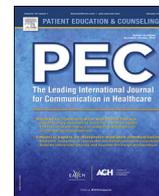




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Lacking willpower? A latent class analysis of healthcare providers' perceptions of smokers' responsibility for smoking

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ABSTRACT

Objective: Healthcare providers' (HCPs) perceptions of smokers' responsibility for smoking may affect implementation of smoking cessation care (SCC), but are understudied. This study examined Dutch HCPs' perceptions of smokers' responsibility for smoking, and how many and which subgroups exist with regard to these perceptions.

Methods: Observational cross-sectional study among physicians and other HCPs ($N = 570$). Latent class analysis was used to analyse data.

Results: Results showed two latent classes of HCPs: a majority (77 %) that appeared to hold smokers themselves more accountable for their smoking, and a minority (23 %) that seemed more inclined to believe that people smoked as a consequence of factors such as addiction, and smoking initiation when people were young and could not foresee consequences. The two-class model showed excellent certainty in classification. Class membership was associated with age, working experience, and smoking status. The majority class experienced more barriers to SCC than the minority class and provided SCC tasks to fewer patients.

Conclusions: HCPs' perceptions of smokers' responsibility for smoking relate to HCP background characteristics, barriers to SCC and implementation of SCC.

Practice Implications: New approaches to improving SCC might be needed that take HCP's perceptions of smokers' responsibility into account.

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1. Introduction

Healthcare providers (HCPs) can contribute greatly to the health of smokers by supporting smoking cessation. The implementation of smoking cessation care (SCC) is often suboptimal, however, despite the large number of studies into this [1–5]. HCP behaviour can be explained using the Theoretical Domains Framework (TDF), which integrates 33 theories of behaviour and behaviour change [6]. The original TDF contains twelve domains, such as motivation, and social/professional role and identity [6]. Research into the implementation of SCC shows that many factors at the level of the HCP, patient and the environment are at play, such as limited HCP self-efficacy, (perceived) lack of motivation in patients, and lack of time [4,5,7,8]. Despite the importance of these factors, it appears that some also reflect HCPs' underlying perceptions of whether SCC fits with their professional role or identity [7,9,10], as well as their perceptions of the role that

smokers play themselves [5,11]. Especially the latter has not been studied much, although it can be expected that HCPs who perceive smokers as responsible for smoking and quitting are less likely to perceive SCC as part of their own role, and subsequently to provide SCC (see [12] for similar findings in lifestyle change more generally). For example, a recent qualitative study found that HCPs feel less responsible for SCC if they consider it a patient's own choice to smoke and believe that patients mostly need willpower to quit, compared to those who perceive smoking as an addiction or disease [13]. In line with this, Weiner's attribution theory of controllability posits that people who are perceived as being stigmatized (or who ended up in a negative situation) as a consequence of factors beyond their control will be evaluated less negatively and receive more help than people who are perceived as having caused their stigma themselves [14,15]. A German study found that over half of physicians believe that a smoker's willpower alone is most effective in quitting smoking [11]. Physicians' own smoking status plays a role in these perceptions, for example non-smoking (vs. smoking) HCPs more strongly perceived internal factors as barriers to quitting (i.e., lack of willpower and lack of interest), whereas smoking HCPs more strongly perceived stress caused by external factors as a barrier

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[16]. However, perceptions of responsibility for smoking are still relatively understudied compared to the large volume of research into the implementation of SCC more generally, and also the smaller number of studies into role identity and perceptions of smoking specifically. Notably, the tobacco manufacturing company Philip Morris wrote already in a 1979 report that “in Holland, the anti-smoking cause is not exceptionally strong. (. . .) Members of the medical profession and government appear to have highly individual opinions and the consensus is that smoking is a matter of personal choice.” (cited p. 95 [17]);). Given that the implementation of SCC worldwide is still not what it should ideally be, it appears worthwhile to examine such perceptions as this might lead to novel ways of improving implementation of SCC.

The current study investigated Dutch HCPs' perceptions of smokers' responsibility for smoking, using latent class analysis (LCA) to examine how many and which subgroups exist with regard to these perceptions. We also examined HCP characteristics and perceptions of the role of the government and tobacco industry in order to further describe the subgroups. Finally, we examined whether barriers to implementation of an SCC guideline (i.e. the 'Dutch Tobacco dependence treatment and SCC guideline'), sense of responsibility for SCC, and implementation of SCC tasks differed between the subgroups.

2. Method

2.1. Design

Observational, exploratory cross-sectional study. This study is part of a larger study that investigated the implementation of SCC among a large sample of HCPs using a survey, focus group interviews, and individual semi-structured interviews [7,13].

2.2. Participants and procedure

Data were collected in The Netherlands between April and November 2017, using an online survey (a small number of addiction specialists completed a hardcopy version at a conference). The data collection period for the entire study ran from February to November 2017. The items assessing perceptions of smokers (see Measures) were inspired by the qualitative part of the larger study, and as such were added when quantitative data collection was already ongoing. Participants were eligible if they were practicing physicians (any specialization), dental hygienists, dentists or midwives. All of these groups are expected to have regular contact with smokers and are addressed by national SCC guidelines. In total, 843 people started filling out the survey after the perception items were added, of whom 570 completed the survey and were included in this study (68 %). 379 people had already completed the survey before perception items were added.

The study was introduced as a questionnaire about opinion on SCC, experiences with SCC, and barriers and facilitators to SCC. In order to prevent selection bias, we explicitly stated that participants could take part regardless of experience in SCC, and we employed a wide range of recruitment strategies. Participants were primarily recruited through their respective professional associations (45 %), snowball sampling (24 %, e.g. participants forwarding the study invitation to colleagues), e-mails sent directly to relevant departments of all hospitals in The Netherlands (10%), and physician journals and social media (7%). No sample size calculation was performed as the aim was to include as many participants as possible, to enlarge generalizability of the findings. Participants were informed that participation was voluntarily and that data would be analysed and stored anonymously and treated confidentially. Informed consent was obtained from all individual participants included in the study. A more detailed description of

the procedure can be found elsewhere [7]. The procedure was cleared for ethics by the Medical Ethical Committee of Leiden University Medical Center (P17.074).

2.3. Measures

The variables used in the current study are described below. Unless indicated otherwise, variables had no missing values. More details are provided elsewhere [7].

2.3.1. Perceptions of smokers' responsibility for smoking

Six items assessed participants' perceptions of smokers' responsibility for smoking (see Table 2 for all items). Answer categories ranged from [1] 'strongly disagree' to [5] 'strongly agree'. The items were developed through discussions among the authors, and based on qualitative work by the authors and previous literature on physicians' perceptions of barriers to quitting [13,16,18].

2.3.2. Perceptions of industry and society

Two additional items were developed to assess participants' perceptions of the tobacco industry and Dutch governmental efforts, i.e. 'The tobacco industry aims to make smokers addicted' and 'Sufficient efforts are being undertaken in The Netherlands to prevent tobacco dependence' (answer categories [1] 'strongly disagree' to [5] 'strongly agree').

2.3.3. Background characteristics

Participants provided their gender, year of birth (2 missing), HCP group (e.g., pulmonologist; see Supplementary Materials Table A for all categories), years working experience (1 missing), previous participation in SCC training, and smoking status (never smoker/ex-smoker/current smoker) [8]. The sample included one ophthalmologist, who was grouped with 'other physicians' in the analysis that included HCP group.

2.3.4. Barriers to implementation

Participants indicated to what extent fourteen pre-specified factors were barriers to guideline implementation and providing SCC, with answer categories [1] 'not at all' - [5] 'very strongly'. Barriers were lack of guideline adaptability, guideline complexity, task interference, lack of time, materials, patient reimbursement, referral possibilities, professional's rewards, and training, and smoking being a sensitive subject, patients' negative attitude toward SCC, and the negative impact of SCC on the patient-HCP relationship. The barriers 'lack of guideline adaptability' and 'guideline complexity' had a 'I do not know/not applicable' category, these values were treated as missing (50 and 44 missing, respectively). Barriers were based on previous literature [4,8,16,19].

2.3.5. Responsibility for SCC

We assessed role identity (i.e., 'As a [specific HCP] I see implementing the guideline as my task' [8]; 70 'I do not know/not applicable' responses treated as missing), and sense of responsibility for the organization of SCC in the HCP's immediate working environment, and for stimulating development in the area of SCC with one item each (e.g., 'I feel responsible for the organization of SCC in my immediate working environment'), with answer categories [1] 'completely disagree' - [5] 'completely agree'.

2.3.6. Implementation of SCC tasks

Participants indicated, via self-report, among how many of their patients they performed the following tasks identified in the Dutch SCC guideline [20]: Ask about smoking status (all patients); advise to quit smoking, in a clear and personalized way (all patients and

different subgroups of patients who smoke that the Dutch SCC guideline defines as important [20]; 65 missing per subgroup item); assess smoking profile, assess motivation to quit (patients who smoke); increase motivation to quit (patients considering quitting); and refer to adequate SCC (patients motivated to quit) [8]. Answer categories were [1] 'all' [2], 'the majority' [3], 'half' [4], 'the minority', and [5] 'none'.

2.4. Statistical analyses

LCA was selected as a statistical approach as this allows for examination of clusters based on a latent construct, i.e. subgroups of HCPs based on their perception of smokers' responsibility for smoking which was measured by the six manifest variables. Before performing the LCA, we used independent samples *t*-tests and χ^2 -analyses to examine whether inclusion in the analyses was related to background characteristics. Pearson bivariate correlations were used to examine associations between the six perceptions of smokers items. The two additional items on the tobacco industry and society were not included in the LCA, but used to describe the classes. LCA was subsequently performed on the six manifest perception items in R statistical software, using the *p*LCA package [21,22]. LCA aims to reduce heterogeneity in a population to a number of latent classes, i.e. existing but unobserved subgroups of participants. The model aims to maximize similarity within a class and difference between the classes [23]. We did not take the ordering of categories into account, as this allowed us to empirically examine whether categories ordered as would be expected. A series of models were fit ranging from 1 to 5 classes. We used a maximum of 1000 iterations, and repeated each analysis 100 times to decrease chances of obtaining local maxima. The models were evaluated using maximum log-likelihood (LL), Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), and relative entropy values. Lower LL, BIC and AIC values indicate better models. The BIC takes loss of parsimony into account and has been proposed as the most accurate fit measure for basic latent class models [22]. Furthermore, relative entropy values > 0.80 indicate sufficient certainty in classification. After selection of the best fitting model, conditional probabilities were examined to interpret the classes. We next examined associations between class membership and HCP background variables using independent samples *t*-tests and χ^2 -analyses, as well as differences between the classes with regard to implementation of SCC tasks and barriers to SCC implementation using independent samples *t*-tests (with Bonferroni corrections applied to account for multiple tests). We ensured that the assumptions of all analyses were met.

Each analysis was performed among participants who had full data for the variables in the analysis.

3. Results

3.1. Attrition and preliminary analyses

Inclusion in the analyses was not significantly related to age, working experience in years, or gender. Addiction specialists, neurologists, pulmonologists and midwives were significantly more likely to be included in the analyses, whereas anaesthesiologists, internists, other physicians, ophthalmologists, and youth specialists were less likely to be included (see Supplementary Materials Table A for statistics). HCPs with previous SCC training were more likely to be included.

HCPs agreed most strongly that most smokers continue to smoke because they are addicted to tobacco, and they strongly disagreed that children are capable of estimating the risks of tobacco dependence (see Supplementary Materials Table B). Interitem correlations between most of the items were small.

3.2. Model selection and description of the classes

3.2.1. Model selection

The model with two latent classes showed the best fit to the data based on the BIC value, which is the preferred fit measure as it takes parsimony into account (see Table 1, [23]). The relative entropy value indicated high certainty in classification. In addition, the two classes were both estimated to represent a sufficient share of the population (Class 1 77 % of HCPs, Class 2 23 % of HCPs).

3.2.2. Classes description

Overall, HCPs in Class 1 appeared to hold smokers themselves somewhat more accountable for smoking than HCPs in Class 2, who seemed more inclined to believe that people smoked as a consequence of factors such as addiction, and smoking initiation when people were young and could not foresee consequences (see Fig. 1 for conditional item response probabilities; Table 2 for means and standard deviations). Specifically, Class 2 HCPs disagreed more with the statements that smoking initiation is a conscious choice than Class 1 HCPs and that children are able to estimate the risks of tobacco dependence, and they were more convinced that most smokers started smoking as a child. Furthermore, Class 2 HCPs were more convinced than Class 1 HCPs that smokers continue to smoke because they are addicted to tobacco, and disagreed more with the statement that smokers continue to smoke because they

Table 1
Model characteristics (N = 570).

Classes	LL	BIC	AIC	Parameters	Relative entropy	Class membership ^a
1	-4395.008	8942.312	8838.017	24	1.00	100%
2	-4255.219	8821.375	8608.438	49	0.981	1: 77 % 2: 23 %
3	-4204.335	8878.248	8556.671	74	0.988	1: 23 % 2: 10 % 3: 67 %
4	-4170.251	8968.721	8538.503	99	0.991	1: 15 % 2: 22 % 3: 50 % 4: 14 %
5	-4136.202	9059.264	8520.405	124	0.992	1: 19 % 2: 7 % 3: 19 % 4: 34 % 5: 20 %

Notes. LL = maximum log likelihood; BIC = Bayesian Information Criterion; AIC = Akaike Information Criterion.

^a Values represent estimated class population shares.

Table 2
 Means and standard deviations on the perception items in both Classes: Independent samples *t*-tests (*N* = 570).

Perceptions of smokers' responsibility for smoking	M (SD)		Total sample
	Class 1 (n = 442)	Class 2 (n = 128)	
People make a conscious choice to start smoking	2.52 (0.94)***	1.19 (0.67)***	2.22 (1.04)
Smokers continue to smoke because they are addicted to tobacco	3.59 (0.97)**	3.95 (1.32)**	3.68 (1.07)
Most smokers started smoking as a child	3.41 (0.83)***	3.90 (1.08)***	3.50 (0.91)
Smokers continue to smoke because they lack willpower	2.74 (0.90)**	1.96 (0.94)**	2.56 (0.97)
Patients have sufficient knowledge of health damage caused by smoking	3.08 (1.08)***	2.43 (1.08)***	2.94 (1.11)
Children are capable of estimating the risks of tobacco dependence	1.71 (0.85)***	1.16 (0.78)***	1.59 (0.86)
Other perceptions	Class 1	Class 2	
The tobacco industry aims to make smokers addicted	4.00 (0.90)***	4.45 (0.91)***	4.10 (0.92)
Sufficient efforts are being undertaken in The Netherlands to prevent tobacco dependence	2.25 (1.04)***	1.68 (0.97)***	2.12 (1.05)

** *p* < 0.01.
 *** *p* < 0.001.

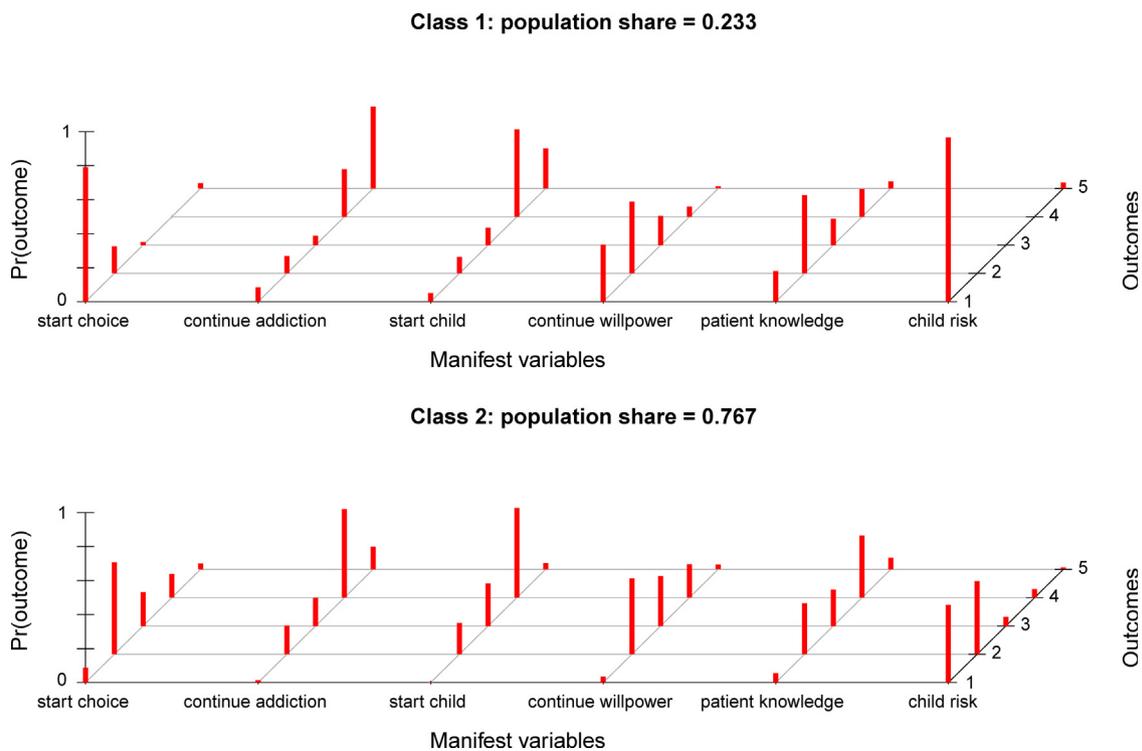


Fig. 1. Conditional item response probabilities for the six perception items in both classes.

lack willpower. Finally, whereas HCPs in Class 2 believed that patients have insufficient knowledge of the health damage caused by smoking, Class 1 HCPs were neutral about this.

3.2.3. Additional perception items

The two classes had different perceptions of the tobacco industry and governmental efforts (see Table 2). Class 2 HCPs more strongly believed that the tobacco industry aimed to make smokers addicted, and were less satisfied with efforts in The Netherlands to prevent tobacco dependence, although these perceptions were shared -to a lesser extent- by Class 1 HCPs.

3.3. Association of class membership with background variables

Examination of background characteristics showed that Class 1 HCPs were significantly younger (Class 1 *M* = 44.67, *SD* = 10.25; Class 2 *M* = 48.12, *SD* = 9.70, *p* < 0.01) and had fewer years of working experience than Class 2 HCPs (Class 1 *M* = 12.99, *SD* =

10.25; Class 2 *M* = 15.33, *SD* = 9.70, *p* = 0.02). Class membership was also related to own smoking status, such that ex-smokers were significantly more likely to belong to Class 2 (see Table 3). Class membership was not significantly related to gender and participation in SCC training. No χ^2 -test could be performed for HCP group and class membership because of expected cell counts < 5. Based on percentages, paediatricians and pulmonologists appeared least likely to belong to Class 1, whereas anaesthesiologists, surgeons, youth specialists, dentists and dental hygienists appeared more likely to belong to Class 1.

3.4. Barriers to implementation, responsibility for SCC and implementation of SCC tasks

Independent samples *t*-tests showed that HCPs in Class 1 experienced lack of professional rewards, patients' dishonesty about smoking and a negative impact of implementing SCC on their relationships with patients as stronger barriers than Class 2 HCPs

Table 3
Frequencies and percentages of the two classes on background variables (N = 570).

Variable	Categories	n (%)		χ^2 -statistic
		Class 1 (n = 442)	Class 2 (n = 128)	
Smoking status	Never smokers	304 (80 %)	74 (20 %)	$\chi^2(2) = 8.40, p = 0.02$
	Ex-smokers	112 (70 %)	49 (30 %)*	
	Smokers	26 (84 %)	5 (16 %)	
Gender	Male	177 (79 %)	48 (21 %)	$\chi^2(1) = 0.27, p = 0.60$
	Female	265 (77 %)	80 (23 %)	
SCC training	No	317 (88 %)	44 (12 %)	$\chi^2(1) = 1.77, p = 0.18$
	Yes	125 (60 %)	84 (40 %)	
HCP group	Addiction specialist	31 (72 %)	12 (28 %)	
	Anaesthesiologist	18 (86 %)	3 (14 %)	
	Cardiologist	25 (78 %)	7 (22 %)	
	General practitioner	48 (71 %)	20 (29 %)	
	Internist	15 (79 %)	4 (21 %)	
	Neurologist	41 (79 %)	11 (21 %)	
	Paediatrician	16 (67 %)	8 (33 %)	
	Pulmonologist	55 (69 %)	25 (31 %)	
	Other physicians	11 (79 %)	3 (21 %)	
	Surgeon	36 (84 %)	7 (16 %)	
	Youth specialist	21 (84 %)	4 (16 %)	
	Dental hygienist	50 (86 %)	8 (14 %)	
	Dentist	23 (88 %)	3 (12 %)	
	Midwife	52 (80 %)	13 (20 %)	

Note. No χ^2 -test could be performed for HCP group and class membership because of expected cell counts < 5.

* Deviation from the expected cell count at $p < 0.05$.

** Deviation from the expected cell count at $p < 0.01$.

*** Deviation from the expected cell count at $p < 0.001$.

Table 4
Barriers to implementation, responsibility for SCC, and implementation of SCC tasks in both Classes: Independent samples t-tests (N = 570).

Barriers to SCC guideline implementation	M (SD)	
	Class 1 (n = 442)	Class 2 (n = 128)
Lack of training	3.29 (1.10)	3.16 (1.21)
Lack of guideline adaptability	2.60 (0.85)	2.50 (1.00)
Guideline complexity	2.49 (0.80)	2.47 (0.94)
Lack of professional rewards	2.73 (1.14)*	2.45 (1.29)*
Lack of time	3.47 (1.05)	3.32 (1.25)
Task interference	3.23 (0.99)	3.17 (1.27)
Lack of materials	2.82 (0.94)	2.84 (1.09)
Lack of referral possibilities	2.69 (0.93)	2.69 (1.15)
Lack of patient reimbursement	2.99 (1.05)*	3.32 (1.22)*
Smoking sensitive subject for patients	3.19 (1.11)	3.09 (1.24)
Patients negative towards smoking cessation care	2.96 (0.96)	2.81 (0.95)
Patients unmotivated to quit	3.28 (0.91)	3.14 (1.03)
Patients dishonest about smoking	2.91 (0.89)*	2.66 (1.02)*
Negative impact patient-provider relationship	2.34 (0.82)***	2.00 (0.90)***
Responsibility	Class 1	Class 2
Role identity	3.67 (1.01)	3.81 (1.18)
Organization of SCC	3.16 (1.03)	3.30 (1.11)
Stimulating SCC development	3.42 (1.00)	3.55 (1.20)
Implementation of SCC tasks	Class 1	Class 2
Ask about smoking status	1.67 (1.04)	1.56 (0.93)
Advise to quit		
All smokers	3.04 (1.35)*	2.81 (1.44)*
New patients who smoke	2.23 (1.26)*	1.90 (1.14)*
Smokers with smoking-related complaints	1.57 (0.93)*	1.38 (0.71)*
Smokers pre-surgery	2.21 (1.93)	2.20 (2.08)
Pregnant smokers	1.68 (1.04)	1.57 (0.96)
Assess smoking profile	2.14 (1.32)	2.01 (1.28)
Assess motivation to quit	3.04 (1.38)*	2.81 (1.36)*
Increase motivation to quit	3.10 (1.59)*	2.84 (1.56)*
Refer to SCC	2.90 (1.45)*	2.66 (1.46)*

Note. SCC task items refer to the proportion of patients that the task applies to, e.g. asking about smoking status applies to all patients, and referring to SCC applies to smokers who are motivated to quit. Higher scores indicate a lower proportion of patients.

* $p < 0.10$.

* $p < 0.05$.

*** $p < 0.001$.

(see Table 4). Concerns about harming the patient-provider relationship remained significant after Bonferroni correction for multiple testing (at $p < 0.004$). There were no significant differences in role identity and responsibility for SCC, although mean scores appeared higher in

Class 2. Class 1 HCPs provided quit advice to fewer new patients who smoke and assessed motivation to quit among fewer smokers than Class 2 HCPs (see Table 4). After Bonferroni-correction for multiple testing, these differences were no longer significant (at $p < 0.005$).

4. Discussion and conclusion

4.1. Discussion

This study provided new insight into how HCPs perceive smokers' responsibility for smoking, and how these perceptions relate to background characteristics, implementation of SCC, and experienced barriers to SCC. Overall, HCPs quite strongly agreed that most smokers continue to smoke because they are addicted to tobacco, and strongly disagreed that children are capable of estimating the risks of tobacco dependence. The two-class model resulting from the LCA fitted the data best and showed excellent certainty in classification. Results showed two latent classes of HCPs: a minority (23 %) that seemed to hold factors beyond smokers' own choice more accountable, and a majority (77 %) that appeared to hold smokers more accountable for their smoking, despite recognizing the role of other factors. For example, the minority class quite strongly disagreed that smoking initiation is a conscious choice, whereas the majority class was relatively neutral about this. Furthermore, majority class HCPs experienced more barriers to SCC than the minority class, although only the barrier that SCC would harm the patient-provider relationship remained significant after Bonferroni correction. This barrier has been frequently reported in the literature [5,24]. Importantly, evidence also suggests that many smokers expect SCC interventions to be effective, raising the question whether SCC indeed harms the relationship [11]. Alternatively, it could be a reflection of HCPs' perceptions of smokers' responsibility for smoking. For example, if HCPs believe that smoking is an individual's deliberate choice, it makes sense that HCPs perceive SCC as (unwanted) interference with the individual's freedom, which would harm the relationship. On the other hand, HCPs who conceptualize smoking more strongly as an addiction may feel that they are doing smokers a favour when addressing smoking, which should not harm the relationship. The majority class also seemed to perform SCC tasks to fewer patients, but this was no longer significant after Bonferroni correction.

Class membership was related to HCPs' own smoking status, with ex-smokers being more likely to belong to the minority class of HCPs that perceived smokers as less personally responsible for smoking. It is likely that their own experiences with quitting smoking contributed to these perceptions. These findings are compatible with a previous study showing that physicians who smoke are less likely to state that 'lack of willpower' prevents smokers from quitting [16]. In addition, it appears that HCPs who smoke provide less SCC, although findings are mixed [7,16,25]. Finally, based on previous qualitative results, one may expect that minority class HCPs (who perceive smokers as less responsible) have a sense of responsibility for providing SCC themselves, organizing SCC in their region, or stimulating SCC developments [13]. Although means were in the expected direction, no significant differences were found that support this.

The current results are important from a societal point-of-view. Although the harmful health effects of smoking have been known for a long time [26], many westernized countries including the Netherlands have seen a relatively recent change in views on smoking, which seems to become increasingly less normal in healthcare and society more generally. For example, only in 2017 key healthcare associations (e.g., university medical centres, mental health care associations) agreed to make healthcare settings smoke free, suggesting that the problem of smoking has recently gained importance. It is hoped that more HCPs would then move to the -current- minority class, such that perceptions of smokers' responsibility for smoking among HCPs move increasingly further away from those that were outlined by the tobacco industry as beneficial [17].

This study has limitations. First, this was an exploratory study and the items were newly developed specifically for this study, given that a measure of HCPs' perceptions of smokers' responsibility for smoking, to our knowledge, did not yet exist. Although the clustering of perception items and associations with other measures in this study suggest that the items are valid, it is important to further validate the items and classes in other samples of HCPs. The study was not designed for assessing differences between the two classes. Second, the cross-sectional nature of this study did not allow for examination of directionality in the relationships that were found. Perceptions of smokers' responsibility may affect for example barriers, or vice versa. Third, although this study included a wide range of HCPs, other groups of HCPs were not included (e.g., other types of physicians, nurses, psychologists etcetera) because of time and financial constraints. Relatedly, the items about perceptions of smokers' responsibility were added to the survey later. Attrition analyses showed that certain groups of HCPs were more likely to be part of the current sample (e.g. midwives), whereas the majority of HCPs from other groups had already completed the survey before the items assessing perceptions were added (e.g. internists). In addition, HCPs trained in SCC training were more likely to be included in the current sample. As HCPs who participate in SCC training are likely more positive about SCC, more HCPs may belong to the majority group in the entire population [27–29]. Implementation research more generally is also likely to include HCPs that are interested in the topic under study and might be doing relatively well with implementing the intervention. Age, working experience and gender were unrelated to inclusion in this sub study, and the sample included in this sub study was sufficient for performing the analyses.

4.2. Conclusions

This study showed two classes of HCPs based on their perceptions of smokers' responsibility for smoking: a majority class of HCPs who held smokers themselves more accountable for their smoking, and a minority class that seemed more inclined to believe that people smoked as a consequence of factors beyond the smokers' own conscious choice or will. Class membership was related to own smoking status, barriers to SCC (especially perceiving SCC as a threat to the patient-provider relationship), and implementation of SCC tasks.

4.3. Practice implications

The findings suggest that different approaches might be needed when improving SCC based on HCPs' perceptions of smokers' responsibility. Certain groups of HCPs were more likely to belong to the majority class that held smokers more accountable, such as HCPs working in surgery and dentistry settings. It seems beneficial to develop strategies that address perceptions of responsibility in these groups. Notably, this study showed that the two classes did not differ significantly on previous participation in SCC training, suggesting that traditional SCC training programs (targeting TDF domains knowledge, skills or motivation) might not be the preferred route to addressing perceptions. Alternatively, HCPs who are ex-smokers themselves could share their own experiences with quitting and smoking with their peers, as they are less likely to hold smokers accountable for smoking. Another route might be specifically address perceptions of smokers' and HCPs' responsibility in training programs, or to have HCP associations or other respected authorities provide information on factors beyond the smoker's direct control that contribute to continued smoking. In addition to these strategies that target perceptions, implementation of SCC may potentially be improved by providing HCPs with

rewards (financial or otherwise) for providing SCC since majority class HCPs in particular reported lack of rewards for themselves as a barrier to SCC. Future research should investigate how HCPs perceptions of smokers' responsibility for smoking can best be addressed, such that smoking is increasingly perceived as an addiction and serious health threat that smokers need treatment for.

Research involving human participants and/or animals

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee (Medical Ethical Committee of Leiden University Medical Center, P17.074) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

CRediT authorship contribution statement

E. Meijer: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing - original draft, Visualization, Project administration, Funding acquisition. **N.H. Chavannes:** Conceptualization, Writing - review & editing, Funding acquisition.

Declaration of Competing Interest

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Appendix A. Supplementary data

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