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Home-based smoking prevention program Smoke-free Kids on smoking-related cognitions: Secondary outcomes from a cluster randomized controlled trial

Marieke Hiemstra[a]*, Rutger C.M.E. Engels[b,c], Onno C.P. van Schayck[d] and Roy Otten[b,c]

[a]*Research Centre for Adolescent Development, University Utrecht, Utrecht, The Netherlands;* [b]*Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, The Netherlands;* [c]*Trimbos Institute, Utrecht, The Netherlands;* [d]*Department of General Practice, Maastricht University, Maastricht, The Netherlands*

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Objectives: The home-based smoking prevention programme 'Smoke-free Kids' did not have an effect on primary outcome smoking initiation. A possible explanation may be that the programme has a delayed effect. The aim of this study was to evaluate the effects on the development of important precursors of smoking: smoking-related cognitions.
Methods: We used a cluster randomised controlled trial in 9- to 11-year-old children and their mothers. The intervention condition received five activity modules, including a communication sheet for mothers, by mail at four-week intervals. The control condition received a fact-based programme. Secondary outcomes were attitudes, self-efficacy and social norms. Latent growth curves analyses were used to calculate the development of cognitions over time. Subsequently, path modelling was used to estimate the programme effects on the initial level and growth of each cognition.
Results: Analyses were performed on 1398 never-smoking children at baseline. Results showed that for children in the intervention condition, perceived maternal norms increased less strongly as compared to the control condition ($\beta = -.10$, $p = .03$). No effects were found for the other cognitions.
Conclusion: Based on the limited effects, we do not assume that the programme will have a delayed effect on smoking behaviour later during adolescence.

Keywords: cluster randomised controlled trial; cognitions; children; home-based; prevention

Introduction

Smoking during adolescence is a worldwide public health problem (World Health Organization, 2012). By the age 10, 4% of Dutch children have already tried smoking. This increases to 6% of 11-year-olds, 11% of 12-year-olds and 35% of 14-year-olds (Stivoro, 2012). Children who try smoking at a young age are more likely to develop

*Corresponding author. Email: j.m.hiemstra@uu.nl
Research was conducted at Behavioural Science Institute, Radboud University Nijmegen, The Netherlands.

long-enduring smoking patterns (e.g. Chassin, Presson, Pitts, & Sherman, 2000). Tobacco prevention programmes aim to delay the age of smoking onset and decrease the prevalence of early initiators. It is important to intervene before children form attitudes and beliefs about smoking and before they have to deal with smoking-related situations with peers. Therefore, smoking prevention in elementary school-aged children is paramount as most children are still never-smokers at this stage. In the United States, a smoking prevention programme called 'Smoke-free Kids' for children of smoking parents has shown to be effective with positive effects on smoking initiation after 36 months. Only 12% of children had tried smoking in the intervention condition vs. 19% in the control condition (OR = 2.16, 95% CI = 1.39–3.37, $p < .001$) (Jackson & Dickinson, 2003, 2006). In a previous paper, we tested the long-term effects of an adapted Dutch Smoke-free Kids programme on children of smoking and non-smoking parents (Hiemstra et al., 2014). After 36 months, we found that 10.8% of children in the intervention condition tried smoking compared to 12% in the intervention condition, which was not significant (OR = .90, 95% CI = .63–1.27, $p = .54$). These findings are in line with a later US trial for children of non-smoking parents in which also no significant effects were found (Jackson & Dickinson, 2011). Our findings are also comparable with other elementary school prevention programs, that in general show no significant effects (Crone, Spruijt, Dijkstra, Willemsen, & Paulussen, 2011; Marsiglia, Kulis, Yabiku, Nieri, & Coleman, 2011; Wang et al., 2011) or negative effects (Elek, Wagstaff, & Hecht, 2010) on smoking onset. A possible explanation for the absence of an effect may be that smoking prevention in elementary-aged children is too early, and too far from the actual age of onset to be related. A related explanation may be that the programme has a delayed effect (cf. Crone et al., 2011). At 36 months, there was a 1.2% difference between the two conditions: a difference that might become larger later in adolescence. To gain more insight into this potential explanation, we examined whether the intervention programme had an effect on relevant precursors of smoking.

The process that ultimately leads to smoking behaviour starts years before actual smoking occurs with the development of smoking-related cognitions (Leventhal & Cleary, 1980). Conform the Theory of Planned Behaviour (Ajzen, 1991) important cognitions are attitudes, self-efficacy and social norms. Previous research has shown that smoking-related cognitions indeed do predict smoking later in life (Engels & Willemsen, 2004; Harakeh & Vollebergh, 2011; Huver, Engels, & de Vries, 2006; Huver, Engels, Vermulst, & de Vries, 2007; Otten, Harakeh, Vermulst, van den Eijnden, & Engels, 2007; Veselska, Madarasova Geckova, Reijneveld, & van Dijk, 2011).

On the short term, we have tested the effects on these cognitions and found that the Smoke-free Kids programme has effects on the social norms of friends, best friend, mother (marginally), and self-efficacy (contrary to expectations) (Hiemstra, Ringlever, Otten, van Schayck, & Engels, 2013). This study examined the effects of the intervention programme on the development of these smoking-related cognitions from baseline to 36-month follow-up. We expect that when the programme has an effect on the development of important precursors of smoking behaviour, this may be an indication of a delayed effect on the smoking behaviour of adolescents later in life.

Methods

Procedure

Families were recruited via primary schools in the Netherlands (i.e. active informed consent). In 2008, a letter was sent to 1347 school boards requesting that they distribute a letter to all children aged 9–11 to recruit participants. After telephonic contact with the schools, 630 (47%) were willing to participate. Participation by the families was given by returning the recruitment letter or registering online via a secured web page. Participants had to fit the following inclusion criteria: children had to be between 9- and 11-year-olds; participating adults had to be mothers or female guardians; both mother and child needed to be able to read and speak Dutch; and only one child per household was eligible to participate. A total of 1490 mothers and children were selected.

Data were collected by means of telephone interviews (60.2%) or by written questionnaires (39.8%). Trained Master students administered the telephone interviews with mothers and children. At baseline, mothers were interviewed first to check the eligibility of the family. Children were interviewed several days later. At follow-up, only the children were interviewed. Prior to the interview, we made sure that mothers and the children could speak freely in order to assure privacy. To protect children from parents listening to their child responding to questions from the interviewer, we only used closed-ended questions. Questionnaires were sent via mail and returned in two separate enclosed envelopes, allowing children to return their own questionnaire without their mother reading their answers.

The baseline assessment of mothers and children took place between December 2008 and June 2009. From February 2008 to September 2009, the intervention was mailed at four-week intervals to participants of both conditions, consisting of five activity modules or fact sheets. The follow-up measures were 6, 12, 24 and 36 months after baseline and only assessed the children by telephone or mail. The 36-month assessment was conducted between December 2011 and June 2012. Each family received €10 for completing all measurements (i.e. baseline to 36 months). In addition, five travellers' checks of €1000 were raffled among these families. The ethics committee of the Faculty of Social Sciences at the Radboud University Nijmegen approved the trial protocol registered in the Dutch Trial Register (NTR1465).

Participants

A total of 1490 mothers and children were selected to participate in the study. From 12 families, we received only a baseline measurement of the mother. Therefore, these families were excluded. Overall, 418 schools were randomised in the intervention condition ($n = 728$ children) and in the control condition ($n = 750$ children). Children who had already puffed a cigarette at baseline ($n = 80$, 5.4%) were included in the programme, due to confidentiality, but excluded from the analyses, leaving 1398 never-smoking children eligible for the analyses. Overall, the participation rate was 1328 children (95%) at 6 months, 1284 children (91.8%) at 12 months, 1255 children (89.8%) at 24 months and 1238 children (88.6%) at 36 months (Figure 1). Attrition analysis comparing children that participated in wave five and those that dropped out

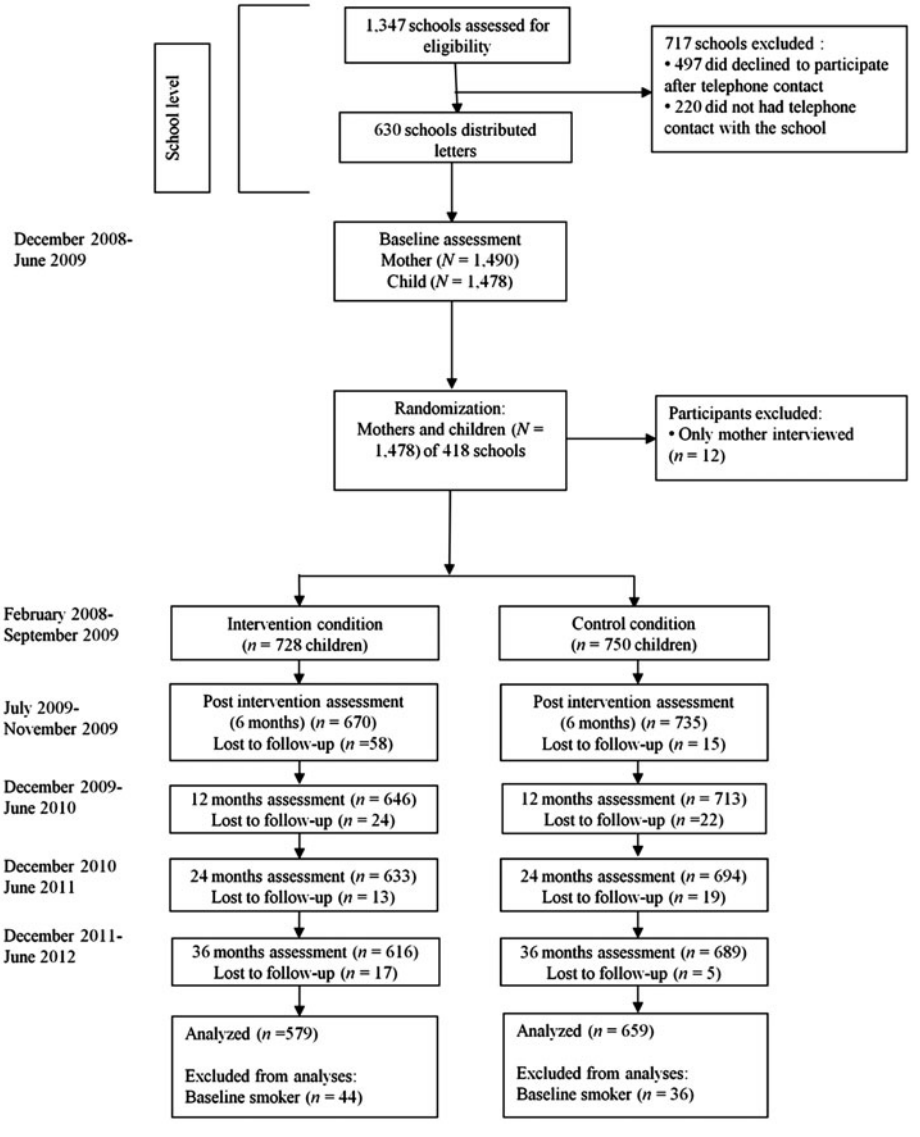

Figure 1. Flow of participants through the trial.

showed that children of the intervention condition were more likely to drop out than children in the control condition (OR = 2.61, 95% CI = 1.78–3.84, $p < .001$). Children from one current and one former smoking parent were more likely to drop out than children from non-smoking parents (OR = 1.95, 95% CI = 1.07–3.57, $p = .03$). Reasons for dropout included loss of interest in participating or the inability of investigators to get in touch with the children (either by phone or by paper-based questionnaires).

The final sample (n = 1398) is characterised by a mean age of 10.10 (SD = .78) at baseline and consisting of 52.5% girls and 47.4% boys. The majority was Dutch (98.2%).

Socio-economic status (SES) of parents was assessed by asking parents about their highest completed education level, which is a regular proxy of SES (Ringlever, Otten, de Leeuw, & Engels, 2010). Levels of education were divided into low (i.e. preparatory school for technical and vocational training) (25.2%), middle (i.e. intermediate or general education) (26.6%) and high (i.e. preparatory college and university education) (48.2%). Fourteen per cent of the children had asthma (Table 1).

Sample size

A power calculation indicated that 428 children were needed in both the intervention and the control condition to find a difference of 10% in smoking initiation at 36-month follow-up: a power of 80%, α of .05.

Randomisation

Each school was randomly allocated to the intervention or control condition; this was done by an independent statistician (allocation ratio (1:1)). Based on the baseline assessment, schools were stratified by the number of asthmatic children. Participants were blind to randomisation (single-blind trial).

Intervention

The intervention was based on the 'Smoke-free Kids' programme developed in the United States (Jackson & Dickinson, 2003, 2006). This home-based smoking prevention programme was adapted for the Dutch situation (for more details, Hiemstra et al., 2009). Mothers and children received five printed activity modules by mail at four-week intervals. These modules were designed to gradually increase parental skills and comfort level in communicating with children about smoking, addiction and expectations regarding abstinence by performing different assignments. Each module included a high concentration of structured interactions that engages mother and child simultaneously, such as games, scripted role-plays, contests and interviews. Each module intervened on different socialisation variables, including general communication about smoking, the influence of smoking messages, the setting of rules, smoke-free houses and environments, the influence of smoking friends and the handling of peer pressure (see, e.g. Hiemstra et al., 2009). All five activity modules included a communication sheet for mothers. These sheets provided background information about the subjects discussed in the modules and communication tips for mothers. Finally, a booster module was delivered 12 months post-baseline (after the post-intervention measure). Mothers were instructed that the time investment to read and complete a module takes approximately one hour each month.

The control condition received a fact-based programme in order to minimise drop-out and to be able to follow families over time. The programme was intended to function as 'care as usual'. The factsheets provided information on youth smoking and directed parents' attention towards macro-level variables relevant to youth smoking, but

Table 1. Baseline characteristics of Smoke-free Kids.

		Intervention condition (n = 684)	Control condition (n = 714)	Total (N = 1398)	Significant difference I and C^+
Characteristics	Age child (mean (SD))	10.13 (.78)	10.08 (.77)	10.10 (.78)	n.s.
	Gender				p = .001
	Female (%)	56.7	48.6	52.6	
	Male (%)	43.3	51.4	47.4	
	Smoking status parents (%)				n.s.
	Both never-smokers	22.3	23.9	23.1	
	One former and one never-smoker	25.7	22.9	24.3	
	Both former smokers	16.6	16.7	16.7	
	One current and one never-smoker	12.3	13.3	12.8	
	One current and one former smoker	11.6	11.6	11.6	
	Both current smoker	11.4	11.6	11.5	
	Ethnicity mother (%)				n.s.
	Dutch	98.4	98.2	98.3	
	Other	1.6	1.8	1.7	
	Ethnicity child (%)				n.s.
	Dutch	98.7	97.8	98.2	
	Other	1.3	2.2	1.8	
	Socio-economic status				n.s.
	Low	24.7	25.6	25.2	
	Middle	26.7	26.5	26.6	
	High	48.6	47.8	48.2	
	Asthma (%)				p =.03
	Yes	16.1	12.2	14.1	
	No	83.9	87.8	85.9	

Smoking-related Cognitions	Attitude	1.10 (.14)	1.10 (.16)	1.10 (.15)	n.s.
	Self-efficacy	4.75 (.98)	4.75 (.96)	4.75 (.97)	n.s.
	Social norm friends	1.76 (.68)	1.82 (.74)	1.79 (.71)	n.s.
	Social norm best friend	1.64 (.72)	1.67 (.75)	1.65 (.73)	n.s.
	Social norm mother	1.24 (.50)	1.27 (.53)	1.26 (.51)	n.s.

Note: n.s. = $p > .05$.
[+]Logistic regression analyses were used to compare the intervention with the control condition.
Attitude was measured on a scale of 1 (negative attitude) to 3 (positive attitude); self-efficacy from 1 (low self-efficacy) to 6 (high self-efficacy); social norms 1 (low approval to smoke) to 4 (high approval to smoke).

that were not targeted by the intervention version. The information in the factsheets was also available in local, state or national media. The mothers received the programme along with the intervention condition but did not receive a booster.

Secondary outcomes

Smoking-related cognitions

Attitudes towards smoking assessed how children think about daily smoking. Children were asked *with 7 items* what they think about daily smoking using the text: 'I think that daily smoking is …' Children responded either with (1) negative attitudes, (2) neutral attitudes or (3) positive attitudes. *For example: I think that daily smoking is unhealthy, not unhealthy but also not healthy, or healthy.* Negative attitudes were 'unpleasant', 'harmful', 'useless', 'boring', 'dangerous', 'unhealthy', 'bad', and positive attitudes were 'pleasant', 'harmless', 'useful', 'exciting', 'not dangerous', 'healthy' and 'good' (Harakeh, Scholte, Vermulst, & Engels, 2004). Because of skewed data, the Omega (McDonald, 1999) was calculated instead of the Cronbach's alpha. Omega's across waves ranged from .82 to 90. *Therefore, a mean score was calculated: a higher mean* score reflected a pro-smoking attitude.

Refusal self-efficacy referred to children's confidence in their ability to stay a non-smoker and to refuse a cigarette (de Vries, Dijkstra, & Kuhlman, 1988; Engels, Knibbe, de Vries, & Drop, 1998; Engels, Knibbe, & Drop, 1999; Vries, Backbier, Kok, & Dijkstra, 1995). This was measured with six items on a six-point scale ranging from 'very difficult' (1) to 'very easy' (6). *Some of* the items were simplified by asking children to imagine smoking-related situations, for instance "Imagine: When I am offered a cigarette, I find it difficult/easy to refuse". *Other examples are* 'For me it is difficult/easy to stay a non-smoker', 'I find it difficult/easy to explain to other people that I do not want to smoke'. A higher score indicated higher efficacy to refuse a cigarette. Omega's across waves ranged from .84 to 88.

Social Norms assessed children's perceptions of the extent to which mothers, friends and best friends would approve of their smoking behaviour (e.g. Vries et al., 1995) using three items: 'Do you think your friends/your best friend/your mother would approve when you smoke (or would smoke)?' Responses were measured on a four-point scale ranging from 'definitely not' (1) to 'definitely' (4).

Analyses

We first examined whether randomisation was successful. Therefore, we tested the differences between the intervention and control condition at baseline for the covariates (i.e. gender, age, ethnicity child and mother, smoking behaviour parents, SES and asthma) and the smoking-related cognitions using SPSS 19.0. Significant differences between the intervention and control condition were found for gender (OR = 1.46, 95% CI = 1.16–1.83, $p = .001$) and asthma (OR = 1.42, 95% CI = 1.02–1.98, $p = .04$) (Table 1).[1] Therefore, analyses on the effects of the programme were corrected for gender and asthma. Loss to follow-up was examined with logistic attrition analyses using 36-month follow-up as outcome, covariates, smoking-related cognitions, and condition as predictors.

Table 2. Model fit indices and growth curve parameters for attitude, self-efficacy, social norms of friends, best friend and mother.

Variable	χ^2(df)	p	CFI	TLI	RMSEA	Mean intercept	Mean slope	Mean quadratic	Variance intercept	Variance slope	Variance quadratic
Attitude	37.88 (10)	.000	.93	.93	.05	1.09 SE = .004 (305.07)***	−.007 SE = .001 (–5.11)***		.01 SE = .002 (6.46)***	.001 SE = .00 (4.26)***	
Self-efficacy	12.22 (6)	.06	1.00	.99	.03	4.76 SE = .03 (166.36)***	.21 SE = .02 (10.44)***	−.01 SE = .005 (–.29)**	.56 SE = .05 (12.16)***	.08 SE = .04 (2.16)*	.005 SE = .002 (3.03)**
Social norm friends	61.96 (10)	.000	.96	.96	.06	1.77 SE = .02 (91.74)***	.04 SE = .007 (6.12)***		.23 SE = .02 (13.17)***	.02 SE = .003 (7.41)***	
Social norm best friend	81.68 (10)	.000	.95	.95	.07	1.65 SE = .02 (94.09)***	.03 SE = .007 (3.92)***		.24 SE = .02 (13.71)***	.02 SE = .003 (7.23)***	
Social norm mother	17.40 (10)	.07	.99	.99	.02	1.25 SE = .01 (95.36)***	.01 SE = .004 (1.57)		.13 SE = .02 (9.04)***	.01 SE = .002 (5.61)***	

Note: T-values are presented in parentheses below their respective associated growth curve parameter. CFI – Comparative Fit Index; TLI – Tucker–Lewis Index; RMSEA – root mean square error of approximation.
***$p < .001$; **$p < .01$; *$p < .05$, two-tailed tests.

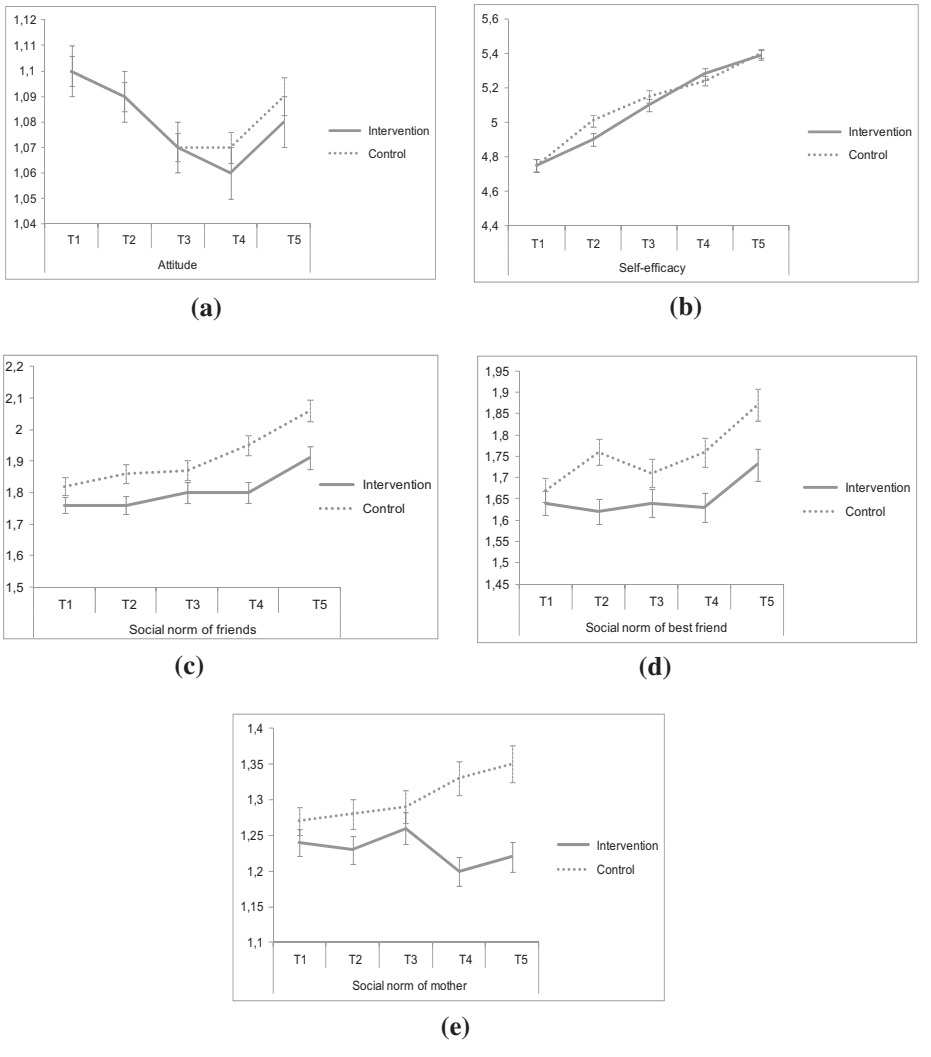

Figure 2. Mean development of attitude (a), self-efficacy (b), social norm of friends (c), best friend (d) and mother (e) separately control and intervention condition.

The effectiveness analyses were conducted in two stages. First, individual development of smoking-related cognitions over time was estimated with latent growth analysis using Mplus 5.0 (Muthén & Muthén, 1998–2004). The parameters in the models were estimated applying the maximum likelihood estimator with Robust standard errors due to the skewness of the distribution of the model variables. We also corrected for nested data within schools via the CLUSTER command in combination with TYPE = COMPLEX procedure. With this method, standard errors of the estimated parameters are corrected for dependency, resulting in unbiased estimates. To find the best fit for all unconditional latent growth curves, we ran a linear (i.e. intercept and slope) and a quadratic model.

Table 3. Standardised estimates and standard errors of the programme effects on intercept (*I*), slope (*S*) and quadratic trend (*Q*) of smoking-related cognitions.

	I			*S*			*Q*		
	B	SE	p	B	SE	P	B	SE	p
Attitude									
Condition	.004	.04	.91	−.02	.05	.68			
Asthma	−.05	.03	.11	.02	.04	.72			
Gender	−.04	.04	.29	.04	.05	.45			
Self-efficacy									
Condition	−.02	.04	.59	−.02	.08	.77	.04	.07	.54
Asthma	.002	.04	.95	.05	.07	.47	−.02	.06	.68
Gender	−.03	.04	.38	−.08	.07	.28	.04	.06	.45
Social norm friends									
Condition	−.06	.04	.16	−.07	.05	.14			
Asthma	.05	.04	.16	−.04	.04	.32			
Gender	**−.12**	**.04**	**.002**	−.08	.04	.06			
Social norm best friend									
Condition	−.06	.04	.11	−.07	.05	.17			
Asthma	.04	.04	.31	−.01	.05	.77			
Gender	**−.16**	**.04**	**.000**	**−.11**	**.05**	**.02**			
Social norm mother									
Condition	−.05	.04	.22	**−.14**	**.05**	**.002**			
Asthma	.04	.04	.30	.003	.05	.95			
Gender	.02	.03	.56	**−.10**	**.05**	**.03**			

Note: Significant results in bold. Condition: 0 = control condition and 1 = intervention condition, 1 = boy, 2 = girl, Model fits for full model of attitude: (χ^2 = 57.49 (19), p < .001, CFI/TLI = .94/.92, RMSEA = .04); self-efficacy: (χ^2 = 24.63 (12), p = .01, CFI/TLI = .99/.99, RMSEA = .03); social norm of friends: (χ^2 = 71.95 (19), p < .01, CFI/TLI = .96/.95, RMSEA = .05); social norm of best friend: (χ^2 = 95.19 (19), p < .01, CFI/TLI = .95/.94, RMSEA = .05); social norm of mother: (χ^2 = 31.13 (19), p = .04, CFI/TLI = .99/.99, RMSEA = .02).

In all analyses, model fit was assessed by chi-square values (df), the Comparative fit index (CFI), Tucker–Lewis index (TLI) and the root mean square error of approximation (RMSEA) (McDonald & Ho, 2002). Missing values were handled by using full information maximum likelihood (Muthén & Muthén, 1998–2004).

For attitudes and social norms of friends, best friend and mother, a good linear model (i.e. initial level and growth across time) fit was found. For self-efficacy, a quadratic model fit the data more optimally (i.e. rate of acceleration) (Table 2). Second, to estimate the influence of the intervention on adolescents' initial level and linear growth (and for self-efficacy rate of acceleration), path modelling was used separately for each smoking-related cognition. These analyses were corrected for baseline differences of asthma and gender.

Results

Descriptive statistics on smoking-related cognitions

At baseline, no significant differences were found between the intervention and control condition on the smoking-related cognitions (see Table 1). Figure 2((a)–(e)) showed the means for the smoking-related cognitions at the various waves for the intervention and

control conditions. Repeated measures indicated that the change of mothers perceived social norms differed significantly between the control and intervention conditions (Wilks' $\Delta = .98$, F (4-1104) = 4.89, $p = .001$). No differences in the attitudes, self-efficacy and social norms of friends and best friends were found.

Effect on smoking-related cognitions

Table 3 depicts the relations between the intervention and the initial level and the development of smoking-related cognitions. Results showed that the intervention condition was significantly related to the slope of the social norms of mothers ($\beta = -.10$, $p = .03$). This indicates that for children in the intervention condition, the perceived maternal norms regarding their smoking behaviour increased less strong than for children in the control condition, with lower perceived maternal norms indicating lower likelihood to expect maternal approval. No intervention effects were found on the initial level and the development of attitudes, self-efficacy or social norms of friends and best friends.

Discussion

This study evaluated the long-term secondary effects of a home-based smoking prevention programme 'Smoke-free Kids' on children's smoking-related cognitions (i.e. attitudes, self-efficacy, social norms of friends, best friends and mother) using a cluster randomised controlled trial. We found that the Smoke-free Kids prevention programme had an effect on the development of the perceived maternal social norm on smoking. For attitudes, self-efficacy and social norms of friends and best friends, no significant programme effects were found.

The effect of the programme on maternal social norms indicates that, compared to children in the control condition, more children in the intervention believed that their mother would be more likely to disapprove their smoking behaviour. An explanation for the fact that the social norms of mothers had changed in response to the intervention, whereas those of friends and best friends had not, could be due to the fact that children work through the programme together with their mother. Children talk with their mother about smoking during the programme and become more aware of their mothers' ideas about smoking-related topics. This is likely not the case for peers because only a small percentage of friends were smoking at this age.

An explanation of the absence of the effect of attitudes is that children already had very negative beliefs towards smoking before the start of the programme. Previous studies show that ideas about smoking are formed early in life, long before children start using cigarettes (e.g. Leventhal & Cleary, 1980). Our results are similar to those from other studies in which children reported very negative attitudes towards smoking (Hahn et al., 2000; Porcellato, Dugdill, & Springett, 2005; Porcellato, Dugdill, Springett, & Sanderson, 1999). We also did not find an effect for self-efficacy. *We did find an effect after 6 months*; however, this was in contrast with our expectations. Directly after the intervention, self-efficacy was lower in the intervention condition than in the control condition (Hiemstra et al., 2013). After 36 months, the level of individual self-efficacy was *again* similar in both conditions. *Specifically, in both intervention and control condition, we found that self-efficacy skills increased over time.* An explanation *for this*

finding could be that self-efficacy develops through observation (e.g. Bandura, 1992), and children *at primary school* age may be too young to encounter situations in which they need to use smoking refusal skills. *However, when they transfer to secondary school, this is likely to change because they increasingly engage in situations where other peers smoke.* Based on the above-mentioned results and the non-significant findings of the Smoke-free Kids programme on smoking onset (Hiemstra et al., 2014), we do not expect a delayed effect on smoking later during adolescence. Therefore, and based on results of previous prevention programmes in elementary schools (e.g. Crone et al., 2011; Elek et al., 2010; Marsiglia et al., 2011; Wang et al., 2011), we do not recommend to conduct a prevention programme for children at this specific age group. To gain more insight in *what* parents think about smoking prevention, it is important that we learn more about the timing, the setting and the content that smoking prevention programmes should have. Qualitative research involving interviews and focus groups could be a valuable first step.

In addition, the Smoke-free Kids programme focused on parenting strategies. To gain more insight into the communication between mother and child while talking about smoking, observations should be performed (i.e. Wakschlag et al., 2011). Observations will inform us about the different communication strategies in real life. In order to gain insight into the development of smoking-related cognitions, these observations could be conducted repeatedly embedded in a longitudinal design.

Furthermore, future smoking prevention may benefit more from a broader and more holistic approach, in which anti-smoking messages are not limited to the home environment and prevention efforts should occur at family level, school level *and* community level. Only this way, norms regarding smoking in children can be changed. Therefore, future programmes should exist of multiple components that fit carefully together in order to optimise their effectiveness (e.g. a home-based programme combined with a school prevention programme, embedded in a larger community-based programme, by means of a strong mass media campaign [Pentz, 1999]).

Furthermore, prevention aimed at children in elementary school may be too far removed from the actual moment of smoking onset, which occurs mostly halfway through secondary school (i.e. age 14–16). Future studies should focus on programmes closer to the age of smoking onset, concentrating on 11- to 13 year-old children, including the transition phase between elementary and secondary school.

Some limitations of this study should be acknowledged. First, generalisability to the larger population is limited since we used a sample consisting of families who voluntarily signed up for the study. The findings are mainly generalisable to participants who are interested in anti-smoking socialisation. Future studies should focus more on at-risk populations (e.g. low SES, smoking parents). To reach lower SES children, it would be essential to focus on prevention programmes at schools. At schools, prevention efforts could focus on all children of different SES. Second, children reported about their own smoking-related cognitions, which introduce the possibility of under- or over-reporting because of social desirability. To overcome this potential weakness, implicit measures of attitudes could be used (de Leeuw, Engels, & Scholte, 2010) and compared with explicit attitudes (Sherman, Chassin, Presson, Seo, & Macy, 2009). Third, all measures were assessed by means of self-report. Chemical validation of, for instance, smoking initiation was not possible due to financial and logistic limitations. Finally, for practical reasons, the programme focused on mothers instead of both parents. Previous research

indicates differences between fathers and mothers in communication about smoking, suggesting that mothers are more positive about anti-smoking socialisation than fathers (Engels & Willemsen, 2004; Harakeh, Scholte, de Vries, & Engels, 2005). In future research, fathers should be taken into account, as they may affect the effectiveness of prevention programmes in families.

In conclusion, the only programme effect we found was on the perceived smoking norms of mothers. Specifically, we found that mothers in the intervention condition were less positive towards smoking as compared to those in the control condition. Based on these results, we do not expect the Smoke-free Kids programme to have a delayed effect on smoking behaviour later during adolescence.

Disclosure statement

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Note

1. During randomisation, we stratified for asthma. This randomisation was conducted on all the initial 1478 children, while this study was performed on the 1398 children who never tried smoking. No difference on asthma between the intervention and control condition was found after randomisation of the total sample ($\chi^2 = 3.34$ (1, $N = 1474$), $p = .07$).

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