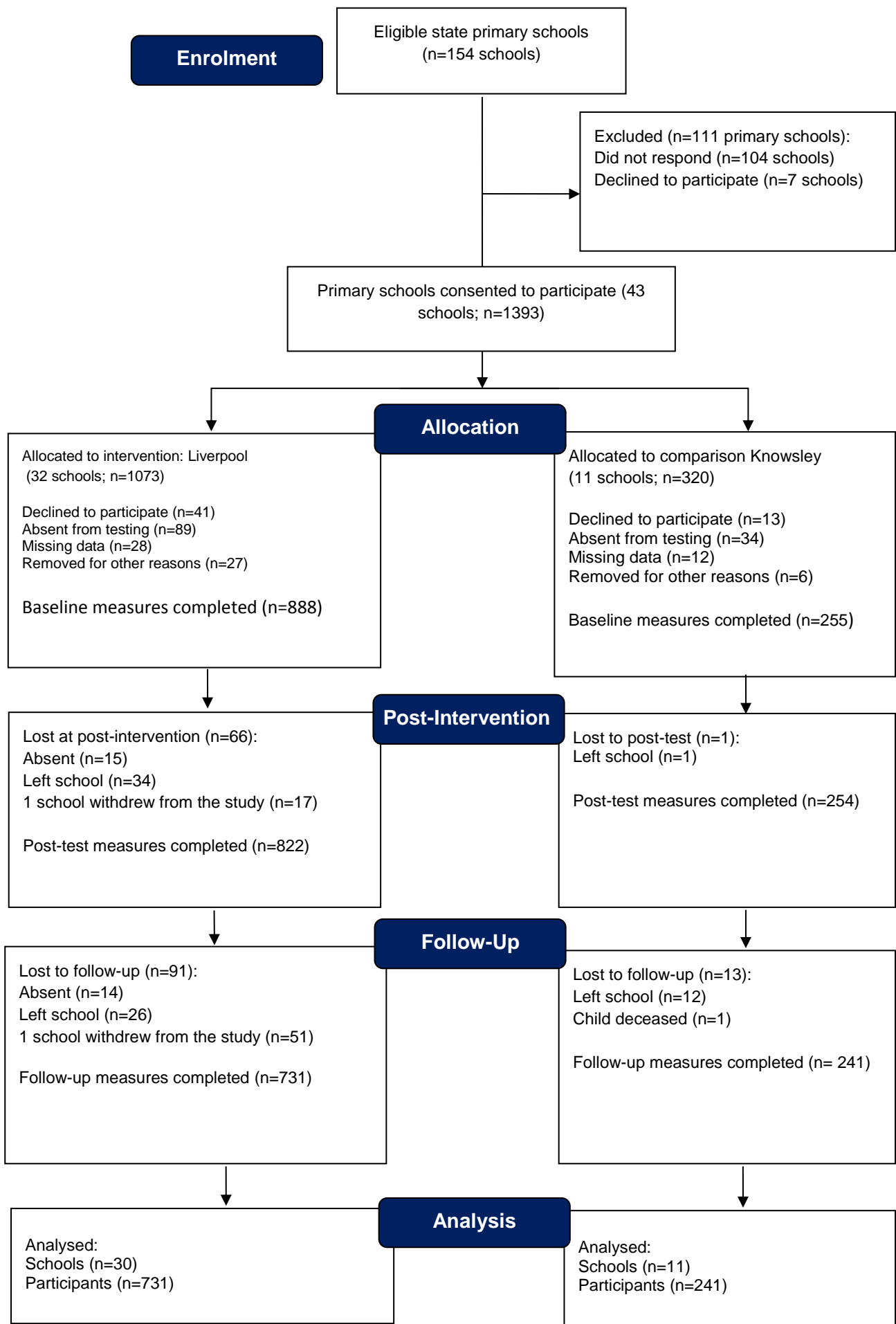


Figure 5.3 Flow of participants and schools through the study.

Table 5.3 Baseline descriptives of children in the comparison and intervention group

	Comparison			Intervention		
	All (n=241) M±SD or %	Boys (n=114) M±SD or %	Girls (n=127) M±SD or %	All (n=731) M±SD or %	Boys (n=369) M±SD or %	Girls (n=362) M±SD or %
Demographics						
Age (years)	9.6±0.3	9.6±0.3	9.6±0.3	9.6±0.3	9.6±0.3	9.6±0.3
Ethnicity (White British)	98.3	99.1	97.6	82.1	82.6	81.5
Deprivation level (IMD)	50.9±17.9*	49.8±17.7*	51.9±18.2*	55.7±16.4*	55.5±16.5*	55.8±16.3*
Social Influences						
Mother smoking	40.7	39.5	41.7	34.9	32.2	37.5
Father smoking	43.6	47.4	40.2	38.2	38.0	38.4
Sibling smoking	10.8	10.5	11.0	9.2	8.0	10.4
Friend smoking†	18.7	25.4	12.6	17.1	22.9	11.2
Smoking Intentions						
Total non-smoking intentions (range 4-12)	11.7±1.0	11.6±1.1	11.7±0.9*	11.8±0.8	11.7±1.0	11.9±0.5*
Self-Efficacy						
Total refusal self-efficacy (range 3-15)	13.5±3.2	13.5±3.1	13.5±3.3	13.7±3.0	13.4±3.3	14.0±2.7
Attitudes towards smoking						
Smoking is bad for health ('definitely yes')	88.8	87.7	89.8	90.1	86.2	94.1
Safe to smoke year or two ('definitely not')	59.8	60.5	59.1	64.4	63.6	65.3
Difficult to quit once started ('definitely yes')	43.2*	45.6	40.9*	52.8*	51.2	54.3*
Others smoke harmful to you ('definitely yes')	59.3	60.5	58.3*	66.1	63.1	69.2*
Effects sports performance ('definitely yes')	51.0	53.5	48.8	58.3	59.2	57.4
Makes you gain/lose weight ('no difference')	42.3	37.7	46.5	42.6	45.2	40.1

Notes: IMD, Indices of multiple deprivation score [45]; (†) at least one friend smokes or tried. Independent t-tests and chi-square statistics were used to determine differences in means and percentages, respectively. *Significant differences (P<0.05).

Intervention effects

Non-smoking intentions

In the adjusted analyses no significant intervention effects were observed between baseline and post-intervention (Table 5.4) or between baseline and follow-up (Table 5.5) for non-smoking intentions. However, intervention participant's non-smoking intentions values remained high at follow-up.

Attitudes towards smoking

In adjusted analyses significant intervention effects were observed on five of six attitude items between baseline and post-intervention (Table 5.4). Compared to children in the control group, children who received the SFS intervention had higher odds of believing: it is 'definitely not' safe to smoke for a year or two as long as you quit after that (OR =1.79, 95% CI: 1.27, 2.54, $P < 0.001$), it is 'definitely' difficult to quit smoking once started (OR =2.64, 95% CI: 1.48, 4.73, $P < 0.001$), smoke from other peoples cigarettes is 'definitely' harmful to you (OR =1.66, 95% CI: 1.23, 2.24, $P < 0.001$), smoking 'definitely' effects sports performance (OR =6.83, 95% CI: 1.58, 2.26, $P < 0.001$), and smoking makes 'no difference' to weight (OR =4.50, 95% CI: 1.84, 11.00, $P < 0.001$).

Between baseline and follow-up (Table 5.5) significant between-group differences were observed on three of six attitude items. Compared to children in the control group, children who received the SFS intervention had higher odds of believing: it is '*definitely*' difficult to quit smoking once started (OR =1.34, 95% CI= 0.99, 1.82, $P = 0.05$), smoke from other people's cigarettes is '*definitely*' harmful to you (OR =1.39, 95% CI: 1.02, 1.86, P

=0.04), and smoking '*definitely*' effects sports performance (OR =3.96, 95% CI: 1.75, 9.00, P <0.001). No intervention effects were observed for the remaining attitude items at follow-up.

Refusal self-efficacy

In the adjusted analyses no significant intervention effects were observed between baseline and post-intervention (Table 5.4) for refusal self-efficacy. At post-intervention between-group differences were observed for refusal self-efficacy, which approached statistical significance (β =0.35, 95% CI: -0.02, 0.73, P =0.07) among the intervention group. At follow-up (Table 5.5) significant between-group differences were observed for refusal self-efficacy (β =0.32, 95% CI: 0.03, 0.60, P =0.03).

Table 5.4 Multilevel analyses of the effectiveness of the SFS intervention between baseline and post-intervention

Outcome measure	Crude model ^a		Adjusted model ^b	
	β or OR (95% CI)	P	β or OR (95% CI)	P
No intention to smoke in the future	0.05 ^c (-0.05, 0.15)	0.34	0.06 ^c (-0.04, 0.16)	0.24
Cigarette self-efficacy	0.28 ^c (0.07, 0.63)	0.13	0.35^c (-0.02, 0.73)	0.07
<i>Attitudes Towards Smoking</i>				
Smoking cigarettes is bad for health? (<i>definitely yes</i>)	1.40 ^d (0.83, 2.36)	0.21	1.52 ^d (0.89, 2.60)	0.12
It is safe to smoke for only a year or two as long as you quit after that? (<i>definitely not</i>)	1.76^d (1.26, 2.46)	<0.001	1.79^d (1.27, 2.54)	<0.001
Once someone has started smoking it is difficult to quit? (<i>definitely yes</i>)	2.59^d (1.47, 4.55)	<0.001	2.64^d (1.48, 4.73)	<0.001
The smoke from other people's cigarettes is harmful to you? (<i>definitely yes</i>)	1.71^d (1.24, 2.36)	<0.001	1.66^d (1.23, 2.24)	<0.001
Smoking effects sports performance? (<i>definitely yes</i>)	6.47^d (1.10, 1.73)	<0.001	6.83^d (1.58, 2.26)	<0.001
Smoking cigarettes makes you gain or lose weight? (<i>no difference</i>)	4.42^d (1.82, 10.71)	<0.001	4.50^d (1.84, 11.00)	<0.001

Notes: OR = odds ratio; CI = Confidence Interval. Values reflect the intervention effects (i.e., between group differences) between baseline and post-intervention. Values in bold denote (95% CI) and significance values of outcomes with significant intervention effects ($P < 0.05$).

^aAdjusted for group and baseline value of the outcome measure.

^bAdditionally adjusted for, sex, parental smoking, sibling smoking, friend smoking and IMD.

^c β value.

^dOdds ratio.

Table 5.5 Multilevel analyses of the effectiveness of the SFS intervention between baseline and follow-up

Outcome measure	Crude model ^a		Adjusted model ^b	
	β or OR (95% CI)	P	β or OR (95% CI)	P
No intention to smoke in the future	0.09 ^c (-0.01, 0.18)	0.09	0.08 ^c (-0.02, 0.18)	0.11
Cigarette self-efficacy	0.30^c (0.01, 0.58)	0.04	0.32^c (0.03, 0.60)	0.03
<i>Attitudes Towards Smoking</i>				
Smoking cigarettes is bad for your health? (<i>definitely yes</i>)	1.41 ^d (0.64, 3.14)	0.38	1.59 ^d (0.69, 3.70)	0.28
It is safe to smoke for only a year or two as long as you quit after that? (<i>definitely not</i>)	1.13 ^d (0.83, 1.52)	0.44	1.11 ^d (0.86, 1.33)	0.52
Once someone has started smoking it is difficult to quit? (<i>definitely yes</i>)	1.35^d (1.00, 1.81)	0.05	1.34^d (0.99, 1.82)	0.05
The smoke from other people's cigarettes is harmful to you? (<i>definitely yes</i>)	1.38^d (1.02, 1.86)	0.04	1.39^d (1.02, 1.89)	0.04
Smoking effects sports performance? (<i>definitely yes</i>)	4.12^d (1.77, 9.59)	<0.001	3.96^d (1.75, 9.00)	<0.001
Smoking cigarettes makes you gain or lose weight? (<i>no difference</i>)	1.09 ^d (0.81, 1.48)	0.55	1.05 ^d (0.77, 1.42)	0.77

Notes: OR = odds ratio; CI = Confidence Interval. Values reflect the intervention effects (i.e., between group differences) between baseline and post-intervention. Values in bold denote (95% CI) and significance values of outcomes with significant intervention effects (P<0.05).

^aAdjusted for group and baseline value of the outcome measure.

^bAdditionally adjusted for, sex, parental smoking, sibling smoking, friend smoking and IMD.

^cβ value

Interaction effects

Table 5.6 shows the results of the significant sex interaction effects at post-intervention. There were significant intervention effects on non-smoking intentions and refusal self-efficacy for both boys and girls. Similarly, significant intervention effects were observed for boys' and girls' regarding the belief that smoking is 'definitely' bad for your health and is 'definitely not' safe to smoke for a year or two as long as you quit afterwards. There were

no significant sex interactions for non-smoking intentions and refusal self-efficacy at post-intervention or follow-up.

Table 5.6 Significant post-intervention group interactions for smoking non-smoking intentions and self-efficacy

Outcome measure	Intervention*sex (crude)		Boys		Girls	
	B or OR ^a (95% CI)	P	B or OR ^a (95% CI)	P	β or OR ^a (95% CI)	P
No intention to smoke in the future	0.19 (0.01, 0.38)	0.06	0.19 (0.01, 0.38)	0.02	0.15 (0.01, 0.28)	0.03
Cigarette self-efficacy	0.77 (0.03, 1.50)	0.05	0.76 (0.02, 1.53)	0.04	0.73 (0.01, 0.29)	0.01
<i>Attitudes Towards Smoking</i>						
Smoking cigarettes is bad for health? (<i>definitely yes</i>)	2.66^a (0.90, 7.86)	0.08	2.82^a (0.94, 8.43)	0.06	2.64^a (1.22, 5.71)	0.01
It is safe to smoke for only a year or two as long as you quit after that? (<i>definitely not</i>)	1.78^a (0.99, 3.22)	0.06	1.76^a (0.97, 3.22)	0.06	2.36^a (1.42, 3.42)	<0.01
Once someone has started smoking do you think it is difficult to quit? (<i>definitely yes</i>)	1.40 ^a (0.77, 2.53)	0.27	n/a	-	n/a	-
The smoke from other people's cigarettes is harmful to you? (<i>definitely yes</i>)	1.58 ^a (0.87, 2.87)	0.14	n/a	-	n/a	-
Smoking effects sports performance? (<i>definitely yes</i>)	1.52 ^a (0.79, 2.92)	0.21	n/a	-	n/a	-
Smoking cigarettes makes you gain or lose weight? (<i>no difference</i>)	1.36 ^a (0.75, 2.49)	0.31	n/a	-	n/a	-

Notes: OR = odds ratio; CI = Confidence Interval. Values reflect the intervention effects (i.e., between group differences) between baseline and post-intervention. Values in bold denote (95% CI) and significance values of outcomes with significant intervention effects (P<0.05).

^aAdjusted for group and baseline value of the outcome measure.

^bAdditionally adjusted for, sex, parental smoking, sibling smoking, friend smoking and IMD.

^cβ value.

^dOdds ratio.

Qualitative findings

Primarily children believed smoking prevention to be the purpose of SFS *“trying to encourage kids not to smoke”* (Girl, school 10, focus group 3). Children were able to recall the health messages that were addressed during the intervention, particularly in relation to the health implications associated with smoking, *“smokers would get more phlegm and a non-smoker would get less phlegm”*, its impact on sport performance, *“like your heart beats faster when you’re doing exercise like when you’re a smoker”*, the contents of a cigarette, *“there’s over 4,000 chemicals in a cigarette and they’re not nice, rat poison, nicotine, rocket fuel”* and its effect on weight *“people think when you smoke you lose weight but you really don’t”*.

Although the majority of children expressed a high intention not to smoke in the future, they articulated that the SFS made them more determined not to smoke, *“we’ve learnt its bad and not to do it [smoke] so I’m definitely not going to smoke when I’m older”*. Children highlighted several reasons for not wanting to smoke including concerns surrounding the effects of smoking on health *“I don’t want to die early,”* and, *“because your lungs wouldn’t be in the best condition”*, its cost *“it costs you loads of money”*, the chemicals present in a cigarette *“because I’ve learnt how many chemicals and what goes into them [cigarettes], that’s why I wouldn’t smoke”*, and the addictive nature of smoking, *“If you tried one [cigarette] then you’d get addicted to it, and then you’d want another one and another one,”* and its impact on sport performance *“it’s harder to breathe and harder to do exercise”*. In contrast, a small number of children were uncertain about their future smoking intentions

and verbalised that they might smoke because of social smoking norms “*I don’t want to smoke when I’m older but I’ll probably end up changing my mind because I want to be like one of my sisters who smokes,*” and considered smoking to be strategy for coping with stress “*I’m not saying I definitely won’t [smoke] because it’s just something that might happen if something stressful happens.*”

Analysis of interviews indicated that teachers perceived SFS to positively impact on children’s smoking-related attitudes and short-term intentions, “*I couldn’t imagine anyone of them to have a cigarette, I know they are young anyway but they are really against it [smoking], some of them before the [SFS] didn’t see it as good or bad they just saw it as something that happened*”. (Teacher, school 2, interview data).

Coaches were in agreement with teachers and believed SFS increased children’s awareness of smoking factors with one coach saying; “*they come in with a perception already [smoking] is bad but by the end of the session they realise a lot more of the chemicals inside cigarettes and they understood the effects of [smoking], of what it can do to the lungs, the throat... so yeah it is really beneficial for the kids to do the activities because it really drills home the effects that smoking would have on their bodies*” (Coach 2, interview data).

Collectively, coaches and teachers believed that the information children received through SFS would have a positive impact on their future smoking behaviour, “*I think it [SFS] will have a great impact on it [children’s smoking*

behaviour] (Teacher 2, school 8, interview data). However, some coaches and teachers were sceptical regarding the long-term impact of SFS on children's future smoking behaviours, recognising external pressures on children to smoke: "It's effective now but I feel if it [SFS] doesn't continue they'll just get pressured anyway" (Teacher 1, school 2, interview data).

5.4. Discussion

The aim of this study was to examine the impact of SFS on smoking-related intentions, attitudes and refusal self-efficacy among 9-10 year old primary school children. Using a non-randomised controlled trial, the SFS intervention did not demonstrate effects on children's non-smoking intentions, which remained high across both groups. However, qualitative data revealed that SFS reinforced children's opinions about smoking and made them more determined not to smoke. Further, children in the intervention schools displayed significantly more negative attitudes toward smoking at post-intervention and follow-up than those from comparison schools. Whilst no significant intervention effects were found for refusal self-efficacy at post-intervention, positive intervention effects were observed at follow-up. These findings may lend support for physical activity as one strategy for smoking prevention efforts targeted at preadolescent children.

Whilst significant differences were observed for non-smoking intentions and two attitude items between the comparison and the intervention groups at baseline, differences in the group means and proportions were small (Table

5.1). Nevertheless, in the final analysis each model was further adjusted for baseline individual level smoking-related cognitions (e.g. for the intention model, adjustments were also made for refusal self-efficacy scale and dichotomous attitude items) since these variables may be directly or indirectly related (Bandura, 1986; Ajzen, 1991). The SFS intervention did not significantly impact on children's non-smoking intentions, possibly because preadolescent children are still against smoking. The high baseline values observed for non-smoking intentions in the intervention and control group suggests a ceiling effect may have been evident whereby it was not possible to detect children with significantly stronger or weaker non-smoking intentions. These findings are comparable to other school-based smoking prevention programmes targeted at preadolescent children (Hecht et al., 2008; Crone et al., 2011) but inconsistent with other studies (Andrews et al., 2011; Andrews et al., 2014). The conflicting results however, may in part be explained by inconsistencies in prevention approaches. For example, the SFS intervention was specific to smoking prevention, whereas the activities reported by Andrews and colleagues (2011; 2014) centred on health education messages surrounding smoking and chewing tobacco. Nevertheless, qualitative data from the current study revealed that SFS had strengthened children's non-smoking intentions, with one child stating *"I'm very confident I'm not going to smoke cos they've [SFS] told us how bad [smoking] is and that there are over four thousand chemicals [in a cigarette] and it is hard to quit."* This is encouraging since smoking intentions are precursors to and are predictive of smoking initiation in youth (Andrews et al., 2010). Implementing a smoking prevention programme such as SFS during

preadolescence could have the potential to postpone or prevent smoking initiation and regular smoking in adolescence. A recent randomised controlled smoking prevention programme for Dutch primary school children aged 10-12 years found that although the smoking education programme had no effects on intentions during elementary school, one year later in secondary school, children who received the intervention had significantly higher non-smoking intentions and smoked less than the control group (Crone et al., 2011).

Smoking-related knowledge and attitudes are frequently measured and have a propensity to increase following smoking prevention interventions (James et al., 2003; Hopfer et al., 2010; Crone et al., 2011). In the current study, children that participated in the intervention developed more negative attitudes toward smoking at post-intervention some of which were sustained at follow-up, with intervention participants having higher odds of believing smoking is addictive, impairs sport performance, and that second-hand smoke is harmful to health. Magnitude of effect size was interpreted using Cohen's definition (Cohen, 1988). Cohen described small, medium and large effect sizes as 1.5, 3.5, and 9.0, respectively. Therefore the current study findings suggest that SFS had a small to medium effect size on preadolescent's negative attitudes towards smoking. Nevertheless, focus group data with children supported these findings and revealed that the SFS games played and smoke free messages received positively influenced children's attitudes towards non-smoking. Given the misconception surrounding smoking harms and challenges observed at baseline (see

Chapter 3, Study 1), these findings are encouraging because many authors advocate that attitude change is related to behavioural change (Ajzen & Fishbein, 1991; Flay et al., 1998). SFS could therefore provide a mechanism for health education that is necessary to dispel myths that exist among children around smoking harms and challenges. Moreover, findings lend support to the positive effects of physical activity on cognitive function (Donnelly & Lambourne, 2011) and suggest that integrating movement such as physical activity into the learning process may enable children to efficiently retain and retrieve learned information (Debby, 2012; Kibbe et al., 2011). Qualitative findings support the latter view, since children were able to recall the SFS games played and the information learned, with one child stating, *“in the chemical soup game we did all the chemicals that go into a cigarette, like rat poison, tar, copper, tobacco, nicotine..., nicotine, that makes it addictive.”* It is difficult, however, to directly compare these findings with other primary school prevention approaches due to methodological differences. For example, some studies have explored attitudes towards several aspects of smoking such as health, psychological and social consequences of smoking (Crone et al., 2011), while others did not specify any particular item (McGahee et al., 2000). Although previous studies were conducted outside the UK, the focus of SFS intervention differed from other prevention approaches in that we used physical activity as a mechanism to deliver smoking prevention education, thus questionnaire items were developed by the research team and mostly adapted from UK surveys (Health Survey for England, 2009).

Whilst no intervention effects were observed for refusal self-efficacy at post-intervention, effects were apparent at 12 month follow-up. The lack of intervention effects on refusal self-efficacy at post-intervention are similar to those reported by Isensee et al. (2014), who also found no effects on preadolescents refusal self-efficacy at six month follow-up. Since self-efficacy is not a static concept (Bandura, 1997) and levels of self-efficacy fluctuate over time (Hiemstra et al., 2011) the current findings suggest that SFS may have had a protective effect on children's refusal self-efficacy. It is plausible that the additional SFS sessions that teachers were asked to deliver during the intervention period (Foweather et al., 2013) reinforced intervention children's refusal self-efficacy. However, since we did not measure the sustainability of teacher delivery between post-intervention and follow-up periods, we do not know if further sessions were delivered during this time frame. According to others (Dijkstra et al., 1999; Botvin & Griffin, 2003; Gottfredson & Wilson, 2003) the application of additional sessions, also known as 'booster sessions' have been found to enhance the longevity of intervention effects, but the evidence is limited and inconsistent (Thomas et al., 2013). Qualitative findings however from children's focus groups support the need for booster sessions as some children were uncertain about their future smoking intentions with one child stating; *"I'm not saying I definitely won't [smoke] because it's just something that might happen if something stressful happens."* Nevertheless, 83.6% of children in the current study do not have friends who smoke, and so might not have been put to the test of resisting social influences to smoke. Resisting social pressures to smoke is one of the most difficult challenges for adolescents (Kobus, 2003),

and as a consequence refusal self-efficacy may decrease, whereas the likelihood to start smoking increases (Hiemstra et al., 2011; Hiemstra et al., 2012). Given that self-efficacy is subject to change over time, research recommends implementing annual smoking prevention programmes in preadolescence and throughout adolescence until the completion of secondary school (Hopfer et al., 2010; Hiemstra et al., 2011; NICE 2013). Long-term research is however, required to determine if the SFS primary school smoking prevention intervention can facilitate children in making a rational and logical decision not to smoke during a period when smoking is more age-related and is considered as accepted behaviour (Otten et al., 2009).

SFS may have additional benefits over traditional school-based smoking prevention education approaches. First, physical activity improves health not only directly but also through its protective effect against smoking initiation in youth (Kaczynski et al., 2008; Horn et al 2013). Second, given that all primary school children are required to participate in physical education, this lesson could provide a forum to integrate smoking education messages within the primary school curriculum. Third, the use of physical activity as a smoking prevention strategy may encourage active engagement with the intervention as well as interactions with other pupils and teaching staff. In a previous meta-analysis of school-based drug prevention programmes (Tobler & Stratton, 1997) it was found that interactive and participatory programmes that foster interactions among peers and use interactive techniques to stimulate participation of pupils were more effective than didactic and non-

participatory teaching methods. Finally, since movement is considered essential to learning (Blakemore, 2003), SFS could provide an opportunity to enable children, particularly those who are kinaesthetic learners, to engage in 'experimental learning' which is an important method of behaviour change (Solvic, 2001). For example, in one of the SFS activity sessions, children experienced that they could not escape addiction, and were repeatedly defeated in a timed game against children who represented 'non-smokers', which is consistent with recommendations in NICE (2013) to deliver interactive and participatory smoking prevention interventions. The SFS pilot study showed promise for smoking prevention efforts among preadolescent children. However, in accordance with the MRC guidance (2014), RCT's with a built in cost-effectiveness evaluation are warranted.

The present study has several strengths. First, the intervention design and content were informed by formative work conducted in community youth club settings (Romeo-Velillia et al., 2014; Hilland et al., 2014) and in three primary schools with 9-10 year old children (Trigwell et al., 2012; see Chapter 4, Study 2). Second, this study adopted a mixed-methodology approach which used rigorous quantitative data analysis methods that adjusted for school-level clustering, as well as qualitative approaches to provide context and explanations for changes in outcome variables. Third, this study involved a comparison group and included both six and 12 month follow-up measures (from baseline). Fourth, the study comprised of a large sample size and importantly low attrition rates were observed. Fifth, process evaluation measures were used to explore the implementation of SFS from the

perspectives of children, teachers and coaches (Foweather et al., 2013). Overall, SFS was considered to be an acceptable intervention to educate children about smoking. Moreover, the majority of children enjoyed taking part in SFS, and over 80% of children and teachers rated the intervention five out of five (Foweather et al., 2013). Finally, the results of this study provide the first evidence for the effectiveness of a large scale UK primary school smoking prevention intervention that used physical activity as a mechanism to deliver smoking education messages. This study is important because smoking prevention programmes administered during primary school have the potential to prepare children for secondary school and prevent them from smoking (Crone et al., 2011).

Despite the current study strengths, several limitations merit attention. First, of the 154 schools approached, only 43 agreed to participate, which may suggest a negative climate toward smoking prevention within primary school settings across Merseyside. Research has shown that some parents and school officials may be concerned that exposing preadolescent children to smoking prevention programmes may stimulate their interest and curiosity about smoking (Ringwalt et al., 2010). Most often, however, reasons for non-participation included limited time and lack of interest, which might be related to the fact that smoking prevention is not mandatory in Stage Two of the UK National Curriculum (Department for Education, 2013). However, it is clear that smoking prevalence increases dramatically following the transition to secondary school (Fuller et al., 2013) and it is postulated that prevention efforts may be more effective if started in primary school (NICE, 2010).

Second, the reliance on self-report in the assessment of outcome variables carry risk of measurement error due to inaccurate recall, literacy issues and social desirability bias (Brener et al., 2003; Hiemstra et al., 2012). However, self-reports have been demonstrated to be accurate provided confidentiality is assured (Dolicini et al., 1996). Moreover, it was not possible to blind study participants or the research team to the intervention because of the practical nature of the intervention. Third, given that the majority of children were White British and from one of the most deprived local authorities in England, these results may be not generalise to other racial and socio-economic child populations. Fourth, the study did not include a cost-effectiveness evaluation and it is unknown whether SFS is a cost-effective smoking prevention initiative. Finally, variations in the fidelity of sessions and dose delivered by coaches may have limited the effectiveness of the intervention (Foweather et al., 2013; Trigwell et al. under review). Furthermore, although teachers were trained to deliver SFS sessions, less than half (47.5%) of classes received the minimum requirement of five lessons which may limit the sustainability of SFS (Foweather et al., 2013). Nevertheless, SFS alone may not be sufficiently equipped to prevent smoking within proximal and wider social environments (US Departments of Health and Human Services, 2000). Suggestions from previous research postulate that the most effective school-based smoking prevention programmes are those that involve all school classes, and in addition involve the family and the wider community environment (Storr et al., 2002; Crone et al., 2003) as such strategies enable message reinforcement.

In summary, the results from this study suggest that SFS may be an effective method to improve smoking-related attitudes and maintain refusal self-efficacy among 9-10 year old UK primary school children. Although no quantitative intervention effects were observed for non-smoking intentions, children articulated that SFS made them more determined not to smoke. Overall, these findings may suggest that physical activity be considered as one strategy for smoking prevention efforts targeted at preadolescent children. However, a definite randomised controlled-trial is required to confirm these findings. Moreover, longer-term assessments are needed to determine the durability of the current study findings and whether SFS could be effective in preventing smoking in adolescence.

Chapter 6

Synthesis of findings

Thesis Study Map

<p>Study 1: The influence of mother, father, sibling and friend smoking on 9-10 year old primary school children's smoking-related intentions, attitudes and refusal-self-efficacy</p>	<p>Objective:</p> <ul style="list-style-type: none"> To examine the association between social factors on boys and girls smoking-related intentions, attitudes and refusal self-efficacy <p>Key Findings:</p> <ul style="list-style-type: none"> Compared to girls, boys had lower non-smoking intentions, refusal self-efficacy, and were less likely to agree that smoking is 'definitely' bad for health Friend smoking was negatively associated with non-smoking intentions in girls and boys, Friend smoking was negatively associated with refusal self-efficacy in girls only Sibling smoking was negatively associated with non-smoking intentions in girls but a positive association was found in boys Boys who had a smoking friend had lower odds of 'definitely' believing that the smoke from other people's cigarettes is harmful and that that smoking is bad for health Boys with a smoking sibling had lower odds of 'definitely' believing smoking is bad for health
<p>Study 2: A formative study to explore the acceptability and feasibility of SFS within primary school settings</p>	<p>Objective:</p> <ul style="list-style-type: none"> To explore the feasibility and acceptability of using SFS as a mechanism to deliver smoking education messages within primary school settings from the perspectives of children, teachers and coaches <p>Key Findings:</p> <ul style="list-style-type: none"> The structure of SFS (launch event, coaching sessions, and celebration event) was considered acceptable by teachers: although it was suggested that the celebration event could be utilised to showcase children's smoking knowledge and present awards Overall, children, teachers and coaches provided a positive review of sessions. Activities delivered appeared to vary between classes. Moreover, it was reported sessions sometimes lacked structure and became repetitive, and teachers noted inconsistencies in the content of messages between coaches Schools were considered a suitable setting to deliver SFS, and the use of PA to deliver smoke free education messages was considered acceptable. Children, teachers and coaches believed teachers could deliver smoke free messages during PE lessons. <p>Key recommendations:</p> <ul style="list-style-type: none"> A practical element to the training should be included where ideas of how to deliver sessions are practised Base each coaching session on a SFS theme (e.g., smoking and health, smoking and sport performance and social influences) and develop SFS session plans for delivery by coaches Develop a support package for teacher delivery of SFS Consult teachers in the planning and designing of future SFS trials. Change the structure of the celebration event to highlight the end of the intervention, showcasing children's learning and present awards.
<p>Study 3: Examine the impact of SFS on children's smoking-related intentions, attitudes and refusal self-efficacy</p>	<p>Objectives:</p> <ul style="list-style-type: none"> To investigate the short-and mid-term effectiveness of SFS on children's smoking-related intentions, attitudes, and refusal self-efficacy Explore perceived impact of SFS from the perspectives of children, teachers and coaches. <p>Key Findings:</p> <ul style="list-style-type: none"> The SFS intervention did not demonstrate effects on children's non-smoking intentions, which remained high across both groups Children in the intervention group displayed more negative attitudes towards smoking at post-test (4/6) and follow-up (3/6) than those in the comparison schools. No significant intervention effects were found for refusal self-efficacy at post-test, but positive intervention effects were observed at follow-up Qualitative data revealed that the SFS reinforced children's negative opinions about smoking and made them more determined not to smoke. Teachers and coaches believed that SFS had a positive impact on children's smoking-related knowledge and attitudes and that SFS would positively impact on their smoking behaviour. However, some teachers were sceptical about the long-term effects of SFS and felt that if it didn't continue children may succumb to the external pressures to smoke.

Chapter 6

Synthesis, conclusion and recommendations

6.1 Introduction

The purpose of this chapter is to discuss and synthesise the results from each of the studies within the thesis. The chapter begins with a recap of the aims of the thesis. Next, a summary of the main findings for each study are presented. The final segment of this chapter provides recommendations arising from this thesis, including suggestions for policy, future practice and further research.

6.2 Thesis recap

The aim of this research was to (1) examine the social factors associated with boy's and girl's smoking-related intentions, attitudes and refusal self-efficacy, (2) explore the acceptability and feasibility of a school-based physical activity intervention to prevent smoking among preadolescents from the perspectives of children, teachers and coaches, and (3) examine the impact of SFS on smoking-related intentions, attitudes and refusal self-efficacy, as well as perceived intervention impact.

6.3 Main findings

Study 1 was unique in that it was the first study to investigate the influence of social factors on outcomes relevant for primary prevention (i.e. before experimentation or smoking use) among UK preadolescent boys and girls. The cross-sectional (baseline) study indicates that sibling and friend smoking

represent more salient influences on children's cognitive vulnerability to smoking than mother and father smoking. These findings are inconsistent with previous studies who have found parental smoking to be associated with cognitive vulnerability to smoking among primary school-aged children (Porcellato et al., 1999; Brook et al., 1999; Andrews et al., 2010; de Leeuw et al., 2010; Hiemstra et al., 2012; Schuck et al., 2012), especially those in lower socio-economic status groups (Cremers et al., 2014). Moreover, some differential effects were observed by gender, suggesting that social factors may, in part, influence the antecedents of smoking behaviour differently among boys and girls. Whilst family smoking, particularly parental smoking is assumed to influence children's smoking behaviour and their intention to smoke (Cremers et al., 2014) further research is needed to examine the independent influence of mother or father smoking on preadolescent's cognitive vulnerability to smoking.

A pertinent point is that over a third of children did not recognise with certainty that short term smoking is not safe, that smoking cigarettes is addictive, that others smoke is harmful, smoking affects sport performance and that smoking *per se* does not influence weight status. Whilst smoking prevalence is declining (Health Survey for England, 2014), some children still have misconceptions about smoking harms and challenges. It is, perhaps, understandable that these children, who are mostly from areas of deprivation, appear to be confused about the consequences of smoking given their physical and social environment (Cremers et al., 2014). Over half of children reported to have at least one immediate family member that

smoked (Study 1). Given that smoking patterns begin prior to experimentation with the development of attitudes and beliefs (Porcellato et al., 1999), findings provide an indication that smoking prevention for preadolescent children is still warranted. Thus, assertions were made that intervening with smoking prevention in preadolescence, particularly in deprived neighbourhoods, is necessary to delay or prevent smoking onset in adolescence (Crone et al., 2011).

In accordance with MRC guidelines (MRC, 2008) for complex interventions, an exploratory feasibility study (Study 2) was conducted in three primary schools within Liverpool City and North to determine how well a novel physical activity intervention (SFS) was received by children, teachers and coaches and to identify components that worked well and elements of the intervention that needed improvement. Overall, data from Study 2 showed that schools were a suitable setting to deliver SFS and that the use of physical activity to deliver messages was considered acceptable by key stakeholders and child participants. The intervention components were well received by children and teachers, with the majority reporting that SFS was a fun learning experience. Despite the positive review of SFS, recommendations were made to improve the delivery of a larger SFS intervention. The findings from the research gave an indication of the strengths and weakness of a bespoke training workshop developed to train sports coaches to deliver the intervention. For example coaches recalled the training improved their knowledge surrounding smoke free messages, but felt further practical demonstrations surrounding the delivery of these messages

would have been useful. Further, some important lessons were learned regarding the methods and practices employed by coaches to promote smoking prevention messages through physical activity. For example, children and teachers recalled variations in the delivery of SFS sessions and messages between coaches and classes, and children revealed some messages received were not part of the prescribed intervention.

Study 2 was instrumental in informing the content of a larger SFS intervention (Study 3), ensuring a 'bottom-up' and systematic approach to development as recommended by the MRC guidelines (2008) for complex interventions. The non-randomised controlled-trial provided unique insight into the short-and medium-term effects of a 7-month SFS intervention, that included teacher and coach training, delivery of five activity sessions (multi-skill, 2xDance, 2xFootball), and a school assembly. Questionnaire data suggested that the SFS intervention did not impact on children's non-smoking intentions, which remained high across both groups. Nevertheless, through focus groups, children articulated that SFS made them more determined not to smoke in the future. Further, children who participated in the SFS intervention expressed more negative attitudes towards smoking at post-intervention, some of which were sustained at follow-up, with intervention participants recognising that smoking is addictive, smoking can impair sport performance and second-hand smoke is harmful to health. This data suggests that SFS could provide a mechanism for health education that is necessary to dispel the myths that exist among children around smoking. Whilst, no intervention effects were observed for refusal self-efficacy at post-

intervention, positive intervention effects were evident at follow-up, suggesting that the SFS had a protective effect on children's refusal self-efficacy. These findings are consistent with previous smoking prevention interventions (Hecht et al., 2008; Crone et al., 2011; Isensee et al., 2014). However, longer-term research is needed to determine the durability of intervention effects on smoking-related attitudes, intentions and refusal self-efficacy at a time when smoking is more age-related and considered normative behaviour (Otten et al., 2009). Further, some academics recommend implementing booster sessions to enhance the longevity of intervention effects (Botvin et al., 2003; Gottfredson & Wilson, 2003) which is supported by the qualitative findings in Study 3 since some children articulated their uncertainty surrounding future smoking.

6.4 Implementation of SFS

Whilst not included in Study 3, a process evaluation was conducted to explore intervention implementation by examining intervention reach, dose, fidelity, acceptability and sustainability (Foweather et al., 2013). The results from this comprehensive process evaluation showed that whilst intervention reach and acceptability were high, disparities in intervention duration and uptake, as well as the extent to which the intervention components were delivered as intended were apparent (Foweather et al., 2013). Although the SFS session plans were designed to be pragmatic for consistent implementation across schools, barriers to intervention fidelity (e.g., environment, class size and children's physical disabilities) related

specifically to the use of physical activity as a vehicle for delivering smoking prevention education (Foweather et al., 2013). Whilst some degree of variation is to be expected, it is essential that important components of an intervention are delivered with accuracy and consistency. Whilst the process evaluation revealed challenges in maintaining fidelity, the intervention was sufficient to demonstrate impact, as shown by Study 3. Further, these aspects can be addressed prior to a definitive trial.

6.5 Deliverers of school-based smoking prevention interventions

Most school-based smoking prevention programmes are delivered by teachers or health educators and some are delivered by same-age or slightly older peers (NICE, 2010). In the city-wide SFS intervention, teachers and coaches were used. However, it is not clear whether the effectiveness of school-based smoking prevention programme depends on the status of the person delivering it. There is reasonably strong evidence that peers should be involved in the delivery of smoking prevention education (NICE, 2010), but in most cases, they are not necessarily better than other adult providers (Botvin et al., 2003; NICE, 2010). Sports coaches may be seen as having particular credibility with youth, which is supported by a previous SFS feasibility study (Romeo-Velilla et al., 2014) where a coach-led smoking prevention intervention positively influenced children and young people's smoking-related attitudes and beliefs. In the feasibility study undertaken in this thesis, children also considered their teachers to be credible deliverers of smoking prevention education, and in an attempt to increase the

sustainability of the city-wide SFS intervention at least one teacher from each participating school attended the SFS bespoke training workshop. Despite the offer of incentives, only half of classes received five teacher-led sessions, thus teachers may need additional resources to support the delivery the SFS intervention in practice (Foweather et al., 2013). Further research is needed to determine what factors facilitate teacher implementation and what support is required to ensure compliance in the delivery of intervention components (Foweather et al., 2013). Moreover, it is unknown whether coach-led smoking prevention education is more effective than teacher-led, thus more research is warranted.

6.6 The importance of smoking prevention

Prevention interventions and related initiatives are increasingly viewed as critical in preventing children from starting to smoke (Botvin & Griffin, 2004). Despite a downward trend in national smoking prevalence (Health Survey for England, 2013), over half of children reported having at least one family member that smoked. Further, the research within this thesis has shown sibling and friend smoking to be important influences on children's cognitive vulnerability towards smoking. As smoking is associated with social inequalities and generates inequalities in health, socially deprived areas are an important target for smoking prevention.

Evidence regarding the most appropriate age to intervene with smoking prevention is mixed with some academics suggesting smoking prevention should be started in early primary school years (Porcellato et al., 1999; Storr

et al., 2002), mid-to-late primary school (Botvin et al., 2003; Gottfredson & Wilson, 2003) and others arguing they should be implemented with secondary school pupils (Tobler et al., 2000). Findings from this research suggest that smoking prevention efforts must strive to target preadolescent children since many children had misconceptions about smoking harms and challenges, which may lead to smoking initiation among children (Mantler et al., 2012). However, whilst it is pertinent to measure antecedents of behaviour at the preadolescent stage (Hopfer et al., 2010), particularly in the absence of smoking behaviour, it is behaviour that ultimately matters. We do not know whether SFS will be protective against smoking behaviour in adolescence. Therefore, a longer-term follow-up is needed to determine the impact of SFS on smoking behaviour, particularly following the transition to secondary school, when children are more vulnerable to factors that lead to smoking (Cote et al., 2004).

6.7 Implications of findings

Our cross-sectional study has yielded an understanding into the influence of social factors on cognitive vulnerability to smoking among preadolescent's residing in socially deprived areas. As smoking is associated with social inequalities and generates inequalities in health, socially deprived areas are an important target for smoking prevention. Physical activity appears to be a promising vehicle for communicating health promotion messages such as smoking prevention education. Whilst physical activity has previously been recommended as an active component for smoking prevention initiatives (Kaczynski et al., 2008; Audrian-McGovern et al., 2005; Audrian-McGovern

et al., 2013), physical activity has additional benefits beyond smoking prevention as it has been found to improve children's health directly from participating in the activities themselves (Chief Medical Officers, 2011). From an educational perspective, PA has been found to improve cognitive functioning, aiding children's learning through improved concentration (Norlander et al., 2005) attention (Mahar, 2011) and memory (Kamijo et al., 2011). This is supported by focus group data (Study 2) with children recalling the purpose of some SFS games, with one child stating; *"in the dance when the music changed we represented the blood vessels and the arteries getting blocked to show what would happen inside your body if you smoked and it made you realise what you're doing to yourself if you smoke"*.

The findings indicate that the SFS prevention approach is just as effective as classroom-based smoking prevention education but with a further benefit of using interactive and participatory approaches over more traditional didactic lessons. Using participatory techniques for delivery, such as active-game based learning and activities with sports coaches have previously been successful in transmitting health promotion messages and positively impacting on children and young people's attitudes (Botcheva & Huffman, 2004; Romeo-Velilla et al., 2014; Dubuy et al., 2014). Further, using interactive and participatory techniques has been found to aid children's engagement with health promotion education (Tobler et al., 2000). Therefore, utilising physical activity as a mechanism to deliver health promotion messages could enable children, particularly those who are kinaesthetic learners, to engage in 'experimental learning' which is an important method

of behaviour change (Solvic, 2001). However, future research is needed to compare the SFS approach to classroom based interventions. Further, an economic evaluation would also be useful to determine the cost-effectiveness of SFS as a smoking prevention intervention.

Physical Education (PE) is an integral part of the school curriculum and it aims to provide students with knowledge, skills, abilities, behaviours, and confidence to be physically active throughout their lifetime (Sallis et al., 2012). There is growing recognition of the importance of health-based PE in promoting the knowledge and skills required to lead healthy lifestyles (Alfrey et al., 2014), therefore this lesson could be used as forum to deliver health promotion topics to children such as smoking prevention. As many primary school teachers are not PE specialists and lack confidence in their ability to deliver lessons (Morgan & Burke, 2008) then training courses and appropriate resources need to be offered to primary school teachers to improve their confidence and competence at delivering health promotion messages through physical activity. Since all primary school children are required to participate in PE, utilising existing PE infrastructures could aid long term sustainability of SFS, maintain intervention effects and reach out to large cohorts of children from diverse backgrounds. More research is needed to determine whether teachers and or sports coaches can effectively deliver smoking prevention education through health-related PE.

6.8 Strengths

The cross-sectional study involved a large sample of preadolescent children from two deprived local authorities in Merseyside. Further, the findings from this study add to the limited UK evidence-base surrounding the influence of social factors on outcomes relevant for primary prevention. In relation to the SFS intervention, it is the largest and only UK intervention that has utilised physical activity as an active component for smoking prevention targeted at preadolescent children from socially deprived areas. The intervention design was developed in partnership with steering group members from different local partner organisations, a practice recommended by NICE (2010) guidance in delivering health promotion initiatives. Moreover, in accordance with MRC guidelines (MRC, 2008) for complex interventions an exploratory feasibility study was conducted to engage stakeholders in the designing and development of a larger SFS intervention. Further, the intervention was evaluated using a non-randomised comparison group that included short-term (two weeks post-intervention) and mid-term (approx. 12 months post-intervention) follow up measures as well as qualitative approaches to determine perceived impact. This mixed-methodology approach used rigorous quantitative data analysis methods that adjusted for school-level clustering, as well as qualitative data to provide context and explanations for changes in outcome variables. Triangulation between children's, teachers and coaches decreased the risk of misinterpreted views and therefore potentially inaccurate data. Finally, the intervention design will help ensure SFS can reach out to large cohorts of children, across diverse social

backgrounds, utilising existing PE infrastructures to aid long-term sustainability.

6.9 Limitations

As limitations specific to each study were outlined in chapters 3, 4 and 5, the discussion in this section is limited to the overall methodological approach. Since funding required all Liverpool schools be offered the intervention, local schools could not be randomised. Therefore, prior to school recruitment Liverpool was matched with a neighbouring borough on the basis of population data (e.g., smoking rates, ethnicity and deprivation). Further, although the assessments were conducted by trained researchers, they were not blinded to the intervention since researchers were responsible for co-ordinating and delivering elements of the intervention (e.g., introductory element of the launch event). Moreover, it was not possible to mask the intervention from pupils as they were active participants. A further limitation surrounds the reliance of self-report measures of cognitions. Although they are often used in prevention research and typically adapted from previously validated surveys with same age-cohorts, these measurements carry a risk of measurement error due to literacy issues and social desirability bias. In addition, it is important to note that this research was conducted in two of the most deprived local authorities with high adult smoking prevalence which limits the generalisability of findings to other regions in England.

6.10 Conclusion

This thesis examined the influence of social factors on 9-10 year old children's cognitive vulnerability towards smoking and evaluated the effectiveness of a novel smoking prevention intervention that used physical activity as a mechanism to deliver smoking education to UK primary school children. Findings from this research indicate that sibling and friend smoking are important influences on children's cognitive vulnerability toward smoking. Further, SFS has been found to be an effective smoking prevention method to improve children's smoking-related attitudes and maintain refusal self-efficacy expectations. Utilising physical activity to deliver smoking prevention education appears to work at least as well as smoking prevention delivered through traditional classroom-based learning. Importantly, teachers and coaches viewed physical activity as an acceptable method to engage children in smoking prevention education. Nevertheless, strategies to increase the sustainability of SFS and embed intervention components into the school curriculum require further investigation.

6.11 Recommendations

Whilst this thesis has answered a number of research questions, the research process has generated a number of recommendations, including suggestions for policy, practice and to further this line of research.

6.11.1 Recommendations for policy

- Since the Government has pledged to improve the health of those from lower socio-economic status groups, they should focus their

smoking prevention resources in socially deprived areas to reduce smoking-related inequalities

- Focus resources on developing sustainable interventions through appropriate training, support and resource packs for all staff involved in delivering smoking prevention
- Local and national governments should promote partnership working between sports organisations, schools and local partners involved in smoking prevention to deliver health promotion intervention activities

6.11.2 Recommendations for practice

- Researchers and interventionists should undertake formative work when designing novel health promotion initiatives to ensure a ‘bottom-up’ and systematic approach to intervention development
- Ensure coaches and school staff who will be involved in delivering smoking prevention education to children receive sufficient training and ongoing support to deliver key elements of the programme
- Consult teachers in the planning and designing of interventions to identify effective ways to integrate smoking prevention education into the curriculum to ensure programme acceptability
- Modify the SFS manual to include other physical activities and include additional content concerning other smoking topics e.g., electronic cigarettes and shisha
- Keep intervention components realistic for the time available for delivery by coaches and or within a school environment, as well as

having a system in place to allow for variation and flexibility in the delivery of intervention components

- Quality assurance and monitor delivery staff to ensure the intervention is delivered as intended with further training and support provided as necessary

6.11.3 Recommendations for further research

- Qualitative research is required to better understand the thought processes through which boys and girls form their smoking-related cognitions
- Examine the influence of different family contexts, such as single parent families on preadolescent's cognitive vulnerability to smoking
- To overcome the limitations of the cross-sectional research design in Study 1 (e.g., cause and effect) longitudinal studies are needed to examine the influence social factors at the individual level as well as the familial and societal level on the development of smoking initiation and the possible progression to regular smoking
- Whilst a 12 month follow-up demonstrated the medium-term impact of SFS on children's smoking-related attitudes and refusal-efficacy, a three to five-year follow-up of research participants is required to determine the longer-term intervention impact
- In line with the Medical Research Council (MRC, 2014) framework for complex interventions, RCTs with a built in cost-effectiveness evaluation are warranted

- Investigate the minimum dose and components necessary for the intervention to be effective
- Repeat the SFS intervention in a different geographical location to explore whether findings can be replicated. Blind researchers to the intervention where possible
- Compare coach delivery of SFS relative to teacher delivery
- Compare the SFS prevention approach to other class-room based interventions
- Explore the feasibility of SFS in other age groups, for example among younger children and/or adolescents
- Explore the feasibility of using physical activity as a mechanism to deliver other health promotion messages to reduce various health risks behaviours among children such as alcohol, drugs, and substance misuse etc.

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Appendix 1

Evidence Tables:

School-based smoking prevention interventions

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Hurry & McGurk (1999)</p> <p>UK .</p> <p>An evaluation of a primary prevention programme for schools.</p>	<p>Study year Not reported</p> <p>Population/Setting 3 schools in Hackney, London</p> <p>Age 7-10 years</p> <p>Gender Not reported</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes</p> <p>Excluded Yes</p>	<p>Method of allocation Three intervention schools also acted as the control group.</p> <p>Number of measurements Two (pre and post)</p> <p>Process Evaluation No</p> <p>Measures to minimise confounding Not reported</p> <p>Theory Life skills</p> <p>Intervention (s) Project Charlie was delivered weekly (30 min) for one by a trained teacher brought into the school to implement the programme.</p> <p>Intervention period 1 year</p> <p>Comparator/s Yes (control continued with usual curriculum)</p> <p>Sample sizes: Total n= 140 (from one school included in analysis) Intervention n= 73 Control n= 67</p> <p>Baseline comparisons Yes</p> <p>Power calculation No</p>	<p>Primary Outcomes Increase pupil's self-esteem, decision making powers, ability to resist peer pressure and knowledge and drug knowledge, attitudes towards drugs, intentions and pupils use of drugs.</p> <p>Secondary Outcomes None</p> <p>Follow-up period At the end the project implementation (time is not specified).</p> <p>Evaluation Qualitative (peer pressure and decision making) and quantitative measures were used to address the study primary outcomes.</p> <p>Method of analysis Not stated, except for one of the primary outcome measures (decision making skills) where regression analysis was undertaken to control for pre-test scores.</p>	<p>Primary outcomes Children who received project Charlie had greater knowledge of the effects of medicinal, social and illicit drugs. They could generate more and higher quality solutions to hypothetical social dilemmas and were more secure in their ability to resist peer pressure to commit anti-social acts than comparison groups.</p> <p>Project Charlie did not have significantly higher self-esteem compared to control children, nor did the two groups differ in intentions to smoke, drink or use illegal drugs, or their reported current use.</p> <p>Secondary outcomes None</p> <p>Attrition details Of the 140 pupils included in the final analysis, 20 (12 comparison and 8 intervention) had left school at post-test.</p>	<p>Both control and project Charlie children attended the same school – increasing the risk of cross contamination.</p> <p>Of the 3 schools, only one was suitable for a methodically sound evaluation (since one school did not implement the project as planned and in the other school Project Charlie was already underway) and therefore included in the final analysis.</p> <p>Small sample of children (final intervention sample n=65; comparison n=55).</p> <p>Data not reported or analysed separately by age or class.</p> <p>No process evaluation</p> <p>Not clear what methods of analysis were used to measure intervention impact.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Hurry et al. (2000)</p> <p>UK.</p> <p>Long term effects of education in primary school.</p>	<p>Study year Not reported</p> <p>Population/Setting 3 schools in Hackney, London</p> <p>Age Mean age 14.1 years</p> <p>Gender Intervention: M= 45% Control: M= 39%</p> <p>Race/Ethnicity No</p> <p>SES Status Yes (school meals)</p> <p>Excluded No</p>	<p>Method of allocation Long term follow-up of Project Charlie (Hurry & McGurk, 1999). Three samples were studied; refer to the evaluation section for details.</p> <p>Number of measurements One (4 year follow-up)</p> <p>Process Evaluation None</p> <p>Measures to minimise confounding None reported</p> <p>Theory See Hurry & McGurk study details above</p> <p>Intervention (s) See study details above (Hurry & McGurk, 1999).</p> <p>Intervention period See study details above</p> <p>Comparator/s Yes (matched controls in same school)</p> <p>Sample sizes: Total: 309 Intervention = 34 Control = 42 Third control (see Evaluation subset 3) n= 233</p> <p>Baseline comparisons Yes</p> <p>Power calculation No</p>	<p>Primary Outcomes Decision making, peer pressure resistance, knowledge, attitudes use of substances (tobacco, alcohol and illegal drugs)</p> <p>Follow-up period Four years</p> <p>Evaluation Self-report measures were adapted from the original Project Charlie. <u>Three subsets were studied:</u></p> <ol style="list-style-type: none"> 1. Children were randomly assigned to the intervention (n=20) or control condition (n=14) and pre-tested before some received the drugs education programme who were followed up immediately and again as they approached 14 years. 2. Children who had been taught project Charlie (n=21) were compared with matched controls attending the same secondary school (n=21) 3. Project Charlie children were compared at final post-test with all their class mates. <p>Method of analysis Analysis methods not clear. However, Chi-square tests were used to assess some outcomes (peer pressure).</p>	<p>Primary outcomes At follow-up, Project Charlie children were significantly more likely to resist peer pressure (at subset 1 & 2), had significantly more negative attitudes towards drugs (at subset 1 & 3) or to have used an illegal drug (subset 3).</p> <p>Secondary outcomes None</p> <p>Attrition details 16 children were lost to follow-up.</p>	<p>The evaluation measures used in this long-term follow up were not exactly the same as those in the original study by Hurry & McGurk, (1999).</p> <p>Children who had been taught project Charlie in primary school were matched with controls attending the same school (see subset two measures).</p> <p>Children in the intervention group had poorer verbal skills than the control group (not adjusted for).</p> <p>No process evaluation</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
McGahee et al. (2000) US. The effects of a smoking prevention curriculum on fifth grade children's attitudes, subjective norms and refusal self-efficacy.	Study year Not reported Population/Setting 9 public schools Age 10-11 Gender Not reported Race/Ethnicity No SES Status No Excluded Yes	Method of allocation Quasi-experimental design. Schools were randomised to one of four groups using the Solomon Four-Group design. Number of measurements Two (pre and post) Process Evaluation No Measures to minimise confounding Adjusted for baseline outcome variables Theory Theory of planned behaviour Intervention (s) Children in groups 1 and 3 participated in the five (1 hour) classes. Lessons included information about 1) effects of smoking on your body 2) examining internal and external reasons for smoking 3) applying decision making steps to smoking and developing alternatives to smoking 4) identifying refusal self-efficacy skills and practicing the skills and 5) demonstrating refusal skills through role-playing. Intervention period 1 week Comparator/s Yes Sample sizes: Total n= 361 Baseline comparisons Yes Power calculation Yes	Primary Outcomes Smoking behaviour, attitudes, subjective norms, intentions, and refusal skills. Secondary Outcomes None Follow-up period Three weeks Evaluation Socio-demographic questionnaire. Smoking questionnaire – which was developed by the author and items adapted from a previously validated questionnaire used with adolescents. The authors decreased the level or readability for 5 th grade pupils. Readability was determined by Cronbach's alpha (0.88) Method of analysis Analysis of variance (ANOVA) and t-tests were used to analyse differences from the four groups. Groups 1 and 2 were compared on pre-tests to determine differences. Then all post-test scores were analysed to test for treatment differences. Research hypotheses were analysed using ANOVA	Primary outcomes Children in the intervention group had significantly more negative attitudes towards smoking at post-test than control children. There were no significant difference between the two groups on subjective norms or refusal self-efficacy Secondary outcomes None Attrition details Not reported	Measured behavioural intentions but did not report these findings. No long-term follow-up. Small sample of schools and children. Authors concluded that the imbalance in the number of children in each of the comparisons may have introduced bias (the authors did not state the numbers of children in each group). One person implemented the intervention and collected all data. No process evaluation

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Starkey & Orme (2001)</p> <p>UK.</p> <p>Evaluation of a primary school drug drama project: methodological issues and key findings</p>	<p>Study year Not reported</p> <p>Population/Setting 41 schools</p> <p>Age 10-11</p> <p>Gender Not reported</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes (school meals)</p> <p>Excluded No</p>	<p>Method of allocation None</p> <p>Number of measurements Two (pre and post)</p> <p>Process Evaluation No</p> <p>Measures to minimise confounding No</p> <p>Theory None stated (although it aimed to explore attitudes, and develop relevant skills, raise awareness of consequences of different decisions.</p> <p>Intervention (s) Interactive drama production and workshop day on attitudes, choices, decisions, and risks of alcohol, tobacco, and illegal drug use. Parents were also involved in parent's evenings and watching performances.</p> <p>Intervention period One day</p> <p>Comparator/s No</p> <p>Sample sizes: Total n= 297</p> <p>Baseline comparisons No</p> <p>Power calculation No</p>	<p>Primary Outcomes Knowledge and attitudes relating to drugs and drug use.</p> <p>Secondary Outcomes None</p> <p>Follow-up period 4 weeks</p> <p>Evaluation Draw and write exercises aimed to explore children's knowledge and attitudes relating to drugs and drug use based on an established instrument.</p> <p>Problem solving exercises were conducted based on an evaluation tool previously used in primary school-aged children. This exercise aimed to assess children's decision making skills and their ability to resist peer pressure.</p> <p>Method of analysis Draw and write exercise were categorised and thematically analysed in accordance with Wetton's Framework. A z-test was applied to look at differences in proportions between the pre-and post-project results. The problem solving where also subjected to a classification system. Chi-square analysis was used to test for significance between pre-and-post.</p>	<p>Primary outcomes The intervention had significant impact on children's knowledge and names of specific illegal drugs, and on their awareness that alcohol and cigarettes were drugs, and encouraged children to think in less stereotypical terms about drugs and drug users.</p> <p>Secondary outcomes None</p> <p>Attrition details 15% of schools completed all measures.</p>	<p>No long-term follow-up</p> <p>Intervention implemented in 41 schools but only 6 schools completed the post-project assessments and were therefore included in the final evaluation (N=297).</p> <p>Teachers administered and collected assessments among pupils.</p> <p>No control groups.</p> <p>No process evaluation.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
Chen & Lindsey, (2001) US. Evaluation of a tobacco prevention programme on knowledge, attitudes, intention and behaviour of tobacco use among fourth grade students – a preliminary study.	Study year Not reported Population/Setting 28 schools in four north central Florida counties. Age 9-11 year Gender Intervention (M=48.50%; F=51.50%) Comparison (M=48.93%; F=51.07%) Race/Ethnicity Yes SES Status No Excluded No	Method of allocation Each intervention school class acted as its comparison group Number of measurements Two (pre-and post) Process Evaluation No Measures to minimise confounding Pre-test scores on knowledge, attitude, and intention were used as covariates. Theory None stated Intervention (s) Illustrated story book about tobacco use and its consequences. The story book, supported by teachers guide explores chemicals in tobacco, the physiologic, cosmetic and social consequences of using tobacco including smokeless tobacco and immediate and long term consequences of use, tobacco advertising and second hand smoke. Intervention period Approx. two weeks Comparator/s Yes (no details on what the comparison group received) Sample sizes: Total n= 2139 Intervention= 1064; Control n= 1075 Baseline comparisons Yes Power calculation No	Primary outcomes Knowledge, attitude, intention Secondary outcome None Follow-up period Immediately after the last session Evaluation Questionnaire. To test the reliability and validity of the questionnaire, a pilot study was conducted with children not involved with the study. Cronbach alpha was used to determine internal consistency of reliability Method of analysis ANCOA was used to compare the scores on knowledge, attitude and intention. To compare pre and post differences on behaviour data was analyzed using chi-square.	Primary outcomes For tobacco knowledge, the mean of the education group was significantly higher than the comparison group after the lesson (Education =11.68, Comparison= 6.46 F=809.59, p<.01). For attitude, the mean of the education group was significantly higher than the comparison group (Education =18.99, Comparison= 18.12 F=32.179, p<.01). For intention, the education group showed significant improvement than the comparison group (Education =19.29, Comparison= 18.92 F=12.55, p<.01). Secondary outcome Not reported Attrition details Not reported	Each school acted as its own comparison group. Teachers were responsible for administering and collecting surveys. Teacher delivery of lessons varied in each county in that most classroom teachers delivered, but some schools used more experienced teachers including prevention teachers or Lifeskills management teachers to deliver. Not all teachers who delivered the lesson received training to deliver the programme.

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Ahmed et al. (2002)</p> <p>US.</p> <p>Impact of drug abuse resistance education (D.A.R.E) programme in preventing the initiation of cigarette smoking in fifth-and-sixth grade students.</p>	<p>Study year 1998/1999</p> <p>Population/Setting Fifth and sixth grade students from one middle-and upper class neighborhood school.</p> <p>Age 10-12</p> <p>Gender No break down given</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes Excluded No</p>	<p>Method of allocation One school acted as intervention and comparison group.</p> <p>Number of measurements Not clearly stated -</p> <p>Process Evaluation None</p> <p>Measures to minimise confounding Grade (age), gender and race</p> <p>Theory None reported</p> <p>Intervention (s) Programme aimed to provide children with knowledge and skills to resist peer pressure to experiment with drugs and alcohol. 17 lessons of approximately 50 minutes each were taught during each academic semester. Topics included in the curriculum included; practices of personal safety, drug use and misuse consequences, resisting techniques, assertiveness - a response style, media influences on drug use, decision making and risk taking, alternatives to drug abuse, teaching police officer planned lessons, role modelling, project dare summary, and assembly and graduation.</p> <p>Intervention period 1 year (one school semester)</p> <p>Comparator/s Yes – no description of what the comparison group received</p> <p>Sample sizes: Total: 240 No breakdown for DARE and Non-Dare participants</p> <p>Baseline comparisons : No</p> <p>Power calculation: No</p>	<p>Primary Outcomes Smoking behaviour</p> <p>Secondary outcomes Smoking-related knowledge</p> <p>Follow-up period Immediately following intervention implementation</p> <p>Evaluation Self-reported questionnaire – which was developed based on focus groups discussions with study subjects and standardized questions taken from validated surveys previously validated for use with this age group.</p> <p>Method of analysis Chi square tests were conducted to assess the differences between the two groups. Multiple logistic regression models were performed, and odds ratios with 95%CI were calculated for smoking behaviour and knowledge.</p>	<p>Primary outcomes DARE group had significantly lower rate of smoking compared to non-DARE participants. Logistic regression showed that DARE group was five times (4.9; p=0.003; 95%CI: 1.70. 14.0) less likely to initiate smoking compared with the non-DARE group.</p> <p>Secondary outcomes DARE group had significantly (p=0.002) higher knowledge scores on the risks of smoking. The knowledge score had strong opposite correlation to smoking behaviour. Student with top range knowledge scores had substantially lower rates of smoking (1.4% vs. 14.4% ; p=0.001).</p> <p>Attrition details 98%</p>	<p>Curriculum implemented in one school – who also acted as its own comparison</p> <p>Questionnaires were distributed to pupils through their classroom teachers. The questionnaire was blinded to protect the confidentiality of the subjects by not including any personal identifiable information (i.e. name, parent's name, or home address).</p> <p>Over half of respondents were in 6th grade (55%) and 45% were in 5th grade</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Storr et al. (2002).</p> <p>US.</p> <p>A randomised controlled trial of two primary school intervention strategies to prevent early onset tobacco smoking.</p>	<p>Study year 1993</p> <p>Population/Setting US Primary school pupils in first year from nine public schools.</p> <p>Age Ranged from 5-.7 years (mean age 5.7 years)</p> <p>Gender 53% Male</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes (free school meals as a proxy for family on low income)</p> <p>Excluded No</p>	<p>Method of allocation Randomised block design - each schools served as a block factor. Within each school, children and teachers were randomly assigned to one of two intervention or control classrooms.</p> <p>Number of measurements Two (baseline and follow-up)</p> <p>Process Evaluation None</p> <p>Measures to minimise confounding Yes - adjusted for socio – demographics, baseline family and behaviour covariates.</p> <p>Theory Life course/social fields framework, Model of anti-social behaviour and substance use</p> <p>Intervention (s) <i>Classroom-centered (CC)</i> consisted of 3 components (1) curriculum enhancements; (2) enhanced behaviour management practices and (3) back-up strategies for children not performing adequately. <i>Family-school-partnership (FSP)</i> was designed to improve achievement, and reduce early aggression, shy behaviour and concentration problems by enhancing teacher's communication and providing parents with effective teaching and child behaviour management strategies. Components included (1) training for teachers and other relevant staff in parent-teacher and partnership building; (2) weekly home-school learning and communication activities and (3) a series of nine workshops for parents lead by the first grade teacher and the school psychologist or social worker.</p> <p>Intervention period 1 academic school year</p> <p>Comparator/s Controls continued with usual curriculum and parent-teacher communication and interaction.</p> <p>Sample sizes: Total n=678: CC=230 FSP= 229Control n= 219</p> <p>Baseline comparisons Yes</p> <p>Power calculation Yes</p>	<p>Primary Outcomes Smoking behaviour</p> <p>Secondary Outcomes None</p> <p>Follow-up period Six years (when children were aged 12 years)</p> <p>Evaluation Self-report smoking behaviour</p> <p>Method of analysis Cox regression models for time-to-event data were used to estimate the impact of the intervention on risk of starting to smoke, taking into account the membership of pupils in their original grade 1 classroom (i.e. with risk sets defined by school origin). Adjustment for baseline covariates.</p>	<p>Primary outcomes A modest attenuation in the risk of smoking initiation was found for students who have been assigned to either the CC or FSP intervention classrooms (26% versus 33%) (Adjusted relative risk for CC /Control contrast = 0.57, 95% CI, 0.34-0.96; adjusted relative risk for FSP/control = 0.69, 95% CI, 0.50.97). Results lend support the targeting the early antecedent risk behaviours for tobacco smoking.</p> <p>Secondary outcomes None</p> <p>Attrition details 81% Missing data for: CC=23% FSP=18% Control=16%</p>	<p>Contamination is a possibility since randomisation was at the classroom versus the school level.</p> <p>Authors noted that their sample size may not be optimal with respect to precision of the study estimates and postulated that a study with 1000-2000 children would reduce the uncertainty that is reflected in the 95% CI.</p> <p>Although the finding was modest – it is encouraging 6 years after intervention implementations. Authors recommended a follow-up of study participants after they have passed their peak onset incidence years.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
Botvin et al. (2003) US. Preventing tobacco and alcohol use among elementary school students through life skills.	Study year Not reported Population/Setting 20 schools (9 assigned to intervention) Age 8-12 years Grade 3 = 23% Grade 4 = 40% Grade 5 = 32% Gender M=52% F= 48% Race/Ethnicity Yes SES Status Yes Excluded No	Method of allocation Cluster randomisation. Randomisation at the school level Number of measurements Two (pre & post) Process Evaluation Yes Measures to minimise confounding Adjusted for gender, race, family structure and pre-test score variables. Theory Life Skills Intervention (s) LifesSkills (LST) prevention programme by providing youth with the necessary knowledge and skills for resisting social influences to use tobacco and alcohol, as well as to reduce motivation to use these substances. The programme consisted of 24 lessons (30-45 min.) delivered by trained teachers who taught the programme over 3 years with 8 classes per year for pupils in graded 3-5. Skills are taught using instruction, demonstration, behavioural rehearsal, feedback, social reinforcement, and behavioural homework Intervention period Lessons were taught over three years Comparator/s Yes (no details provided on what they recieved) Sample sizes: Total n= 1090: Intervention n= 426: Control n= 664 Baseline comparisons Yes Power calculation No	Primary Outcomes Smoking behaviour Secondary Outcomes Behavioural determinants Follow-up period 3 months Evaluation Questionnaire data relating to demographics, substance use, peer and parental attitudes and normative expectations, attitudes about smoking and alcohol, knowledge, impulsive and daring behaviour. Questionnaires were completed pre- and post-intervention. Study authors attempted to measure project fidelity by monitoring teachers randomly as they provided the intervention to children. Method of analysis Programme effects were examined using the individual and school as the unit of analysis. For individual unit of analysis, control variables included gender, race, family structure, and the pre-test score of the outcome variable. For the school-level analysis, student scores were averaged for each school and used as covariates in each analysis.	Primary outcomes Intervention groups reported less smoking in the past year than controls. Secondary outcomes Compared to controls, intervention participants had higher self and peer anti-drinking attitudes, increased substance use knowledge, lower peer normative expectations for smoking and alcohol use, lower teen normative expectations for smoking, higher self-esteem at post-test. Following school level analysis, intervention schools had lower smoking and alcohol prevalence, higher mean self and friends anti-drinking attitudes, lower peer drinking norms, and higher mean self-esteem scores at post-test compared with control schools. Attrition details Not reported	Findings are based on a short-term follow-up (3 months). Intervention effects are not reported separately for age or grade level, making it difficult to determine the efficacy of the intervention for different developmental ages. Process evaluation measures surrounding fidelity of intervention not reported.

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
James et al. (2003) US. Evaluation of a tobacco prevention curriculum for elementary school children.	Study year Not reported Population/Setting 97 schools (49 intervention group) from 5 regions in Florida. Age 9-10 year Gender Intervention (M=48.50%; F=51.50%) Comparison (M=48.93%; F=51.07%) Race/Ethnicity Yes SES Status No Excluded No	Method of allocation Two-stage cluster sample Number of measurements Two (pre-and post) Process Evaluation None Measures to minimise confounding Pre-test scores on knowledge, attitude, and intention were used a covariates. Theory None stated Intervention (s) See Lindsey & Chen (2001) for intervention details Intervention period Two to four weeks Comparator/s Yes (comparison group advised not to teach their pupils their prevention curriculum before or during the study) Sample sizes: Total n= 1746 Intervention= Not reported Control n= Not reported Baseline comparisons Yes Power calculation No	Primary outcomes Knowledge about tobacco, attitude towards tobacco and intentions towards tobacco. Secondary outcome None reported Follow-up period One to two days after the lessons were completed Evaluation 15 item questionnaires was used to assess knowledge, and 27 item questionnaire was used to assess intentions. To test the reliability and validity of the questionnaire, a pilot study was conducted with six schools and 24 classes within those schools (not involved with the study). Cronbach alpha was used to determine internal consistency of reliability Method of analysis Chi square, odds ratio, t-tests and ANCOVA were used to evaluate the differences between the intervention and comparison group.	Primary outcomes A significant increase in knowledge and attitudes at post-test but no significant differences were observed for intentions at post-test. Secondary outcome Not reported Attrition details Not reported	Teachers were responsible for administering and collecting surveys. Analysis was conducted at the level of the student.

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Hanewinkel & Abhauer (2004)</p> <p>European Union (Austria, Denmark, Luxembourg, and Germany).</p> <p>Fifteen-month follow-up of a school-based life-skills approach to smoking prevention</p>	<p>Study year 1998/1999</p> <p>Population/Setting 54 schools (106 classes) from Austria, Denmark, Luxembourg, and Germany.</p> <p>Age Mean age 11.4</p> <p>Gender Intervention (M=50.1%) Control (M=54.2%)</p> <p>Race/Ethnicity Not reported</p> <p>SES Status Not reported</p> <p>Excluded None</p>	<p>Method of allocation Quasi-experimental control group design</p> <p>Number of measurements Two (pre & post)</p> <p>Process Evaluation Yes</p> <p>Measures to minimise confounding Adjusted for age and smoking status at baseline (never-smoking at baseline).</p> <p>Theory Life Skills</p> <p>Intervention (s) Started in grade 5 and finished in grade six. 21 sessions were delivered by trained by teachers. The aims were to promote fundamental social competencies and coping skills. Topics covered self-awareness, communication and social skills, specific information and knowledge about smoking (i.e. effects of smoking on the body), resistance skills and decision making, stress management and coping with emotions and closing lesson with a summary of topics. Teachers a 2-day training workshop.</p> <p>Intervention period Four months</p> <p>Comparator/s Yes (matched with intervention pupils - comparison group did not take part in any intervention/education during the course of the study).</p> <p>Sample sizes: Total n= 1858: Intervention n= 1024: Control n= 834</p> <p>Baseline comparisons Yes Power calculation No</p>	<p>Primary Outcomes Smoking behaviour. Cognitions and knowledge regarding smoking and psychosocial variables</p> <p>Secondary Outcomes None</p> <p>Follow-up period 15 months from start of intervention</p> <p>Evaluation To measure intervention fidelity, teachers completed process evaluation questionnaires during the implementation of the programme. Immediately following the last session, teachers and children completed a questionnaire assessing general aspects of the programme.</p> <p>Child questionnaire data related to smoking behaviour, susceptibility, knowledge, attitudes, perceived positive consequences of smoking, social competence and classroom atmosphere. Questionnaires among pupils were administered by teachers.</p> <p>Method of analysis Baseline characteristics assessed using t-tests and chi-square. Programme effects examined using logistic regression analysis.</p>	<p>Primary outcomes Weak effect on lifetime smoking prevalence and experimental smoking</p> <p>Programme effects on smoking knowledge, on the social competence of pupils as well as classroom atmosphere.</p> <p>No effects were found on susceptibility to smoking among never-smokers, attitudes towards smoking and perceived positive consequences than comparison group.</p> <p>Secondary outcomes None</p> <p>Process Evaluation Mean number of lessons conducted was 16.4% out of 21%. From the units teachers implemented, 76.2% of the programme contents were delivered.</p> <p>Attrition details 87.5%</p>	<p>Each of the intervention schools also served as a control group, increasing the risk of cross-contamination.</p> <p>No data was collected for the smoking behaviours of social influences (i.e. family, friends) or socio-economic status (SES), which may have influenced results.</p> <p>Restricted time frame (four months) given for teacher delivery, resulting in elements of the programme not being implemented as planned.</p> <p>Data gathered by self-report and administered by teachers, increasing the risk that smoking habits and behavioural determinants may have been concealed due to the desirability of teachers.</p> <p>Data analysed at the individual level.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Results	Notes
<p>Immediate and short-term effects of the fifth-grade version of the Keepin it REAL substance use prevention intervention</p> <p>US</p> <p>Hecht et al. (2008).</p>	<p>Study year 2004/2005</p> <p>Population/Setting US elementary schools</p> <p>Age At baseline, the students ranged in age from 7 to 15 years (mean age 10.37).</p> <p>Gender Female 49.8%</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes</p> <p>Excluded No</p>	<p>Method of allocation 10 schools randomly assigned to the intervention and 13 schools randomly assigned to control condition.</p> <p>Number of measurements Three: baseline, end of 5th grade intervention and again at the end of 6th grade booster sessions.</p> <p>Process Evaluation None</p> <p>Measures to minimise confounding Accounted for the nesting of students within schools</p> <p>Theory The original curriculum for drew on the etiological risk and resiliency approach and communication competency theory by incorporating knowledge (narratives), motivation (norms) and skills as key to prevention.</p> <p>Intervention (s) After curriculum adaptation (from an intervention previously targeted at adolescents) children in 5th received the intervention with follow-up boosters in grade 6 delivered by teachers.</p> <p>Intervention period Ten lessons delivered in 5th grade and two lessons delivered in 6th grade.</p> <p>Comparator/s Control schools implemented usual prevention curriculum.</p> <p>Sample sizes: Total n=1566, Intervention n= 768: Control n=798</p> <p>Baseline comparisons Yes Power calculation No</p>	<p>Primary Outcomes Refusal self-efficacy, Substance use resistance strategies, hypothetical alcohol resistance, active decision making, intentions, anti-drug norms, substance use expectancies, and lifetime and past month prevalence.</p> <p>Secondary Outcomes None stated</p> <p>Follow-up period Immediate (approximately two months post-curriculum implementation), and short term (through the end of 6th grade) effects of the 5th grade curriculum.</p> <p>Evaluation Self-report questionnaire. Lesson observations by study personnel to determine intervention fidelity</p> <p>Method of analysis Random co-efficient models. Each model included random components that varied across participants and accounted for the serial correlation among the three measurements. In addition, each model accounted for pupils been nested in schools.</p> <p>Generalised linear mixed models were fit to pupil's reports of lifetime and past months' substance use prevalence.</p>	<p>Primary outcomes The intervention appeared to be no more effective than the control school's programming in changing the primary outcomes.</p> <p>Secondary outcomes None reported</p> <p>Attrition details 73%</p>	<p>Intervention effects may be limited due to 9 out of the 13 control schools already in receipt of externally evidence based smoking prevention interventions e.g. Project Alert.</p> <p>Authors concluded that although the adapted curriculum addressed developmental issues, changing it to make intervention component examples more concrete and drawing on specific conclusions for the pupils may have reduced the effectiveness as well as the content focus (norms and resistance skills) may have been inappropriate for a younger cohort.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Kupersmidt et al. (2010)</p> <p>US.</p> <p>Media literacy education for elementary school substance use prevention: study of media detective.</p>	<p>Study year Not reported</p> <p>Population/Setting 12 schools located in 5 local districts.</p> <p>Age 7-13 years</p> <p>Gender F=51%</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes (school meals)</p> <p>Excluded No</p>	<p>Method of allocation RCT: In total, 49 classes participated, with 22 serving control group. Randomisation at the school level.</p> <p>Number of measurements Two (pre & post)</p> <p>Process Evaluation Yes</p> <p>Measures to minimise confounding Intention to treat (condition (intervention/control), gender, previous use (user/non-user) grade by condition, and previous use by condition. Fidelity of implementation was examined as moderators of effectiveness.</p> <p>Theory Social cognitive theory, dual-process theories of attitude change, and theory of reasoned action.</p> <p>Intervention (s) Media detective is a 10 lesson (45 min. Each) substance use prevention programme delivered by trained teachers (who received 1 day training) to increase children's critical thinking skills about media messages and reduce intent to use tobacco and alcohol products.</p> <p>Intervention period 10 days</p> <p>Comparator/s Control school received normal classroom material</p> <p>Sample sizes: Total n= 788: Intervention n= 334: Control n= 335</p> <p>Baseline comparisons Yes</p> <p>Power calculation No</p>	<p>Primary Outcomes Intentions to use tobacco and alcohol.</p> <p>Secondary Outcomes Deconstruction, understanding of persuasive intent, interest in alcohol branded merchandise, self-efficacy.</p> <p>Follow-up period Two weeks after programme implementation</p> <p>Evaluation Self-reported questionnaire]</p> <p>Process evaluation measures included dosage and fidelity reported by teachers. Study observers completed fidelity ratings of teacher delivery.</p> <p>Method of analysis Hierarchical linear model (e.g., intention to treat) was used to investigate differences in primary and secondary outcomes. For examination of the effect of programme implementation on pupils primary outcomes, showed that changes in intentions to use tobacco and alcohol were not likely attributable to teacher differences in implementation.</p>	<p>Primary outcomes Intervention pupils who had used alcohol or tobacco in the past reported significantly less intention to use and more self-efficacy to refuse substances compared to control pupils who had used alcohol or tobacco in the past.</p> <p>Secondary outcomes Compared to control classes, intervention pupils who had used alcohol or tobacco in the past reported significantly more self-efficacy to refuse substances.</p> <p>Boys in the intervention group reported significantly less interest in alcohol-branded merchandise than control boys.</p> <p>Attrition details Not reported</p> <p>Process evaluation Of the 344 students in the intervention, 235 attended all scheduled lessons (68%), missed 1 lesson, 27(8%) missed 2 lessons, 8 (2%) missed 3 lessons and 5 missed ≥4 lessons. Teachers self-reported that they delivered 98% of the taught lessons on average, whereas observers reported 93% on average.</p>	<p>Imbalance in numbers across grades in intervention and control classes (intervention group had a larger proportion of 5th grade children, whereas the control group had larger proportion of 3rd graders).</p> <p>Findings for intentions and self-efficacy were not separated by age or grade level.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Vincus et al. (2010). US.</p> <p>A short-term, quasi-experimental evaluation of DARE's revised elementary school curriculum</p>	<p>Study year 2007/2008</p> <p>Population/Setting 17 urban elementary schools. Schools that were eligible to participate were those that included (but not limited to) grades 5 and 6, comprised of 50 students in each of the two groups.</p> <p>Age 5th grade students (10-11 years)</p> <p>Gender Intervention: Control:</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes</p> <p>Excluded Yes – students who received learning support because of their ability to respond to meaningfully the surveys.</p>	<p>Method of allocation 17 schools assigned to intervention and each school acted as own comparison one year prior to the delivery of the DARE curriculum</p> <p>Number of measurements Two – baseline and post-intervention</p> <p>Process Evaluation None</p> <p>Measures to minimise confounding Age, gender, race and ethnicity and whether their family received public assistance</p> <p>Theory Revised curriculum based on previous DARE interventions</p> <p>Intervention (s) Revised curriculum comprised of nine lessons followed by a graduation ceremony. The curriculum aimed to motivate students to avoid using substances, improve their capacity to make pro-social decision, to resist inducement from peers to use substances and to develop and practice refusal self-efficacy skills. Intervention was delivered by trained uniformed police officers</p> <p>Intervention period 1 school year</p> <p>Comparator/s Yes: Each participating school a cohort of 5th grade students who did not receive DARE during 2007/07 school year to a second cohort of 5th graders who received the curriculum in the spring of 2007/08.</p> <p>Sample sizes: Total: 2940 Intervention =1450 Control =1490</p> <p>Baseline comparisons Yes</p> <p>Power calculation No</p>	<p>Primary Outcomes Past 30 day and lifetime substance use (tobacco, alcohol and marijuana)</p> <p>Secondary Outcomes Academic performance outcomes</p> <p>Follow-up period Approx one month after their final DARE lesson</p> <p>Evaluation Self-reported measures used in substance use</p> <p>Method of analysis Higherarchical linear modelling to account for nested of the data (i.e. multiple observations nested with student and students nested within schools).</p>	<p>Primary outcomes No intervention effect on students substance use for any of the outcomes measured.</p> <p>Secondary outcomes Students more likely to attend school on the days they received the DARE lessons</p> <p>Students in the intervention group were more likely to have been suspended</p> <p>Attrition details Nine schools lost at post-intervention measures. No details provided for participants</p>	<p>Each school served as its own control</p> <p>Student's reports of baseline lifetime cigarette and alcohol use differed across the two years, and that the number of suspensions increased from the comparison to the intervention year. Although baseline differences were controlled for it is possible that they masked other, unmeasured differences in the two cohorts that may have affected study outcomes.</p> <p>Lack of intervention findings may be related to young age of participants</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Crone et al. (2011)</p> <p>Netherlands</p> <p>Does a smoking prevention programme in elementary school prepare children for secondary school?</p>	<p>Study year 2002</p> <p>Population/Setting 121 schools (151 classes) from five community health centre regions in the Netherlands</p> <p>Age 10-111</p> <p>Gender Intervention (M=47%; F=53%) Control (M=47%; F=53%)</p> <p>Race/Ethnicity Industrialised (93% intervention; 90% control)</p> <p>SES Status Both parents working (60% intervention; 57% in control)</p> <p>Parents in average education (29% intervention; 30% control)</p> <p>Excluded None</p>	<p>Method of allocation Cluster randomisation. Randomisation at the school level</p> <p>Number of measurements Three (pre, post & follow-up)</p> <p>Process Evaluation None</p> <p>Measures to minimise confounding Adjusted for parental and teacher smoking and behavioural determinants</p> <p>Theory TPB and Social cognitive theory</p> <p>Intervention (s) Education programme (But I don't smoke) consisted of 6 lessons (1h r each) with 3 lessons in grade 5 and 3 lessons in grade 6. Programme aimed to increase knowledge on the consequences of smoking, form an attitude not to smoke and intention not to smoke. Teachers were trained by project staff (time not provided) to deliver the programme. Components involved making a school smoking project, interviewing parents, discussing attitudes towards smoking and advising/encouraging non-smoking commitment with parents and refusal skills training.</p> <p>Intervention period Teachers decided on when to deliver the lessons for each of the school year.</p> <p>Comparator/s Control school who continued with usual curriculum</p> <p>Sample sizes: Total n= 3173: Intervention= 1756: Control n= 1417</p> <p>Baseline comparisons Yes</p> <p>Power calculation Yes</p>	<p>Social influences to smoke, attitudes, self-efficacy, intentions towards non-smoking and smoking behaviour (behaviour measured in when children in secondary school)</p> <p>Follow-up period Six weeks after the lessons in 5th and in 6th grade. Then 1 year after the intervention ended, when children were in secondary school.</p> <p>Evaluation Questionnaire included items based on the theory of planned behaviour and social cognitive theory and the remaining questions largely based on questionnaire used in a previous study with primary school-aged children.</p> <p>Items included: attitudes, social influences, and social pressures by offering cigarettes, social pressure by encouraging smoking, self-efficacy, intentions and smoking behaviour.</p> <p>Background characteristics included; ethnicity, parental work and parental educational level, religion, age and gender of child.</p> <p>Method of analysis Multi-level techniques to account for the clustering of students in classes.</p>	<p><u>Elementary school</u> Intervention children had fewer perceptions of the benefits of smoking and lower perceived approval and prevalence of smoking among social networks. These effects were no longer significant after the lessons in grade 6.</p> <p>No significant differences between the groups in either grade 5 or 6 for smoking prevalence.</p> <p><u>Secondary school</u> Intervention groups were significantly less likely to smoke and have significantly greater intention not to smoke.</p> <p>A sub analysis of secondary school data showed that these effects were only significant in girls with female girls in the intervention group significantly less likely to start smoking and to smoke than those in the control.</p> <p>Attrition details Intervention = 58% Control = 57%</p>	<p>Limitations of the evidence included the transition to secondary school and differences between secondary schools may have affected the results.</p> <p>There were some baseline differences between the groups (although these were adjusted for).</p> <p>Secondary school data were available for only 57% of students (although dropout rate was identical for each group)</p> <p>Data were self-reported</p> <p>47% of the students in the intervention group recieved all activities in 5th grade and 31% recieved all activities in 6th grade.</p> <p>Teachers administered questionnaires to children in both 5th and 6th grades. The last questionnaire at 1 year follow-up was not completed in the classroom and was posted out to children's homes.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Andrews et al. (2011)</p> <p>US.</p> <p>Short-term efficacy of Click City Tobacco: changing etiological mechanisms related to onset of tobacco use.</p>	<p>Study year Not reported</p> <p>Population/Setting 47 schools (24 intervention).</p> <p>Age 10-12</p> <p>Gender F= 50%</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes (school meals)</p> <p>Excluded No</p>	<p>Method of allocation Cluster randomisation. Randomisation at the school level</p> <p>Number of measurements Two (pre & post)</p> <p>Process Evaluation No</p> <p>Measures to minimise confounding Race/ethnicity. Moderating effect of gender, tried smoking, family smoking and tobacco chewing and sensation seeking were examined on the effect of the intervention on changes on the primary outcomes.</p> <p>Theory Etiological mechanisms based on prototypes, normative social images/beliefs (TPB) and descriptive norms.</p> <p>Intervention (s) 8 session computer-based intervention for 5th graders with two boosters in grade 6. Consisted of 21 sessions and 17 components, with the 6th grade boosters consisting of 5. Components targeted mechanisms predictive of willingness and intentions to use and initiation tobacco. Content included perceptions of long and short-term effects of smoking, exposure to SH smoke and addiction.</p> <p>Intervention period 2 years (started in grade 5 and finished in grade 6)</p> <p>Comparator/s 24 controls continued with their usual curriculum</p> <p>Sample sizes: Total n= 2322: Intervention n=1168: Control n=1154</p> <p>Baseline comparisons Yes</p> <p>Power calculation No</p>	<p>Primary Outcomes Intention and willingness</p> <p>Secondary Outcomes Health cognitions Risk perceptions Risks associated with addictions Trying smoking</p> <p>Follow-up period One week following programme implementation.</p> <p>Evaluation Estimates of reliability the measures are based on data from a previous pilot study and validated items from other surveys. Self-report measures included, behavioural intentions, willingness, descriptive norms, social images, and normative social images, perceptions of risks, addition, family smoking or chewing tobacco, trying smoking.</p> <p>Method of analysis To control for design effect (randomization by school) data were analysed using general linear mixed model, with pupils nested within schools and schools nested within the condition. Moderating effects of family and sibling were examined to determine their effect on intentions and willingness.</p>	<p>Primary outcomes Compared to control schools, intervention participants significantly decreased their willingness and intentions to smoke and chew tobacco in the future.</p> <p>Secondary outcomes Compared to students in control schools a moderate effect size was observed on most of the remaining etiological mechanisms.</p> <p>Attrition details Intervention = 90.3% Control = Not provided</p>	<p>For intentions and willingness the effect sizes, as measured by Cohen's d were small.</p> <p>Findings are immediately post intervention (one week). Although it's part of a longer follow-up study (see the next study in table below).</p> <p>No process evaluation data.</p> <p>No details regarding control school attrition rates.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Andrews et al. (2014)</p> <p>US.</p> <p>Long term efficacy of click city tobacco: A school-based tobacco programme.</p>	<p>Study year Not reported</p> <p>Population/Setting 47 schools (24 interventions).</p> <p>Age 12-13</p> <p>Gender Not reported</p> <p>Race/Ethnicity Yes</p> <p>SES Status</p> <p>Excluded No</p>	<p>Method of allocation See study above (Andrews et al., 2011).</p> <p>Number of measurements Three (pre, post 6th grade programme, and 7th grade assessments)</p> <p>Process Evaluation No</p> <p>Measures to minimise confounding See study details above (Andrews et al., 2011)</p> <p>Theory See study details above (Andrews et al., 2011).</p> <p>Intervention (s) See study details above (Andrews et al., 2011).</p> <p>Intervention period</p> <p>Comparator/s See study details above (Andrews et al., 2011).</p> <p>Sample sizes: Total n= 1168 Intervention n= 1154 Control n= 1154</p> <p>Baseline comparisons Yes</p> <p>Power calculation N/A (Long term follow-up)</p>	<p>Primary Outcomes Intentions and willingness to smoke and chew tobacco in the future.</p> <p>Secondary Outcomes Health cognitions Risk perceptions Risks associated with addictions Moderators (parents and siblings current cigarette smoking and chewing tobacco and sensation seeking).</p> <p>Follow-up period Two years</p> <p>Evaluation See study details above (Andrews et al., 2011).</p> <p>Method of analysis Data were analysed using general linear mixed model with pupils nested within school and schools nested within condition. Moderating effects of family and siblings were examined to determine their effect on intentions and willingness</p>	<p>Primary outcomes Compared to pupils in the controls, intentions and willingness to smoke increased less from baseline to 6th grade, and from baseline to 7th grade among intervention pupils.</p> <p>No differences between groups on intentions to chew tobacco.</p> <p>Secondary outcomes Changes in the etiological mechanisms in the intervention group remained significant (similar to Andrews et al., 2011 short term effects) but were slightly smaller over time.</p> <p>Programme was most effective at changing intentions and willingness to smoke among those who had tried smoking. In addition the programme was most effective at changing intentions to chew tobacco for those with family members who smoked.</p> <p>Attrition details</p> <p><u>Intervention</u> 6th Grade assessment = 67.7% 7th Grade assessment = 64.7%</p> <p><u>Control</u> 6th Grade assessment = 75.9% 7th Grade assessment = 69.7%</p>	<p>Effect sizes (Cohen's d) for intentions and willingness to smoke were small to moderate (0.08 – 0.15).</p> <p>High dropout</p> <p>Mix of elementary schools (24) and middle schools (13) in the intervention.</p> <p>Research staff assisted teachers and students with first 1-2 sessions in 5th grade and for the first session in 6th grade. The remaining sessions were assisted with teachers.</p> <p>No process evaluation</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>The effect of two elementary school-based prevention interventions on being offered tobacco and the transition to smoking</p> <p>US.</p> <p>Wang et al.(2102)</p>	<p>Study year 1993 (See Storr et al. 2002 – this study is a longer term follow-up of participants who were in first grade of primary school and followed to mean age 18 years)</p> <p>Population/Setting See Storr et al. 2002</p> <p>Age Participants initially recruited in first grade of primary school (Storr et al. 2002) were followed up 12 years later (mean age 18 years)</p> <p>Gender No breakdown provided</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes</p> <p>Excluded No</p>	<p>Method of allocation See Storr et al. 2002</p> <p>Number of measurements See Storr et al. 2002</p> <p>Process Evaluation None</p> <p>Measures to minimise confounding See Storr et al. 2002</p> <p>Theory See Storr et al. 2002</p> <p>Intervention (s) See Storr et al. 2002</p> <p>Intervention period 1 year when children were in first grade of primary school.</p> <p>Comparator/s Yes</p> <p>Sample sizes: 628</p> <p>Baseline comparisons Yes</p> <p>Power calculation Yes</p>	<p>Primary Outcomes First tobacco offer and initial tobacco smoking once offered.</p> <p>Secondary Outcomes None</p> <p>Follow-up period 12 years</p> <p>Evaluation Dependent variables: initial tobacco offer and first tobacco smoking once offered. An audio assisted self-interview method was used to measure tobacco involvement.</p> <p>Method of analysis Separate analysis was conducted for first tobacco offer and initial tobacco smoking once offered. Discrete time analysis compared the time defined as years from birth until age at first tobacco offer with censoring participants who were never offered tobacco at the age of their last assessment and the years between age of first offered tobacco and initiating with censoring of non-smokers at the age of their last assessment. Hazard Ratios estimates were obtained through discrete time analysis that included potential confounders.</p>	<p>Primary outcomes The risk of being offered tobacco was reduced among both the CC and FSP groups relative to the control groups, although the reduction was only statistically significant in the CC group.</p> <p>Neither intervention condition reduced the transition to smoking once offered tobacco to smoke.</p> <p>Secondary outcomes None</p> <p>Attrition details 95%</p>	<p>Contamination is a possibility since randomisation was at the classroom versus the school level.</p>

Author, Country & Title	Sample	Method of allocation to intervention/control	Outcomes & method of analysis	Findings	Notes
<p>Isensee et al. (2014)</p> <p>Germany</p> <p>Effects of a school-based programmes on smoking in early adolescence: a 6-month follow-up of the 'Eigenstnädig warden' cluster randomised trial</p>	<p>Study year 2010-2012</p> <p>Population/Setting 45 public schools from four federal states in Germany.</p> <p>Age Mean 10.37 years</p> <p>Gender 47.9% Girls at baseline (no gender breakdown intervention/control).</p> <p>Race/Ethnicity Yes</p> <p>SES Status Yes</p> <p>Excluded For analysis, data sets with inconsistencies concerning age, gender, and smoking status were excluded (n=180).</p>	<p>Method of allocation Cluster randomisation. Randomisation occurred at the school level.</p> <p>Number of measurements Two (pre & post)</p> <p>Process Evaluation No</p> <p>Measures to minimise confounding Adjusted for covariates (age, gender, type of school, migration background, SES status, family, sibling smoking, and whether children had participated in a comprehensive programme in elementary school.</p> <p>Theory Life skills and social influence model</p> <p>Intervention (s) The aim of the intervention was to enhance substance-specific and general life skills, consisting of 14 units (lasting approx. 90 minutes each) and two workshops (4-6 hours) delivered by trained teachers for children in grade 5 and 6</p> <p>Intervention period Two years</p> <p>Comparator/s Control group that continued with usual curriculum.</p> <p>Sample sizes: Total n= 3444: Intervention n=1685: Control n=1789</p> <p>Baseline comparisons Yes</p> <p>Power calculation Yes</p>	<p>Primary Outcomes Lifetime and current smoking</p> <p>Secondary Outcomes Attitudes towards smoking, risk perceptions, smoking-related knowledge, normative expectations, self-efficacy</p> <p>Follow-up period 6 months after the end of the programme. (26 months after baseline)</p> <p>Evaluation Self-completed questionnaires on smoking behaviour and behavioural determinants.</p> <p>Method of analysis Programme effects of were assessed using multi-level mixed effects regression models and adjusted for covariates.</p>	<p>Primary outcomes Tobacco smoking at 6 months follow-up was lower in the intervention group compared to the controls (adjusted OR=0.63; 95% CI 0.41 to 0.96; p=0.026).</p> <p>Secondary outcomes Compared to the control group, intervention participants had higher smoking related knowledge (adjusted β=9.38; 95% CI 6.73 to 12.04; p<0.001) and greater change in attitudes towards a more critical perception of risks and disadvantages of smoking (adjusted β=0.10; 95% CI 0.03 to 0.16; p=0.002).</p> <p>No group differences were found for current smoking, perceived norms of smoking and self-efficacy to refuse cigarette offers.</p> <p>Attrition details 73% Intervention = 1179 Control = 1334</p>	<p>Study had high dropout of participant rates.</p> <p>The study did not include process measures to determine if the intervention was delivered with fidelity, which may have limited the results of the study.</p> <p>Study findings are not comparable to others as the children in this study have already made the transition to secondary school.</p>

Appendix 2

Smoking Questionnaire, Focus Group and Semi-structured Interview Schedules

Smoking Questionnaire: To be administered on Survey Monkey

Introduction

You will now be asked some questions about smoking. We want to know what you think about smoking so please be honest when answering the questions. Remember what you write down will be kept **confidential**. This means nobody will find out your answers.

About you

Q. Please write in your name:.....

Q. Please write in the the name of your school:.....

Q. Are you a boy or a girl? (please tick one box)

Boy	<input type="checkbox"/>
Girl	<input type="checkbox"/>

Q. How many years old are you now? (please circle one number)

8 9 10 11

Q. What is your birthday (date of birth)? (please write in)

.....Day
.....Month.....Year

Q. What is your postcode (e.g. L8 7JD)? (please write in)......

If you don't know your postcode please write in your street name and area you live:

.....

Q. What is your ethnic group? (please tick one box)

<input type="checkbox"/>	White British	<input type="checkbox"/>	Caribbean
<input type="checkbox"/>	White Irish	<input type="checkbox"/>	African
<input type="checkbox"/>	Any other White Background (please write in).....	<input type="checkbox"/>	Any other Black background (please write in).....
<input type="checkbox"/>	White and Black Caribbean	<input type="checkbox"/>	Chinese
<input type="checkbox"/>	White and Black African	<input type="checkbox"/>	Any Other ethnic group (please write in).....
<input type="checkbox"/>	White and Asian		
<input type="checkbox"/>	Any other Mixed background (please write in).....		
<input type="checkbox"/>	Indian		
<input type="checkbox"/>	Pakistan		
<input type="checkbox"/>	Bangladeshi		
<input type="checkbox"/>	Any other Asian background (please write in).....		

Smoking behaviour

Q. Do you smoke cigarettes at all nowadays? (please tick one box)

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Q. Now read the following statements and tick the box next to the one which best describes you.

I have never smoked, not even a puff or two	<input type="checkbox"/>
I have only ever tried smoking once	<input type="checkbox"/>
I used to smoke but I never smoke a cigarette now	<input type="checkbox"/>
I sometimes smoke cigarettes now but I don't smoke as many as one a week	<input type="checkbox"/>
I usually smoke between one and six cigarettes a week	<input type="checkbox"/>
I usually smoke more than six cigarettes a week	<input type="checkbox"/>

Only children who tick 'I have never smoked, not even a puff or two' (question above) will NOT be asked the question below

Q. How old were you when you had your first puff on a cigarette? (please circle one number)

1 2 3 4 5 6 7 8 9 10 11

Quitting smoking

Only children who do smoke will be asked the next 2 questions

Q. Do you want to stop smoking now? (please tick one box)

I do not smoke now	<input type="checkbox"/>
Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Q. Do you think you would be able to stop smoking if you wanted to? (please tick one box)

I have already stopped smoking	<input type="checkbox"/>
Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Smoking and the future

Q. Do you think you will try a cigarette in the next month? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Q. At any time in the next year do you think you will smoke? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Q. Do you think you will be smoking cigarettes in secondary school? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Q. If one of your best friends offered you a cigarette, would you smoke it? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Staying or becoming a non-smoker

How confident are you that you can stay a non-smoker (or become a non-smoker if you already smoke)?

Very confident	<input type="checkbox"/>
Confident	<input type="checkbox"/>
Not too sure	<input type="checkbox"/>
Not really confident	<input type="checkbox"/>
Not at all confident	<input type="checkbox"/>

How confident are you that you could say no to a cigarette if you were offered one?

Very confident	<input type="checkbox"/>
Confident	<input type="checkbox"/>
Not too sure	<input type="checkbox"/>
Not really confident	<input type="checkbox"/>
Not at all confident	<input type="checkbox"/>

How confident are you that you could be a non-smoker if your friends smoked?

Very confident	<input type="checkbox"/>
Confident	<input type="checkbox"/>
Not too sure	<input type="checkbox"/>
Not really confident	<input type="checkbox"/>
Not at all confident	<input type="checkbox"/>

Health

Q Do you like the idea of being a smoker? (please tick one box)

I dislike the idea a lot	<input type="checkbox"/>
I dislike the idea a little	<input type="checkbox"/>
I do not dislike or like the idea	<input type="checkbox"/>
I like the idea a little	<input type="checkbox"/>
I like the idea a lot	<input type="checkbox"/>

Q. How would you feel about yourself if you became a smoker? (please tick one box)

Very unhappy with yourself	<input type="checkbox"/>
A little unhappy with yourself	<input type="checkbox"/>
Not unhappy or happy with yourself	<input type="checkbox"/>
A little happy with yourself	<input type="checkbox"/>
Very happy with yourself	<input type="checkbox"/>

Knowledge and attitudes

Q. Do you think that smoking cigarettes is bad for your health? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

**Q. Do you think
that it is
safe to smoke for only a year or two as long as you quit after that?
(please tick one box)**

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Q. Once someone has started smoking, do you think it would be difficult to quit? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

**Q. Do you think the
smoke from
other people's cigarettes is harmful to you? (please tick one box)**

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Q. Do you think smoking effects sport performance? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

**Q. Do you think that smoking cigarettes makes you gain or lose weight?
(please tick one box)**

Gain Weight	<input type="checkbox"/>
Lose Weight	<input type="checkbox"/>
No Difference	<input type="checkbox"/>

Your friends

Q. Do any of your friends smoke? (please tick one box)

All of my friends smoke	<input type="checkbox"/>
Most of my friends smoke	<input type="checkbox"/>
A few of my friends smoke	<input type="checkbox"/>
None of my friends smoke	<input type="checkbox"/>

Q. Have any of your friends tried smoking? (please tick one box)

All of my friends have tried smoking	<input type="checkbox"/>
Most of my friends have tried smoking	<input type="checkbox"/>
A few of my friends have tried smoking	<input type="checkbox"/>
None of my friends have tried smoking	<input type="checkbox"/>

Q. Would your friends approve of you smoking? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Your family

Q. Do you find that you are often near people who are smoking in any of these places? (please tick one box)

At home	<input type="checkbox"/>
In other people's homes	<input type="checkbox"/>
In cars	<input type="checkbox"/>
Outdoors	<input type="checkbox"/>
In other places (please write in)	<input type="checkbox"/>
No, none of these	<input type="checkbox"/>

Q. Does anyone in your family smoke? (please tick one box)

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Only children with a family member that smokes will be asked the following question.

Q. Who in your family smokes? (you can choose more than one box to tick)

Nobody in my family smokes	<input type="checkbox"/>
Mum	<input type="checkbox"/>
Dad	<input type="checkbox"/>
Step-mum	<input type="checkbox"/>
Step-dad	<input type="checkbox"/>
Older brother or sister	<input type="checkbox"/>
Younger brother or sister	<input type="checkbox"/>
Grandparent	<input type="checkbox"/>
Aunty or Uncle	<input type="checkbox"/>
Cousin	<input type="checkbox"/>
Other (please write in)	<input type="checkbox"/>

Your school

Q How many teachers in your school smoke? (please tick one box)

None	<input type="checkbox"/>
1 to 2	<input type="checkbox"/>
3 to 4	<input type="checkbox"/>
4 to 5	<input type="checkbox"/>
More than 5	<input type="checkbox"/>

Lifestyle

Q. How healthy are you? (please tick one box)

Very unhealthy	<input type="checkbox"/>
Unhealthy	<input type="checkbox"/>
Fairly Healthy	<input type="checkbox"/>
Healthy	<input type="checkbox"/>
Very healthy	<input type="checkbox"/>

Q. How physically active are you? (please tick one box)

Very active	<input type="checkbox"/>
Active	<input type="checkbox"/>
Fairly active	<input type="checkbox"/>
Inactive	<input type="checkbox"/>
Very inactive	<input type="checkbox"/>

Q. How healthy is your diet? (please tick one box)

Very unhealthy	<input type="checkbox"/>
Unhealthy	<input type="checkbox"/>
Fairly Healthy	<input type="checkbox"/>
Healthy	<input type="checkbox"/>
Very healthy	<input type="checkbox"/>

Q. How fit are you? (please tick one box)

Very poor	<input type="checkbox"/>
Poor	<input type="checkbox"/>
Average	<input type="checkbox"/>
Good	<input type="checkbox"/>
Very good	<input type="checkbox"/>

Physical activity enjoyment

Q. When I am physically active... (please tick one box for each row)

	Disagree a lot	Disagree	Do not disagree or agree	Agree	Agree a lot
I enjoy it					
I feel bored					
I dislike it					
I find it pleasurable					
It's no fun at all					
It gives me energy					
It makes me sad					
It's very pleasant					
My body feels good					
I get something out of it					
It's very exciting					
It frustrates me					
It's not at all interesting					
It gives me a strong feeling of success					
It feels good					
I feel as though I would rather be doing something else					

Role models

Q. Do you have a role model? (please tick one box)

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Q. If yes, who is your role model? (please write in the name of one role model)

.....

Q. Is this person a: (please tick one box)

Family member	<input type="checkbox"/>
Friend	<input type="checkbox"/>
Music/ pop star	<input type="checkbox"/>
Film/ TV star	<input type="checkbox"/>
Footballer	<input type="checkbox"/>
Other sports star	<input type="checkbox"/>
Teacher	<input type="checkbox"/>
Sport coach/ dance instructor	<input type="checkbox"/>
Characters from book/ cartoon	<input type="checkbox"/>
People with a job caring for others (e.g. Doctor, nurses, dentist)	<input type="checkbox"/>
Member of the Royal Family	<input type="checkbox"/>
Other (please write in)	<input type="checkbox"/>

Q. Do you have any more role models?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

If 'yes', repeat the three questions above (up to a maximum of 5 times), if 'no' end questionnaire (at baseline and follow up). For the post-data collection phase, the following page of questions will be asked.

Your thoughts on SmokeFree Sports

Q. How useful is SmokeFree Sports in helping you or other children stay smoke free? (please tick one box)

Not at all useful	<input type="checkbox"/>
A little bit useful	<input type="checkbox"/>
Fairly useful	<input type="checkbox"/>
Very useful	<input type="checkbox"/>

Q. Would you recommend SmokeFree Sports to a friend? (please tick one box)

Definitely Not	<input type="checkbox"/>
Probably Not	<input type="checkbox"/>
Probably Yes	<input type="checkbox"/>
Definitely Yes	<input type="checkbox"/>

Q. Have you enjoyed taking part in SmokeFree Sports? (please tick one box)

Not enjoyed it at all	<input type="checkbox"/>
Enjoyed it a little	<input type="checkbox"/>
Enjoyed it a lot	<input type="checkbox"/>

Q. On a scale of one to five, how would you rate SmokeFree Sports? (please circle one number)

Very bad	1	2	3	4	5	Very good
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Well done, you've finished - this is the end of the questionnaire. Thank you for your help

Study 2 Focus Group and Interview Schedules

CHILD FOCUS GROUP SCHEDULE

Campaign

Brand recall

- Can you tell me what this project (with all the sport) is all about?
- Why do you think the coaches have been here?

Brand awareness

- Ok – SmokeFree Sports, can you tell what it's all about?

Collateral/incentives

- Did anyone receive any SFS incentives? What did you receive? What did you think of them?

Activities

- Can you tell me about the types of activities you have been involved doing? (examples of games and activities (prompt: dance routines))
- Has anyone made their pledge? Did the coaches speak about the pledges? What do you think the pledge is about? Do you plan to stick to the pledge?
- Did you attend the SFS assembly/ fun day? What did you think of the SFS assembly/ fun day?

Medium (coaches)

- During the sport sessions, can you tell me the kinds of things the coaches talked about?
- Did any coaches talk about smoking?
- How/when did they do this?
- What resources (e.g. teeth, jar of tar) did the coaches use to teach you about smoking? What did you think of these?
- What did you like about the football/ dance sessions?
- What did you not like about the football/ dance sessions?

Smoking

Knowledge

- Can you tell me whether you know more about smoking since being involved in SFS?
- Can you tell me what new things you have learnt?
- Where else do you learn about smoking (ask for examples)? How do you learn about smoking in schools? What is the best way to teach children about smoking?

Attitudes

- Ok – can you tell me what you think about smoking?
- Have you always felt this way?
- Has SFS changed what you think about smoking?

Behaviour

- Would anyone like to share with the group whether they have ever smoked? (explore further)
- Has anyone stopped smoking since being involved in SFS?

Intentions

- Ok – can you tell me whether you intend to smoke in the future?
- Can you tell me why you intend to OR not to smoke?

Moving forward

Improvement

- Would you like to continue doing these SFS sessions within your school?
- If you could have played other sports/activities instead of football and dance, what would it have been, and why?
- How could you improve the coaching sessions? What would you change?
- How could the coaches improve the way they deliver the SFS messages?
- How else could messages about smoking be delivered in your school through sport and physical activity?

Thank you for your time, is there anything you would like to add?

COACH INTERVIEW SCHEDULE

Introduction & Background

- Can you tell me about your coaching experiences (e.g. years, qualifications, age groups?)
- Can you tell me the types of sports/activities that you coach/teach?
- What are your views and perspectives on the SFS campaign?
- Do you think the campaign has impacted/influenced children's opinions about smoking? Why do you think this?

Brief Intervention Training

- What did you learn from the brief intervention training for coaches?
- Can you tell me the positives of the training course?
- Can you tell me the negatives of the training course?
- Did the training give you the skills necessary to deliver the SFS message in your sessions? If no, what additional training is required?
- Do you have any ideas or suggestions of how to improve the brief intervention training?

SFS Coaching Sessions & Delivery

- How did you feel your SFS coaching/teaching sessions went in general?
- When did you deliver SF messages in your session i.e. warm-up/activity/cool-down?
- How did you implement the messages into your sessions? – Examples
- How confident are you in your ability to successfully deliver SFS messages?
- Did you encounter any challenges/barriers whilst coaching the SFS sessions?
- What did you do to overcome these?
- Did you encounter any challenges/barriers in delivering and implementing the SFS messages?
- What did you do to overcome these?
- Did you use the visual resources during your sessions i.e. tar jar/teeth? How?
- Do you think that the resources were useful in your sessions? Why?
- How do you feel the sessions could have been improved to help deliver the SFS message?

Understanding & Behaviour

- Do you think that the children understood the SFS messages? How?
- Were you aware of any children that smoked?

- Did any of the children raise any issues about smoking with you?
- What were the issues and how did you address them?

Football & Dance

- In your opinion was football/dance the best activity to promote SFS? How & Why?
- What other sports/activities would you suggest using to promote the SFS?

Manual & Pledge

- Did you use any of the key messages from the manual in your sessions? Examples
- What other messages did you deliver in your session? Examples
- What ways did you encourage the children to sign the SFS pledge?
- Do you think the pledge will have an impact on children's future smoking behaviours?
- Do you have any ideas or suggestions of how to improve the coaching manual?

Improvements & Sustainability

- How could you improve the coaching/teaching sessions – what would you change?
- In your opinion, do you think that schools are suitable setting to deliver SFS? Why?
- In your opinion do you think that the age of children was suitable for SFS sessions?
- Did you feel you had adequate support to deliver the SFS messages? Examples/what additional support did you require?
- How do think SFS could be tailored for delivery by school teachers?
- Do you think SFS messages could be delivered during PE by teachers?
- How could the SFS coaching manual be tailored for school teachers?

Future

- Would you/ your organisation (MDI/ LFC) support a future SFS campaign? (Take a SF pledge/ encourage children to take a SF pledge/ promote SF during sessions)
- Would your organisation support a SFS Club Policy? How? Do you think there would be barriers/challenges in implementing the policy?

Thank you for your time, is there anything that you would like to add?

TEACHERS INTERVIEW SCHEDULE

Background

- Currently, what is done in your school regarding smoking prevention and/or smoking cessation?

Campaign: acceptability

- Can you tell me what you think the SFS project is all about?
- What are your views and perspectives on the SFS campaign;
 - a) Social marketing (brand, messages, materials, collateral)?
 - b) Launch and celebration events (assembly and fun day)?

- c) What did you think of the Delivery (i.e. activities/dance and football); resources used; duration; time of delivery)?
- d) When in the school day was the coaching session's delivered?

Campaign: impact

- Do you think the campaign has influenced children's:
 - Attitudes and knowledge about smoking
 - Smoking behaviours
 - Smoking intentions (Do you think the SFS campaign will impact on children's future smoking behaviours?)
- Have you seen the SmokeFree pledges? What do you think of the SmokeFree pledges? Do you think children will stick to them?
- Has the SFS campaign influenced teachers' perceptions and behaviours about smoking? How?

Campaign: improvements

- In your opinion, what were the main benefits of the campaign?
- In your opinion, what were the challenges of the campaign? How could they be overcome in the future?
- What impact has the SFS project had on the school (e.g. policy, resources, teaching methods surrounding smoking)
- In your opinion, do you think the SFS project could be improved? If so, how?
- How would you modify SFS so it can be implemented by schools?

INTRODUCE – CITY WIDE CAMPAIGN

Future plans: intervention: brief introduction of 'train the trainer' model

- Would it be feasible to deliver the SFS message through PE/ school-based sport teams/ etc? Why? How could it be done?
- In theory would you/ your school be willing to do this? Why?
- What resources would your school need to deliver these messages?
- What would encourage schools to participate?
- What support would they need?
- Would teachers be willing to attend the BIT - Smoking prevention through sport & physical activity?
- What mode of delivery would work best for teachers?
- Where should the BIT training workshop be held? (onsite – offsite)
- Who should attend?
- At what time should it be delivered?

Future plans: SFS Policy

- In your school, what policies are currently in place surrounding smoking?
- What are your views on a school policy that would not allow smokers to take part in school team sports? Why do you think this?
 - Do you think your school would support such a policy?
- Could your school policy be used/ adapted to promote being smoke free and participate in sport and physical activity?
- What is the best way to encourage uptake of a SmokeFree sport policy in schools (e.g. incentives, charter, Policy, and Award)? How could it be implemented?
- Would you or a representative from your school be interested in becoming a steering group member of SmokeFree Sports?
- Would you support a future SFS campaign?

Thank you for your time, is there anything you would like to add?

Study 3 Focus Group and Interview Schedules

CHILD FOCUS GROUP SCHEDULE

- Can you tell me what this project is all about?
- Can you tell me about the types of activities you have been involved doing?
- Has anyone made their pledge? Did the coaches speak about this? Do you plan to stick to the pledge?
- Did any coaches talk about smoking? How/when did they do this?
- Did your teachers talk about smoking during PE lessons? How/when did they do this?
- Who did you prefer delivering the smoke free activities, teachers or coaches? Why?
- Do you know more about smoking since being involved in SFS? What have you learnt?
- Can you tell me what you think about smoking? Have you always felt this way?
- Would anyone like to share with the group whether they have ever smoked?
- Can you tell me whether you intend to smoke in the future or not? Why?
- Would you like to continue being coached in these sports/activities within your school?
- Would you like your teachers to continue to deliver smoking messages during PE?
- What did you like/dislike about the multi-activity/football/dance sessions?
- How could you improve the coaching sessions - what would you change?
- If you could have played other sports/activities instead of football and dance, what would it have been, and why?

Thank you for your time, is there anything you would like to add?

COACH INTERVIEW SCHEDULE

- What are your views and perspectives on the SFS campaign? Do you think the campaign has impacted/influenced children's opinions about smoking?
- What did you learn from the brief intervention training for coaches? Positives and Negatives?
- Did the training give you the skills necessary to deliver the SFS message? Do you have any ideas or suggestions of how to improve this training session?
- How did you feel your SFS coaching sessions went in general?
- Did you use any of the key messages/session plans from the SmokeFree Sports Training Manual in your sessions? If so, which ones?
- In what practical ways, during your coaching sessions, did you deliver and implement the SFS message? Can you give me a few examples please?
- Were you aware of any of the children that smoked? Or did any of the children raise any issues about smoking with you? What were the issues and how did you address these?
- How confident are you in your ability to successfully deliver SFS messages?
- Have you encountered any challenges and/or barriers whilst coaching these SFS sessions? (e.g., the children, the sport/activity and the school setting?)

- In what ways did you encourage the children to sign the SFS pledge?
- In your opinion, how do you think the SFS project could be improved?
- Did you use the SFS Training manual? Do you have any ideas/suggestions of how to improve the manual/or session plans.
- How could you improve your coaching/teaching sessions – what would you change

Thank you for your time, is there anything you would like to add?

TEACHER INTERVIEW SCHEDULE

- Can you tell me what you think this project is all about?
- What are your views and perspectives on the SFS campaign;
 - e) Social marketing (brand, messages, materials, collateral)?
 - f) Multi-activity session
 - g) Football and dance sessions
 - h) Football tournament and/or dance festival
- What did you learn from the brief intervention training for teachers? Positives and Negatives?
- Did the training give you the skills necessary to deliver the SFS message/activity sessions? Do you have any ideas or suggestions of how to improve this training session?
- How did you feel your SFS teaching sessions went in general?
- Did you use any of the key messages/session plans from the SmokeFree Sports Training Manual in your sessions? If so, which ones?
- Do you have any ideas/suggestions of how to improve the manual/or session plans?
- In what practical ways, during your sessions, did you deliver and implement the SFS messages? Can you give me a few examples please?
- How could you improve your teaching sessions – what would you change?
- Do you think the campaign has influenced children's knowledge and attitudes about smoking?
- Do you think the campaign will impact on children future smoking behaviours?
- Have you seen the SmokeFree Sports Pledges? What do you think of the pledges? In what ways did you encourage the children to sign the SFS pledge?
- In your opinion, what were the benefits and challenges of the campaign?
- In your opinion, do you think the SFS project could be improved? If so, how?

Thank you for your time, is there anything you would like to add?