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RESEARCH ARTICLE

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PERSonalised incentives for supporting tobacco cessation (PERSIST) among healthcare employees: evaluation and lessons learned

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ABSTRACT

The effectiveness of financial incentives for smoking cessation can be further enhanced by personalising incentives. We aimed to investigate the effect of personalised incentives on abstinence among health care employees who participated in a group-based smoking cessation training, but prematurely terminated the trial due to recruitment issues. All participants ($n=31$; 14% of $n=220$ required) underwent group-based smoking cessation training. Based on individual characteristics, each intervention group participant was recommended one of four incentive schemes, though each participant could choose one of the other schemes. Incentives were provided following the completion of the training and at 3, 6, and 12 months. The control group received no incentives. In the intervention arm, 14 out of 17 participants followed the recommended incentive scheme, and ten chose a deposit scheme. Twelve month-abstinence was 41% in the intervention group and 43% in the control group. Dropouts were categorized as having relapsed. Following the premature closing of the trial, we conducted interviews with potentially eligible participants (health care employees who smoke) who did not participate in exploring considerations for non-participation. Interviews ($n=15$) revealed that reasons for non-participation included unawareness that incentives could be earned, not being ready to quit, and not feeling the need for a cessation programme to quit. A better understanding of reasons for non-participation in incentive-based smoking cessation programs or trials is required.

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Prevention; health behaviour; tobacco control

Introduction

Despite the majority of people who smoke wanting to quit (Babb et al., 2017; Girvalaki et al., 2020), success rates of quitting attempts are generally low. A promising method to encourage smoking cessation is the provision of financial incentives upon validated abstinence, as the desired behaviour – smoking cessation – is made more attractive by rewarding it (Notley et al., 2019). Financial incentive research has most often been implemented in the US context (Notley et al., 2019). An important exception was an incentive-based smoking cessation trial in the workplace in the Netherlands, which showed 41% abstinence after12 months with incentives, versus 26% without incentives (van den Brand et al., 2019).

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Financial incentives come in many ways, varying in timing, certainty (lottery) or direction of payment (gains or losses). A special type of financial incentive used to encourage smoking cessation are deposits, where participants put in their own money which is returned when the desired goal is achieved. Financial incentives provided as deposits can especially benefit people who have a low tendency to quit and who prefer delayed rewards over shorter immediate ones, as shown by Halpern et al. (Halpern et al., 2016) Despite the effectiveness of such deposits, this study also reported the unpopularity of deposits, with only 13.7% of participants accepting a deposit scheme compared to 90.0% for reward-based programs (Halpern et al., 2015).

Even though previous literature has shown that individuals may have different preferences when it comes to rewards, incentive-based approaches often follow a 'one size fits all' approach (Lipman, 2024). Incorporating individual preferences into incentive programs – in other words, personalisation – yields the potential to further increase the effectiveness of incentives to promote long-term abstinence. Although personal characteristics have been shown to be important determinants of the effectiveness of incentive-based smoking cessation programs (Halpern et al., 2016), we are unaware of any attempts to incorporate personalisation in the design of such programs. Within the PERSIST trial (PERSonalised Incentives for Sustained smoking cessaTion) we aimed to investigate the effectiveness of personalised incentives in addition to group-based smoking cessation training among health care workers in the Netherlands (Boderie et al., 2020). In the Netherlands, smoking rates have been declining rather slowly, from 25.7 to 20.2% current smokers between 2014 and 2020 (Bommelé et al., 2021). In a survey among employees of a Dutch regional hospital about 7% of employees self-identified as daily smokers (Pouwels & Teeuwen, 2021). In an attempt to work towards a smokefree generation by 2040, the Dutch National Prevention Agreement requires university hospitals to be smoke-free from mid-2020 and all healthcare facilities by 2025. Furthermore, for health care workers smoking cessation is particularly relevant as they may be expected to have an exemplary role.

Most adults spend one third of their day in a workplace environment and employers can financially benefit from smoking cessation in their workforce, e.g. through reduced absenteeism (Eriksen & Gottlieb, 1998; van den Brand et al., 2020). However, participation rates of workplace-based smoking cessation programs involving incentives are generally low (Cahill & Lancaster, 2014). Unfortunately, this was also the case in the PERSIST trial, and we prematurely concluded the trial after recruiting 31 participants (i.e. 14% of the required sample size of 220) after two years. Given the limited understanding of why eligible participants do not participate in cessation programs with financial incentives, we extended our initial aim to explore the considerations of potentially eligible non-participants (employees who smoke) regarding their decision to not participate in smoking cessation programs in the workplace. We aim to identify and analyze barriers and facilitators that could help improve future programs. Here, we describe the findings of our prematurely concluded trial, as well as those of the subsequent interview study among non-participants.

Methods

Trial

We conducted a randomised controlled trial comparing the effectiveness of personalised incentives in combination with group-based training sessions to promote sustained smoking cessation among healthcare employees to group-based training sessions alone, following our peer-reviewed published protocol (Boderie et al., 2020; Chan et al., 2013). Eligible participants were persons who smoked daily and were employed by one of four participating hospitals in the South-Holland region of the Netherlands (Erasmus MC, ~15,000 employees; Fransiscus Gasthuis & Vlietland, ~5,000 employees; Ikazia, ~2,500 employees; Leiden University Medical Centre, ~8,800 employees). Individuals who used only e-cigarettes were excluded from the study. Recruitment took place between 1 October 2019, and 1 April 2021, when it was decided to terminate the study. Follow-up ended on 1 July 2022, and 15 months after the last inclusion.

Based on previous research and an anticipated extra motivation among health care employees (van den Brand et al., 2018), we estimated that a sample size of at least 185 participants would be needed to compare estimated rates of CO-validated continuous abstinence of 30% in the control group and 50% in the intervention group. This was set to 220 to account for unexpected employee turnover and attrition

(Boderie et al., 2020). Hence, we could compare a control arm without incentives, to a personalised incentive arm. The trial was not intended nor powered to explore the effect of the individual incentive schemes within the incentive arm.

Participating hospitals promoted group-based training, without mentioning financial incentives, among their employees through various channels, such as intranet pages, screensavers, and internal emails. Potentially interested employees were invited to attend information sessions. As preferred by the participating hospitals, the possibility of participating in the trial and earning rewards (i.e. personalised incentives) was only introduced at this information session. At the time of participant inclusion, all participating hospitals had a completely smoke-free policy, including smoke-free outdoor hospital grounds. In addition, all hospitals had a policy that smoking was not allowed while wearing a hospital uniform.

Seven 90-minute sessions over eight weeks were provided by SineFuma, a company specialized in supporting smoking cessation, and took place at the participating hospitals' locations – or online during COVID-19. The groups consisted of three to 16 participants. The completion of group-based training sessions was mandatory for the participants. Owing to the COVID-19 pandemic, some training sessions were conducted online. After completing the baseline questionnaires, participants were randomised 1:1 into a control arm, receiving no incentives, and an intervention arm, where participants were eligible to receive personalised incentives. A computer-generated allocation sequence was provided by ALEA randomisation service, in collaboration with the Erasmus MC Clinical Trial Centre. Allocation happened between two to six weeks before T0. More information regarding randomisation can be found in our protocol (Boderie et al., 2020).

Incentives

Upon completing the eight week smoking cessation training participants in the intervention arm became eligible to receive incentives. Incentives were provided as vouchers that could be spent in major Dutch (web)shops. Personalisation was operationalized by offering four different incentive schemes from which participants could choose. Across the different schemes, the monetary value of the incentives varied over time and the potential total financial rewards also differed. The four incentive schemes were (Figure 1): (1) a standard scheme offering €50, €50, €50 and €200 upon validated abstinence at $t=0$ (i.e. directly following the final smoking cessation training session), $t=3$ months, $t=6$ months and $t=12$ months, respectively (van den Brand et al., 2018), (2) a descending scheme, offering vouchers with a monetary value of €150, €100 and €50 upon validated abstinence at $t=0$, $t=3$ months and $t=6$ months, respectively, (3) an ascending scheme, offering vouchers with a monetary value of €50 and €350 upon validated abstinence at $t=6$ months and $t=12$ months, respectively, and (4) a deposit scheme, where participants provided a €100 deposit at the beginning of the trial, which was refunded upon validated abstinence at $t=6$ months, and where in addition vouchers with a monetary value of €50, €50, €150, and €200 were provided upon validated abstinence at $t=0$, $t=3$ months, $t=6$ months, and $t=12$ months, respectively (Halpern et al., 2016). If a deposit-scheme participant was not continuously abstinent at $t=6$ months, their deposit was donated to the Netherlands Lung Foundation. Detailed descriptions of the incentive schemes can be found in our protocol (Boderie et al., 2020).

To maximize the effectiveness of the incentive programme, participants received personalised advice regarding which scheme would most likely fit their personal characteristics. This advice was based on the degree of (1) tobacco dependence, assessed using the Fagerström Test for Nicotine Dependence (Heatherton et al., 1991), (2) readiness-to-quit, based on Prochaska stages of change (Prochaska et al., 1988), (3) present bias, measured by temporal discounting magnitude based on the Kirby Scale (Kaplan et al., 2016; Kirby, 1997), and (4) willingness to pay for a deposit. Given the known relative effectiveness of deposits as compared to non-deposit-based incentive schemes, anyone willing to pay a deposit was advised to choose the deposit scheme (Halpern et al., 2015, 2016). See Supplementary Appendix I for the decision tree, leading to the advice provided based on input from the questionnaires.

Outcomes

The primary outcome was 12-month continuous abstinence from smoking (Russell's Standard RS12) (West et al., 2005). Abstinence was assessed via self-reported abstinence (both point and continuous abstinence) and biochemically validated using expired air carbon monoxide (CO) measurements. A reading <10 ppm

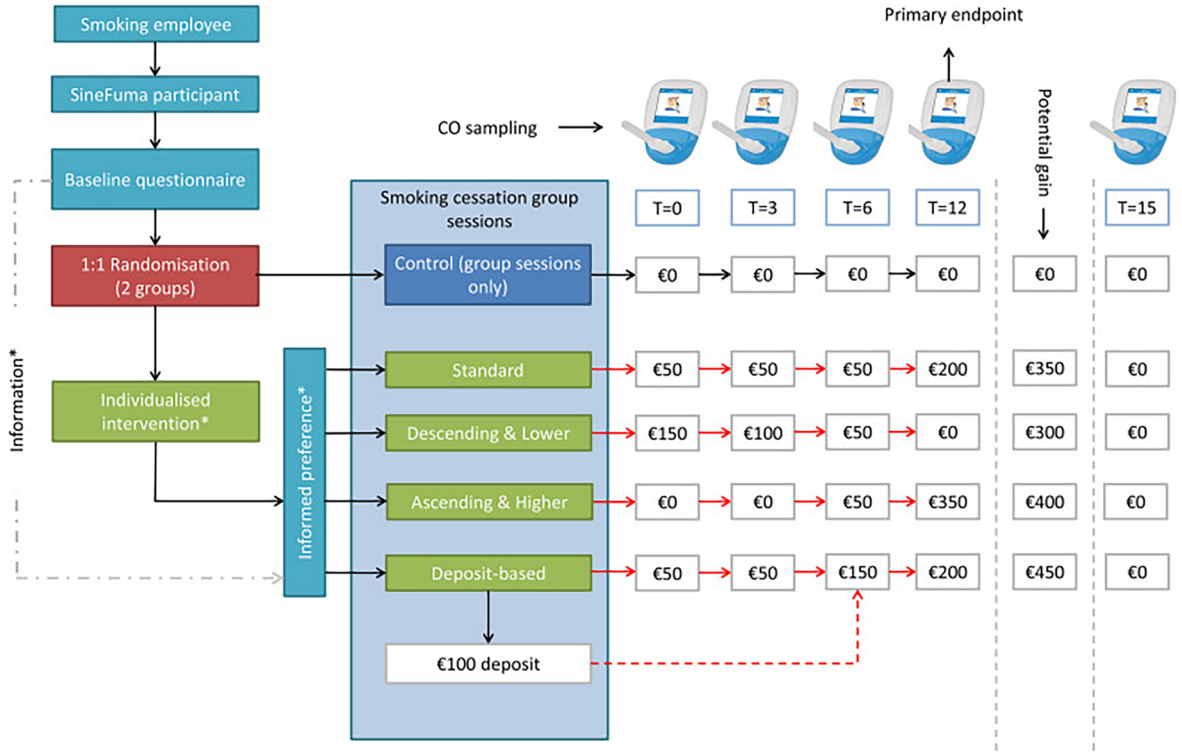

Figure 1. Flow diagram of participant inclusion plus outline of control and intervention conditions. *Participants are provided with an informed choice regarding the individualised incentive scheme based on: 1. Degree of tobacco dependence, 2. Readiness to quit and 3. Present-bias. Note: red arrows are conditional on sustained biochemically validated smoking cessation.

was considered indicative of abstinence. Final follow-up measurements were performed at 15 months after recruitment that is three months after the last time point that incentives could be earned in the intervention group to investigate whether individuals were intrinsically motivated to persist in smoking cessation after the incentives were removed. Participants who were lost to follow-up were classified as non-abstinent.

Data collection

Upon enrolment, the following items were collected: educational level following the International Standard Classification of Education (ISCED; range 0 (early childhood education) to 8 (doctoral or equivalent level) (Schneider, 2013), individual gross monthly income, age, self-reported height and weight, gender, and smoking history (smoking history, pack years, and history of quit attempts). In order to provide a personalised advise, the following questionnaires were also taken at baseline: nicotine dependency (Fagerström Scale, low to moderate vs. high dependency) (Heatherton et al., 1991) readiness-to-quit (Prochaska Stages of Change, (pre)contemplators vs. preparators) (Prochaska et al., 1988), and temporal discounting using a monetary choice questionnaire (Kirby Discontinuity Scale, immediate vs. delayed reward preference) (Kirby, 1997). At each time point during follow-up, participants were invited to complete a web-based questionnaire assessing the following secondary outcomes: self-reported quality of life (EuroQol Five Dimensions Health Questionnaire) (Herdman et al., 2011), smoking abstinence self-efficacy (Smoking Abstinence Self-efficacy Questionnaire) (Spek et al., 2013), perceived stress (Perceived Stress Scale) and self-reported smoking abstinence (point prevalence and continuous abstinence) (Cohen et al., 1983). Please refer to our protocol paper for more details (Boderie et al., 2020).

Data management

Descriptions of the data management plan can be found in our protocol (Boderie et al., 2020). All of which are retained and will be archived until 15 years after the completion of the study.

Analysis

Continuous abstinence rates at 12 months after group-based training were compared between the intervention and control groups using intention-to-treat analysis. All participants were included in the analysis, including those lost to follow-up who were classified as non-abstinent. Due to the small sample size resulting from early termination of the trial, we refrained from undertaking formal statistical testing of between-group differences.

Interviews

Following the premature closing of the trial, we conducted semi-structured interviews to investigate why healthcare employees did not participate in free employer-provided group-based smoking cessation training.

Respondents

The respondents were employed at Erasmus MC, one of the four participating hospitals in PERSIST, smoked daily, were aged 18 years or older, and had not previously participated in a group-based smoking cessation programme provided by their employer. For a period of ten weeks between 1 March and 13 May 2022, individuals who smoked were approached at different times on different days of the week at multiple locations on or just outside the hospital grounds. Those interested in participating in the interviews completed a contact form, after which a one-to-one meeting was scheduled to conduct the interview. The interviews were held in person or by phone.

Data collection

Two researchers (NWB and LB) conducted the interviews based on an interview guide (Supplementary Appendix I). The interviews were conducted in Dutch and used an inductive approach (Bryman, 2016), whereby respondents were stimulated to formulate their ideas and reasons for non-participation themselves, without the researchers already referring to or imposing their initial hypotheses. The semi-structured interview guide ensured that the same topics (such as awareness of the programme, opinion on incentives, etc.) were discussed in every interview. All interviews were audio recorded and transcribed.

Data analysis

The transcripts were analyzed using NVivo software. First, open coding was used, followed by axial coding, where open codes were connected and categorized. The final step was selective coding, in which the different categories were integrated into the four dimensions of non-participation. NWB and LB independently coded the data and after each step the codes were compared and differences were discussed until consensus was reached. Hence, all relevant topics were included.

Ethics and privacy

The Erasmus MC Medical Ethics Committee reviewed the protocol and qualitative study (MEC-2019-0140, MEC-2021-0711). All respondents were informed of the aim of the study and signed an informed consent form.

Results

Trial

Participants were randomised into the intervention ($n = 17$) or control ($n = 14$) group (Figure 2). Due to low recruitment rates, a decision was made after 24 months to terminate the trial before the sample size requirement was met.

Trial participant characteristics

The average monthly income of the intervention group was slightly higher than that of the control group. No other relevant demographic differences were observed between the intervention and control

groups (Table 1). Most participants started smoking before the age of 18 years, almost all tried to quit at least once prior to the trial, and approximately 50% of the participants used nicotine replacement therapy prior to the trial.

Incentives

More than half of the participants were willing to pay a deposit; accordingly, the deposit scheme was advised for 13 out of 17 (76%) participants in the intervention arm (Table 2). Three out of the 17 participants deviated

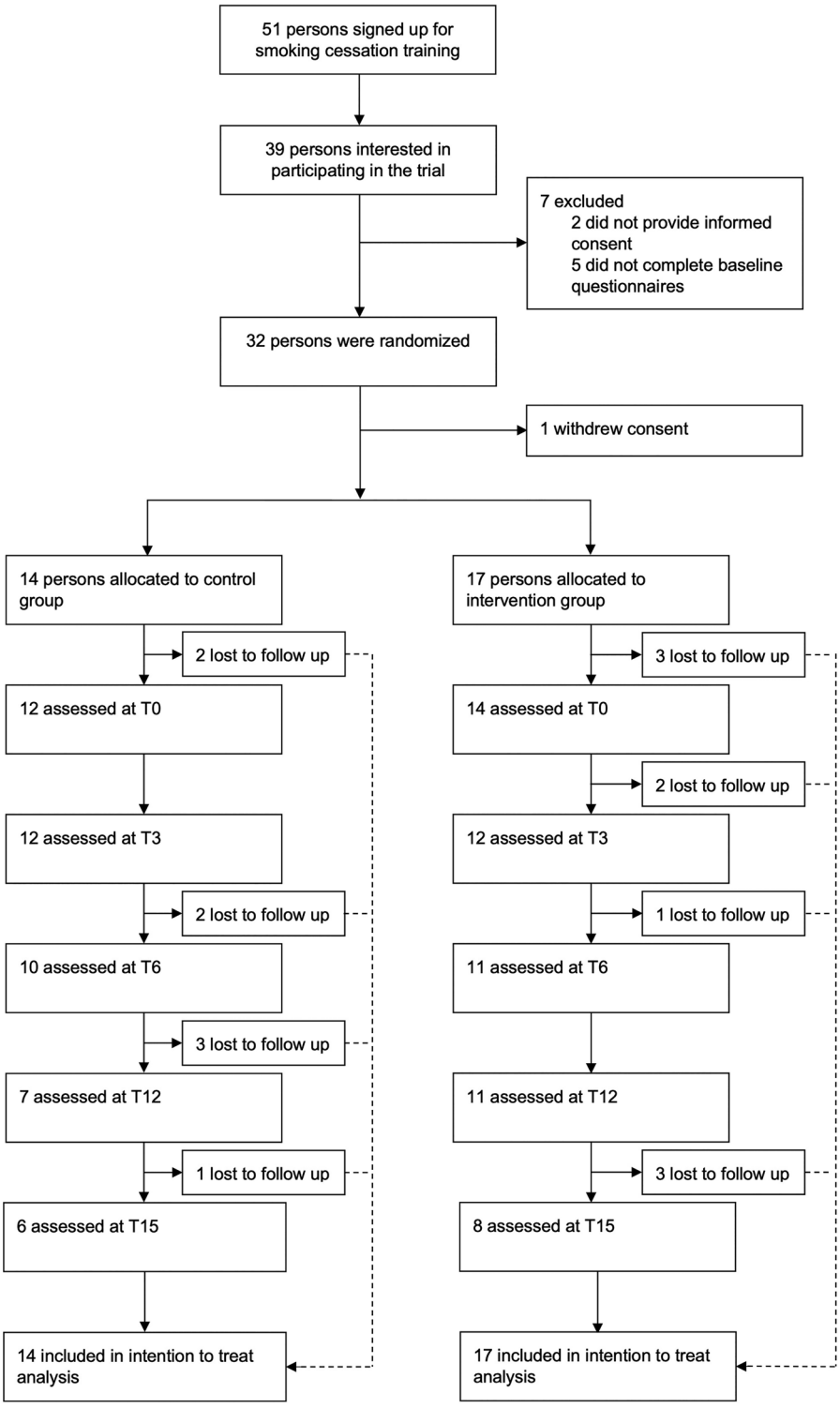

Figure 2. Flowchart with assessment for eligibility and randomisation, participants lost to follow up were classified as smoking.

from personalised advice. These participants were all recommended the deposit scheme but instead chose the standard scheme ($n=1$) or ascending scheme ($n=2$, Supplementary Appendix II).

Outcomes

Overall, abstinence in both the treatment and control groups gradually declined over time (Figure 3). Twelve months after the completion of the smoking cessation programme, 41 and 43% of the intervention and control groups, respectively, were continuously abstinent. Supplementary Appendix IV reports the secondary outcomes.

Interviews

Interview participant characteristics

Eighty smoking employees were approached for an interview on participation, of whom 28 expressed interest and provided contact details. After multiple emails and phone calls, interviews were conducted with 15 employees. The interviews lasted between 15 and 30 minutes. Table 3 presents the sample characteristics.

Table 1. Sample characteristics PERSIST trial ($n=31$).

			Control	Intervention
			14	17
Health	BMI	Mean (SD)	23.3 (7.5) *n* (%)	25.7 (5.3) *n* (%)
Work				
	Average net monthly income	Less than €1900	3 (21)	2 (12)
		€1900 tot €2600	8 (57)	5 (29)
		More than €2600	3 (21)	10 (59)
	Contract	Temporary contract, full time	1 (7)	3 (17)
		Permanent contract, full time	5 (36)	5 (29)
		Permanent contract, part time	8 (57)	8 (47)
		Missing	0 (0)	1 (6)
	Education	Lower	2 (14)	0 (0)
		Middle	4 (29)	6 (35)
		Higher	7 (50)	10 (59)
		Other/Unknown	1 (7)	1 (6)
Smoking behaviour				
	Age of smoking initiation	Median (IQR)	14.0 (13-17)	15.0 (13-16)
	Previous quit attempt	Yes	14 (100)	15 (88)
		No	0 (0)	2 (12)
	Use of nicotine replacement therapy	Yes	7 (50)	7 (46.7)
		No	7 (50)	8 (53.3)
		No previous quit attempt	0 (0)	2 (12)
	Pack years	Median (IQR)	31 (23, 36)	23 (11, 36)
	Fagerström Scale	mean (SD)	4.3 (2)	4.1 (2)
	Persons in household smoking	One or more roommates	0 (0)	1 (6)
		One or more children	2 (14)	3 (18)
		Partner	7 (50)	5 (29)
		None	3 (21)	5 (29)
		Living alone	2 (14)	3 (18)
	SASEQ	Mean (SD)	8.3 (2)	7.5 (3)
	Readiness to quit	Contemplation phase	1 (7)	2 (12)
		Preparation phase	13 (93)	15 (88)
Incentives				
	Kirby discontinuity score	Mean (SD)	13.4 (7)	13.9 (7)
	Present bias	Yes	8 (57)	9 (53)
		No	6 (43)	8 (47)
	Willing to pay a deposit	Yes	8 (57)	13 (76)
		No	6 (43)	4 (24)
	Advice given	Standard scheme		2 (12)
		Descending scheme		2 (12)
		Ascending scheme		0 (0)
		Deposit scheme		13 (76)
	Deviated from advice	Yes		3 (18)
		No		14 (82)
	Scheme choice	Standard scheme		3 (18)
		Descending scheme		2 (12)
		Ascending scheme		2 (12)
		Deposit scheme		10 (59)

*SASEQ: smoking abstinence self-efficacy questionnaire.

Table 2. Advice and deposit characteristics.

Incentives		Control group ($n = 14$)	Intervention group ($n = 17$)
Kirby discontinuity score	Mean (SD)	13.4 (7)	13.9 (7)
Present bias	Yes	8 (57)	9 (53)
	No	6 (43)	8 (47)
Willing to pay a deposit	Yes	8 (57)	13 (77)
	No	6 (43)	4 (24)
Advice given	Standard scheme		2 (12)
	Descending scheme		2 (12)
	Ascending scheme		0 (0)
	Deposit scheme		13 (76)
Deviated from advice	Yes		3 (18)
	No		14 (82)
Scheme choice	Standard scheme		3 (18)
	Descending scheme		2 (12)
	Ascending scheme		2 (12)
	Deposit scheme		10 (59)

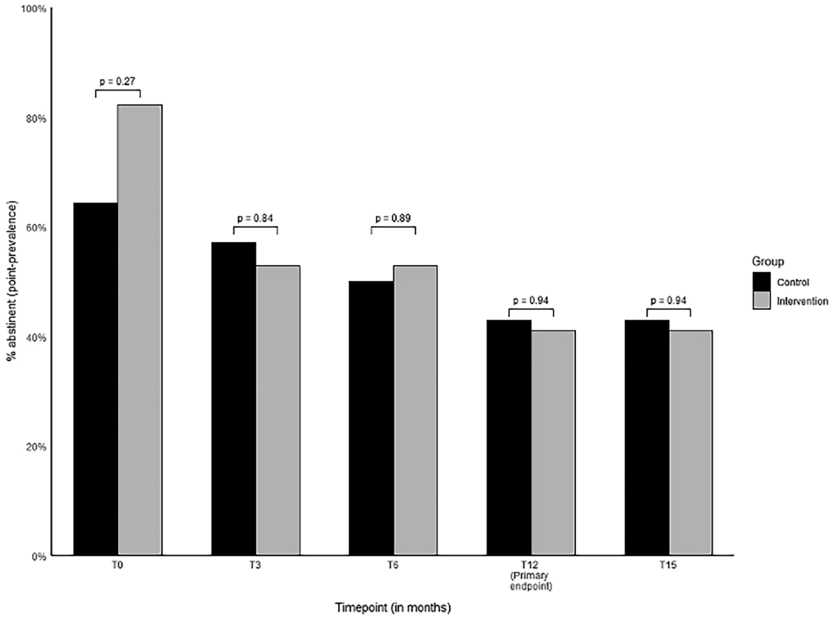

Figure 3. Continuous abstinence over time for intervention and control group.

Open and selective coding resulted in four main dimensions of reasons for non-participation: motivation to quit smoking, perspective on help or stimulation during smoking cessation, characteristics of the PERSIST programme, and perspective on the employer. To distinguish between trial participants and interview participants the latter will be referred to as respondents.

Motivation to quit smoking

Initially, the majority of respondents stated 'not wanting to quit smoking' as the major reason for not joining the PERSIST programme. However, follow-up answers indicated that only three out of 15 respondents did not wish to quit at all. All others wished to quit smoking in the future but not now. Most respondents had tried to quit smoking before, and some had successfully remained abstinent from smoking for weeks and some for months. Respondents frequently expressed fears that quitting smoking would create additional stress in their lives, that it was simply not the right moment, or that they did not feel strong enough to do it now, as for example mentioned by Employee eight:

> Employee 8 (Female; smokes 'half to one' pack a day): 'There are just so many different things happening in my life right now, and I know it sounds like an excuse, but it is just not the right moment. I think you need to have a calm and stable life first before… before being able to quit'.

Table 3. Participant characteristics interview study ($n = 15$).

		N (%)
Gender		
	Female	7 (47)
	Male	8 (53)
Age group		
	30–39 Years	1 (7)
	40–49 Years	9 (60)
	50–59 Years	2 (13)
	60 Years and older	2 (13)
	Missing	1 (7)
Number of cigarettes smoked per day		
	0–5	2 (14)
	6–10	5 (33)
	11–15	5 (33)
	16–20	3 (20)
Motivation to quit smoking		
	I don't want to quit smoking	3 (20)
	I think I should quit smoking but I don't really want to	4 (26)
	I want to quit smoking but I haven't thought about when	5 (33)
	I want to quit smoking and I hope to do so soon	1 (7)
	I want to quit smoking and I plan on doing so in the next three months	1 (7)
	I want to quit smoking and I plan on doing so in the next month	1 (7)
Education		
	Low	1 (7)
	Moderate	6 (40)
	High	7 (47)
	Missing	1 (7)
Occupation		
	Managers	1 (7)
	Healthcare professionals	5 (33)
	Technicians and associate professionals	5 (33)
	Clerical support workers	1 (7)
	Service and sales workers	1 (7)
	Elementary occupations	2 (13)
Duration of employment at current employer		
	0–5 Years	5 (33)
	6–10 Years	5 (33)
	11–15 Years	2 (13)
	16–20 Years	1 (7)
	21 Years and longer	2 (13)
Awareness		
	Knew there was a smoking cessation programme	13 (86)
	Knew there was a possibility to earn incentives	2 (13)

In addition, respondents experienced benefits of smoking, especially in the workplace. Smoking breaks were not only perceived as calming but also as bonding moments with colleagues or patients and their relatives:

> Employee 12 (Female; 0.5 pack a day): 'It calms me down. I go outside when my head is full. I smoke my cigarette and think: okay, breathe in, breathe out, now back to work again'.

> Employee 15 (Female; smokes 'a lot'): 'Sometimes when a parent just received bad news about their child, it is a good way to take them out of the situation by saying: let's go outside together for a cigarette. You see people get more relaxed and feel at ease'.

When interviews came to the perceived level of addiction, answers differed substantially, ranging from accepting one's dependence on nicotine to believing that one can easily quit:

> Employee 2 (Male; more than 30 cigarettes a day): 'I start with it [smoking] and I end with it, but I am trying to phase it out, though. I am aware of the unhealthy factors. But I have to confess that I am guilty, that my body has become dependent on the cigarette'.

> Employee 16 (Female; six cigarettes per day): 'I know I can quit on my own […] I can easily start smoking but also easily quit smoking'.

Perspective on help or stimulation during smoking cessation

Most of the respondents preferred to quit smoking on their own. Quitting smoking was perceived as perseverance. Respondents generally felt that quitting was something they should do on their own.

> Employee 7 (Female; 15 cigarettes per day): 'Look, if I want to quit and I feel I am ready for it, and I try to quit but it turns out to be damn hard, then maybe yes, I might try one of those programmes. But that is really a last resort. I would always say: try it yourself first, without a programme'.

> Employee 13 (Male; 0.5 pack a day): 'If I say: I am going to quit, then I am going to quit. I do not need a programme for that. If I really want to quit, I want it, so I do not need a programme to help me'.

The strong emphasis on intrinsic motivation is reflected in the financial incentives for smoking cessation. One respondent considered it 'bribery' and another respondent stated that money was 'the wrong motivation to quit'. Others were unsure how to feel about the incentives. Most respondents thought financial incentives would not work for them, but maybe for others. Some respondents suggested that non-financial incentives such as extra days off or just a pat on the back might work better for them. One respondent considered financial incentives for smoking cessation programs to be unfair to non-smoking colleagues.

Characteristics of the PERSIST programme

While the majority of respondents were aware of the possibility of joining a smoking cessation programme at the workplace, most of them were not aware of the possibility of earning incentives. Three respondents who were unaware of the possibility of earning financial incentives would have considered participating if they knew about this possibility, such as employee seven:

> Employee 7 (Female, 8 cigarettes a day): 'Yes of course! Look, I know I should quit, but I do not know when. If I get offered money, then I think: oh, then maybe I should do it now. A bit of extra money is always nice, right? Especially these days'.

One respondent mentioned that the hours of smoking cessation training did not match the working hours, especially due to nightshifts. Others doubted whether group-based training could actually help them quit smoking.

> Employee 5 (Male, pack a day): 'I know a colleague who participated in the programme, but that colleague started smoking again. So if I knew it would work, then maybe I would join, but it does not work'.

Another respondent mentioned that a broader programme about not just smoking cessation but a healthy lifestyle in general would be more attractive.

Respondents had different opinions about the fact that the programme was group-based. Half of the respondents preferred to have an individual programme, since that would offer more flexibility and the opportunity to do things at their own pace. The other half liked the fact that the programme was in a group because they imagined it was nice to feel support or considered it a good way to share experiences and tips. The fact that the programme was implemented at work was not always perceived as positive, as some people felt ashamed of their smoking status in front of (non-smoking) colleagues:

> Employee 11 (Male; smokes 'less than he used to'): 'Well, actually it is a… it is a shame culture really. Because it is so stupid, you work at a hospital, you know it is bad for your health, and still you do it [smoking] … It sounds a bit sneaky maybe, but I just do not want everyone to know I'm a smoker, let alone that I'm participating in such a programme'.

To communicate about the programme, most respondents considered e-mail and intranet as good options and proposed methods to improve communication differed: some liked the idea of including managers in the promotion while others did not. Employee three explained, for example:

> Employee 3: 'If you are on less good terms with your manager, I think it might be intimidating'.

While participation in the smoking cessation programme was not obligatory, respondents disliked the tone of communication and felt that they were being pushed into it. Timing also mattered; the smoking

cessation programme was promoted in combination with the introduction of a smoke-free zone around the hospital (Breunis et al., 2021). One respondent even mentioned this was too much at once for employees and it made them feel attacked.

Perspective on the employer

Only one of the 15 respondents stated that offering a smoking cessation programme was a good gesture that showed the employer's compassion for the employee's health. For most respondents, promoting smoking cessation felt that the employer was interfering with their personal lives.

> Employee 10 (Female; smokes only when stressed): 'I do not know… where do you draw the line in what your employer can and cannot decide for you? Are you allowed to interfere in personal spheres as an employer? I find it difficult'.

Two respondents said that the only thing employers should care about is whether the employees did their jobs correctly, not whether they smoked or not. The term 'patronising' was often mentioned by respondents.

> Employee 12 (Female; half a pack a day): 'I hate that patronising stuff, we are all adults'. Like: 'our department is going to take the healthy road', no, I can take my own route. That, that is patronising here. I do not come into your house to smoke, I do not stand next to you if you do not smoke. So who do I bother, myself? May I?

Respondents stated that, if employee health is of concern, working conditions should be optimized first:

> Employee 15 (Female; smokes 'a lot'): 'If you want something from us, you should first pay us better and make sure we get the appreciation we need, because it is an interaction. I work my ass off for this hospital, and the way I have been treated… I think: why would I do something for you, if you do not want to do something for me? If you show good-will to your staff, the staff will give you good-will in return'.

> Employee 13 (Male; half a pack a day): 'So yeah, if they really care about us and our health, then they should start with changing the working conditions. I have to walk more than 20 kilometers per day for my job, the work I do is also unhealthy'.

Respondents generally agreed that the hospital could not allow smoking on hospital grounds, but still had a strong preference for a designated smoking area, as it would in their opinion decrease smoking and cigarette butts in other places. In addition, respondents felt annoyed that walking out of the smoke-free zone to smoke took up most of their break times. Although they understood that it was their own decision to smoke, they felt that employers could provide more care. Furthermore, respondents felt that the focus on smoking was one-sided, as there are many other unhealthy behaviours, such as drinking alcohol and eating fast food.

Discussion

Our randomised controlled trial assessing the effectiveness of personalised incentives for sustained smoking cessation among healthcare employees participating in group-based smoking cessation training was closed prematurely due to low recruitment. Although the overall continuous cessation rates after a year were high among trial participants, there was no clear sign of the added benefit of personalised incentives. Interviews with non-participating employees showed three main reasons why people who smoke would not participate: unawareness that incentives could be earned, not being ready to quit, and not feeling the need for a cessation programme to quit.

Trial

In our study, the quit rates were substantially higher than those in many other studies that evaluated workplace-based smoking cessation interventions (Halpern et al., 2015,van den Brand et al., 2018). While a systematic review and meta-analysis of smoking cessation programs among healthcare employees

found a fairly high success rate of 21% for behavioural and pharmacological smoking cessation interventions in this group (La Torre et al., 2020), we found even higher rates. A likely explanation for this finding is the high degree of selection in our sample. We focused on hospital employees, particularly among staff in medical settings where the importance of good health was felt. Moreover, against the background of the low recruitment rates, those who participated in the programme were most likely very motivated to quit. This might also explain why we did not observe higher quit rates in the intervention group than in the control group; we may have reached a ceiling effect in our sample, in which (personalising) the intervention had no additional effect. However, any comparisons should be made with care, given the sample size limitation of our study.

Another striking finding was that the share of participants who chose a deposit-based incentive scheme (59%) was remarkably high compared to previous literature (Halpern et al., 2015,Giné et al., 2010,White et al., 2013). For example, in a US workplace-based smoking cessation trial, Halpern et al. (Halpern et al., 2015) offered four different incentive schemes to participants, of which two deposit-based schemes had a combined acceptance rate of only 14%. While this in part can be the effect of having a highly motivated sample, another explanation might be the personalised advice offered to participants. A novel element of our trial was that we offered participants informed advice on which incentive scheme would likely be most suitable for them, while they remained free to choose the incentive of their liking. Those willing to pay a deposit were advised an incentive scheme that involved a deposit, given previous evidence that such a scheme was the most effective, yet impopular. Combined with donating the deposit to a good cause in the case of relapse, this might have made deposit contracts more popular in our study.

Interviews

Interviews with non-participants showed that almost all respondents were unaware of the possibility of earning incentives, but they were aware that the smoking cessation programme was offered. Most respondents did not feel ready to quit smoking (yet) and did not sign up for information about the smoking cessation program; hence, they did not receive information about the possibility of earning incentives. A few respondents would have been interested in the program, and they knew about the incentives. However, quitting by themselves and intrinsic motivation were deemed to be more important by most participants. There was a strong belief that if you really wanted to quit, you could, and you could do it on your own. While a tremendous body of literature has shown considerably higher quit rates with guided quit attempts (Notley et al., 2019,Cahill & Lancaster, 2014,La Torre et al., 2020), people who smoke seem to underestimate the effectiveness of these programmes. It is also important to mention that some employees felt guilty or ashamed of smoking in a hospital setting, or did not want colleagues to know that they smoke. This could be a topic in the smoking cessation programme but also something to discuss with non-smoking employees. Interview aparticipants expressed feelings of being undervalued and experiencing work-related stress. The COVID-19 pandemic might have amplified and intensified existing workplace issues such as heavy workload and job-related stress (Donley, 2021). The COVID-19 pandemic started within the first half year of recruitment. Hospitals were saturated, staff was overworked and especially during those first months smoking cessation was not seen as a priority at all. This of course impacted our recruitment. However, we experienced low recruitment prior to the COVID-19 pandemic, and when COVID-19 became a less pressing issue. Hence, we decided that our recruitment issues were larger than COVID-19 alone and conducted the interview study.

Another surprising insight of the interview study was the mismatch between what the researchers expected to be efficient and how participants viewed those elements. The interview participants were critical of the use of incentives and the role of the employer in health promotion. A priori, these were seen as strengths of the design by the researchers (Mersha et al., 2023). The COVID-19 pandemic might have influenced employees view on their employers, but most of all this mismatch shows the need for in involving potential participants in the design of a study, to identify and possibly overcome such mismatches early on.

Strengths and limitations

In addition to the limitations pointed out in the interviews, the PERSIST trial has a relatively high lost-to-follow-up rate. Most likely this was due to the fact that those who started smoking again did not complete the questionnaires anymore. This was addressed by considering those lost-to-follow-up as non-abstinent, in accordance with the Russell standard (West et al., 2005). The PERSIST trial and the interview study were further limited by underrepresentation of lower-educated persons, although many lower-educated persons work in hospitals and tobacco use is more common among lower-educated persons in the Netherlands. Finally, CO measurements only detect smoking up to 24 hours prior to the measurement, and may not be perfect to capture sustained abstinence. However, informing participants that there will be CO measurement can increase the validity of self-reported abstinence (Piper et al., 2020).

The interview study also likely suffered from selection bias. Less opinionated individuals might have been less interested in participating. The recruitment took place within and around a smoke-free zone, therefore individuals might have felt 'caught' and thus be less willing to participate. In addition, there could be recall bias, as the interview study took place more than a year after the smoking cessation programme had been implemented. All interviews were conducted at one of the participating hospitals for practical reasons. Therefore, there could be differences between employers that were not captured in our interviews. Finally, it is important to realize that those who did not sign up for interviews might overlap with those who did not sign up for smoking cessation programs at the workplace. Hence, there is a risk that we may lack information about how to reach this group, as they can be inherently different from those who agreed to participate in the interviews.

Recommendations and future research

Despite these limitations, several recommendations for future research and implementation can be derived from this study. Recruitment issues such as those experienced in PERSIST are not unique and are common in smoking cessation research and public health. The first practical advice to employers would be to communicate openly about the use of financial incentives, for example, following the work by van den Brand et al. (van den Brand et al., 2019) and Poole et al. (Poole et al., 2023) Second, our research focused on incentives for sustained abstinence; however, incentives can also be used to improve the attractiveness of the smoking cessation programme itself, that is, rewarding signing up or completing the smoking cessation program. Most non-participants were not ready to quit but would ultimately like to. Strategies to improve participation among those in the pre-contemplation phase are an important topic for future research, as this group is currently not reached through smoking cessation programs. Furthermore, we timed the smoking cessation programme to match the implementation of a smoke-free zone surrounding the Erasmus MC, as this seemed to be a logical combination. However, this was not how non-participating employees perceived it, showing the need to listen to the preferences and perspectives of employees who smoke. Involving employees in the design and implementation of workplace-based smoking cessation programs is crucial to their success. Finally, as demonstrated in the interviews, one size does not fit all and also applies to the smoking cessation programme itself. Personalisation should not be limited to incentives alone, but could also be considered in, for example, the type of programme (e.g. group-based vs. individual).

Conclusion

Our prematurely terminated trial precludes conclusions on the effectiveness of personalised incentives, in addition to a group-based smoking cessation program. Based on the high acceptance rates of the deposit scheme in our small sample, combining advice and free choice seems to facilitate successful implementation of deposit-based schemes. To improve participation rates in smoking cessation programs, future research should consider the reasons for non-participation and ideally work together with potential participants in designing the programme.

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Author contributions

JVB, FJvL, and HvK obtained the funding. The study was designed using JVB, FJvL, HvK, and NWB. NWB drafted the manuscript, performed the day-to-day trial, and conducted the analysis. The NHC advised on the trial. FvdB, GEN, and CPvS advised on the qualitative part, and NWB and EB conducted and analyzed the interviews. All authors interpreted the data. The manuscript was revised and edited by NWB, EB, HvK, AB, FJvL, FvdB,NHC, GEN, OCPvS, and JVB. All authors approved the final manuscript. Patients and/or the public were not involved in the design, conduct, reporting, or dissemination of this research.

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No potential conflict of interest was reported by the author(s).

Trial registration

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Data availability statement

The data supporting the findings of this study are available upon reasonable request at the corresponding author. The data were not publicly available because of the privacy of the research participants.

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