

Characteristics and consistency of light smoking:
Long-term follow-up among Finnish adults

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Tiivistelmä – Referat – Abstract <p>Tupakointitutkimukset keskittyvät perinteisesti säännöllisesti tai runsaasti tupakoiviin. Koska ei ole osoitettu mitään terveyden kannalta haitattoman tupakoinnin rajaa, määrältään vähäisenkin tupakoinnin tutkiminen on tärkeää. Tutkielman tavoitteina oli analysoida päivittäin 1-4 savuketta polttavien ominaispiirteitä, tupakointitottumusten pysyvyyttä sekä tupakointitavan muutosta ennustavia tekijöitä. Tutkimuksessa käytettiin vuosina 1975, 1981 ja 1990 kerätyn suomalaisen kaksoskohorttitutkimuksen kyselyaineistoa. Vuoden 1975 aineistossa oli 9 940 päivittäistupakoitsijaa, joista 8% poltti alle 5 ja 20% vähintään 20 savuketta päivässä. Tutkimuksessa verrattiin päivittäin vähän ja paljon polttavien ominaispiirteitä. Vähän tupakoivat olivat todennäköisemmin naisia, yksin eläviä, liikunnallisia, korkeammin koulutettuja, elämänsä tyytyväisiä ja vähemmän stressaantuneita kuin runsaasti polttavat. Pienempi osuus vähemmän tupakoivista käytti runsaasti kahvia ja alkoholia tai tupakoidessaan hengitti savua keuhkoihin. Pitkittäistarkastelussa ikä, koulutusaste, siviilisäädyn muutos ja alkoholin käyttö ennustivat tupakointitapojen muuttumista. Yksilötasolla vähäinen tupakointi oli usein väliaikaista: seuranta-aikana valtaosa lopetti tupakoinnin tai lisäsi savukemäärää. Väestötasolla vähän tupakoivien osuus pysytteli samana: tupakoinnin aloittajia, vähentäjiä sekä aiemmin lopettaneita mutta uudelleen aloittaneita siirtyi tähän ryhmään.</p> <p>(150 sanaa)</p>			
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Tiivistelmä – Referat – Abstract <p>Smoking research has primarily targeted moderate and heavy smokers. However, examining characteristics and consistency of light smoking, defined as <5 cigarettes per day (CPD), is equally important. This study analyzed characteristics of light smokers (7.8% of daily baseline smokers) in comparison to heavy smokers, defined as ≥ 20 CPD, (26.9%), described how light smoking pattern changed over time and studied predictors of smoking change. Longitudinal data from the Finnish adult twin cohort study collected in 1975, 1981 and 1990 were used. Female sex, younger age, higher education, being single and physically active, reporting less inhalation, using less alcohol, coffee and other tobacco products characterized light smoking. Longitudinally, age, education, binge drinking and change of marital status predicted change of light smoking pattern. Half of the baseline light smokers quit while many increased smoking during the follow-up. This heterogeneous subgroup included permanent light smokers, relapsed quitters, previous moderate smokers, and smoking initiators.</p> <p>150 words</p>			
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1 Introduction

Light smokers, also called “chippers” or “low-rate smokers”, make up an increasing proportion of smokers in many countries (1,2). Smoking restrictions and health education are among reasons motivating light instead of heavy smoking. Light smoking is often considered as smoking <5 cigarettes per day (CPD). The proportion of light smokers is not well established partly due to the different definitions used in studies (3), nor is their consistency stable because this smoking pattern is often temporary.

Light smoking is relatively common among adolescents, women and some ethnic minorities (3-5). Light smokers can be categorized into three subgroups: those established in this pattern; those progressing to heavier consumption, and those approaching cessation (2-4).

Light smoking may be motivated more by social and enjoyment factors than by craving and addiction (6,7). However, light smokers do not seem to be typically “social smokers”, because they smoke half their cigarettes while being alone (8). It has been suggested that light smokers are less impulsive, more self-disciplined, and their smoking is less linked with mood states when compared to regular smokers (7,9).

Light smokers more likely than heavier smokers sit in the non-smoking sections and have smoking restrictions at home or at workplace (2). Some are motivated by the harm reduction they believe they gain by light instead of heavier smoking (3,10). Occasional smokers have a healthier lifestyle and are better educated than regular smokers (11), and higher education characterizes also daily light smokers (12).

Light smoking may have a genetic component as genetic factors have substantial influence on amount smoked (13,14). Although interindividual genetic differences account for 59% of variation in nicotine metabolism, only 4% of this variation is accounted for by known CYP2A6 alleles (15). Light smokers often demonstrate a slow CYP2A6 activity, which may reduce smoking (14,16). Slow metabolism leads to lesser withdrawal symptoms, and many chippers actually do not experience such symptoms during abstinence (3,9). Their time to first cigarette is rarely under 30 min after waking. Further, smoking <5 CPD has been suggested to be a cut-off point where nicotine regulation becomes ineffective and other factors would maintain low-rate consumption

(2). Social influences may also explain patterns of familial aggregation of light smoking (17).

Light smokers are more likely to plan and to have attempted quitting than heavy smokers (2,4) and many do not find quitting difficult (4,5,18). However, after quitting, light and heavy smokers demonstrate similar relapse rates (19). The subgroup of light smokers varies, consisting mainly of former heavy smokers in some populations (2), while of smoking initiators in others (18,20). Light smokers have been reported to be either consistent in their pattern (4) or to maintain low-rate consumption only for some months (2,5). Quitters often relapse back to regular smoking through occasional or light smoking, consuming fewer cigarettes than before quitting for several months (2,21).

2 Aims

It is important to further characterize the group of daily light smokers as well as to study this pattern longitudinally, because follow-up studies of light smokers are uncommon. Knowing the characteristics and consistency of this smoking subgroup helps to target interventions and understand the health consequences of this pattern. The aims of this study were to characterize daily light smoking in a Finnish population, to describe consistency of such smoking pattern over a 15 year follow-up period, and to explore factors predicting consistent light smoking.

3 Materials and methods

3.1 Subjects

The data for this study were collected as part of the Finnish Twin Cohort established in 1974. The cohort was compiled from the Central Population Registry by identifying as twin candidates sets of persons born on the same day, with the same surname at birth, of the same sex and born in the same local municipality of Finland. The cohort thus includes all same-sex twin pairs born before 1958 with both members alive in 1967 (22). Three questionnaire studies were carried out in 1975, 1981 and 1990 with response rates of 89%, 84% and 77%, respectively. In 1975 31,145 subjects responded, of which 26,567 were biological twins based on questionnaire responses and verified in some

cases from parish records. In order to include in this study as many baseline light smokers as possible, all the data available in 1975 was used, including also non-twins, who were very comparable in their survey characteristics with the twins. Thus, the data was used as individuals while controlling for twin ship. In 1981 the questionnaire was sent only to biological twins still alive in the cohort, whereas in 1990 only to those born 1930-1957, with both co-twins resident in Finland, if they had responded in at least one of the previous surveys. Thus, the most aged participants were excluded from the last survey in order to avoid possible bias caused by increased morbidity.

3.2 *Definition of light smoking*

In this study light smoking among the current daily smokers was defined as smoking <5 CPD (1-4 CPD), reflecting regular but very light smoking pattern. Earlier studies have often used the same definition (2,5,20), but sometimes also higher cut-offs (3).

The current daily smokers, defined as those who had smoked at least 5–10 packs of cigarettes over their lifetime, and who were smoking daily or almost daily at the time of the study, were first identified from the 1975 data. The questions asked were: “Have you ever smoked more than 5–10 packs of cigarettes in your lifetime?” Those responding positively were asked, “Do you smoke or have you smoked cigarettes regularly, say daily, or almost daily during your lifetime?” If one replied ‘yes’, he/she was further asked if still smoking regularly. If so, he/she was classified as a current smoker, whose average daily cigarette consumption was then determined with the following question: “How many cigarettes do you smoke daily on average?” The response alternatives were as follows: None, <5, 5–9, 10–14, 15–19, 20–24, 25–39, and >40. According to the amount of CPD, the 1975 current smokers were collapsed into four groups, (<5, 5-9, 10-19, and ≥ 20 CPD), with a primary focus on comparing characteristics of light (<5 CPD) and heavy (≥ 20 CPD) smokers.

3.3 *Covariates of light smoking*

The subjects for the analyses of characteristics of light smoking were the current cigarette smokers at baseline in 1975. Age and sex were determined from registry information. Age was used both as continuous variable and categorized in four groups: <25, 26-30, 31-40 and >40 years. For marital status those single in 1975 were

considered as one group (reference category), those married or in a marriage-like relationship as another group, and those separated or widowed pooled together as a third group. Education was dichotomized as those with at least 12 years of schooling (senior high school or higher) and those with lower education (reference category).

Concerning smoking behavior characteristics, other than amount smoked, age at smoking onset was examined as a continuous variable. To describe use of tobacco products other than cigarettes, pipe and cigar smoking were assessed. Lifetime pipe or cigar smoking was defined as someone reporting having ever smoked at least 50 cigars or 75 cigarillos or more than 3-5 packages of pipe tobacco. Also regular pipe and cigar smokers were identified. Concerning cigarette smoking, the inhalation pattern was dichotomized as yes or no. Smoking unfiltered cigarettes was dichotomized as 'sometimes or always' or never.

Concerning other health related behaviors, alcohol use, leisure time physical activity, as well as coffee and tea drinking were considered. Alcohol use was regarded as 'binge drinking' if the participant reported having six or more drinks on one occasion at least monthly (23). Physical activity was categorized as sedentary, intermediate or active, based on frequency, duration and intensity of leisure physical activity (24). Those reporting low level of exercise in 1975 were regarded as 'sedentary' while those reporting high level of exercise were 'conditioners', others being classified as 'intermediate'. Daily coffee and/or tea drinking were assessed as continuous variables by the number of cups (non-daily or no use = 0).

Mental health characteristics included measures of life satisfaction and stress scores as continuous variables. Life-satisfaction was assessed by a four-item scale (range 4-20) focusing on feeling of loneliness, hardness of life, happiness and anhedonia (25). Stress of daily activities (SDA) was defined by four self-reported items: being tense and nervous, having stress within daily activities, being mentally and physically exhausted at the end of day, and daily activities being extremely trying and stressful (26). The self-ratings were made on a scale from 1 to 4, the total scores ranged from 4 to 16, and higher scores indicated lower stress levels (27).

In addition to the cross-sectional analyses at baseline, it was explored longitudinally whether those baseline characteristics predicted future smoking pattern of the initially

light smokers. Here, the above-mentioned variables were considered, as well as changes in them, such as change of marital status (similar constant classes, change from single/separated to marriage or marriage-like relationship, and vice versa) and educational level (low, higher plus the change from low to higher).

3.4 *Follow-up of smoking pattern*

Subsequent smoking patterns of light smokers were analyzed: whether they increased smoking, quit smoking or continued light smoking. Here, a cohort study approach among those reporting being light smokers in 1975 was used. A new variable, which grouped subjects into increasers, former smokers, and stable light smokers, was used to examine the 1981 and 1990 smoking patterns of the baseline light smokers. ‘Opposite backwards tracking’ was used to analyze the smoking histories of those who reported being light smokers in 1990 or 1981. Here, all the baseline participants were included.

3.5 *Statistical analyses*

All data analyses were performed with Stata version 9.0 (28). The statistical significances of the characteristics for light *versus* heavy smoking were tested by age- and sex-adjusted logistic regressions. Odds ratios (OR) with 95% confidence intervals (CI) for being light smoker (event, coded as 1) *vs.* heavy smoker (non event, coded as 0) were computed. Predictors for being a consistent light smoker *vs.* a baseline light smoker who either increased or quit smoking at follow-up were examined longitudinally. Since observations on twins within twin pairs may be correlated, robust estimators of variance and the cluster option in Stata were used when estimating standard errors (29).

4 Results

4.1 *Characteristics of light smoking*

At baseline, altogether 9,940 current smokers were identified, 9,902 of whom provided sufficient data on amount of daily smoking. The characteristics of light smokers in 1975 (n=772) compared to moderate (n=6,462) and heavy smokers (n=2,668) are shown in Table 1, including the results of the age- and sex-adjusted logistic regressions. Considering light *vs.* heavy smokers, the likelihood of light smoking was elevated among women, those with higher education, those who were physically active, tea drinkers, among those reporting higher age of smoking initiation, and those reporting less stress. The likelihood of light smoking was lower among older smokers, those who were ever married or lived together (compared to never married / single), those using other tobacco products and inhaling tobacco smoke, binge drinkers, those reporting more coffee drinking, and those dissatisfied with life.

Among baseline light smokers, selected characteristics in 1981 were assessed by three categories of 1981 smoking status (continued light smoking, increased smoking, quit smoking). Being physically active and less stressed but more satisfied became more common, while binge drinking became less prevalent, among constant light smokers and quitters. On the contrary, those who increased their smoking by 1981 to heavy use (≥ 20 CPD) did not show such healthy lifestyle at follow-up. Among them, greater proportions reported inhalation, smoking of unfiltered cigarettes and being sedentary than among baseline heavy smokers. They also reported more coffee and alcohol drinking as well as weaker life satisfaction than baseline heavy smokers (not shown in tables).

Predictors of change in smoking pattern among the baseline light smokers are shown in Table 2. Baseline age of 26-30 or over 40 predicted continued light smoking *vs.* quitting. Change in marital status predicted change in smoking: those living alone at baseline but living together with a partner at follow-up had lower likelihood of continuing light smoking *vs.* quitting, but also lower likelihood of continuing light smoking *vs.* increasing smoking. Higher education at baseline predicted continued light smoking *vs.* becoming a heavy smoker. Baseline binge drinkers had a lower likelihood of continued light smoking *vs.* increased smoking.

4.2 Consistency of light smoking

Cohort-based tracking. Future smoking patterns of the baseline light smokers are described in Figure 1 (See Appendix 1). When considering the change of smoking pattern among light smokers, those who continued this pattern in 1981 were more likely (40%) than those who increased smoking (25%) to have quit by 1990. Altogether, half of the baseline light smokers had quit in 6 years, but only an additional 2% reported being former smokers after subsequent 9 years due to relapse among some former smokers. Acquiring a former or moderate / heavy smoker status by 1981 was a constant change for most subjects. Only 5.9% of baseline light smokers reported same consumption level throughout the 15 years, yet 36% were light smokers in two surveys. Of the baseline light smokers, 39% reported being former smokers; 10% light smokers; and 25% moderate or heavy smokers in 1990.

Backwards tracking. The subpopulation of light smokers in 1981 consisted of former smokers having relapsed, smoking initiators, as well as smoking decreaseers, who had previously smoked 5-19 CPD or ≥ 20 CPD. In 1990 the distribution was slightly different, previous moderate and heavy smokers making up smaller while previous quitters bigger proportion of light smokers. The exact consistencies of light smokers in 1981 and 1990 are shown in Figure 2.

Population-based tracking. Within those subjects who replied to all surveys, light smokers formed a rather stable group in its relative size. Among the whole sample, the proportion of current smokers became smaller, while the proportion of former smokers increased in time. Among smokers, the change happened mostly in those smoking 5-19 CPD, whereas the proportions of light and heavy smokers remained about the same (Figure 3).

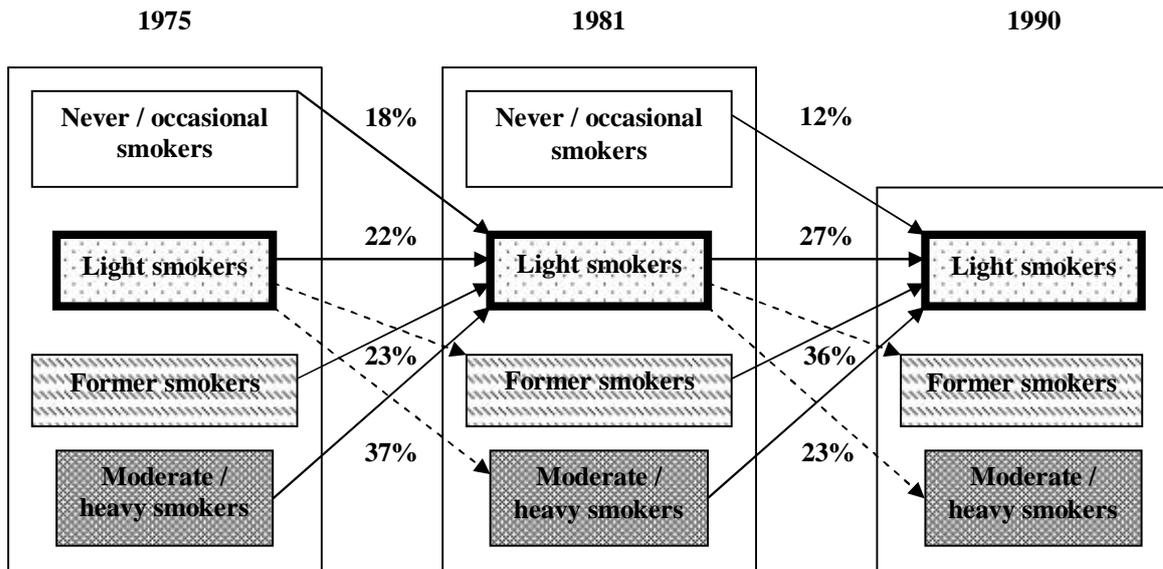


Figure 2. Consistency of light smokers at follow-up surveys.

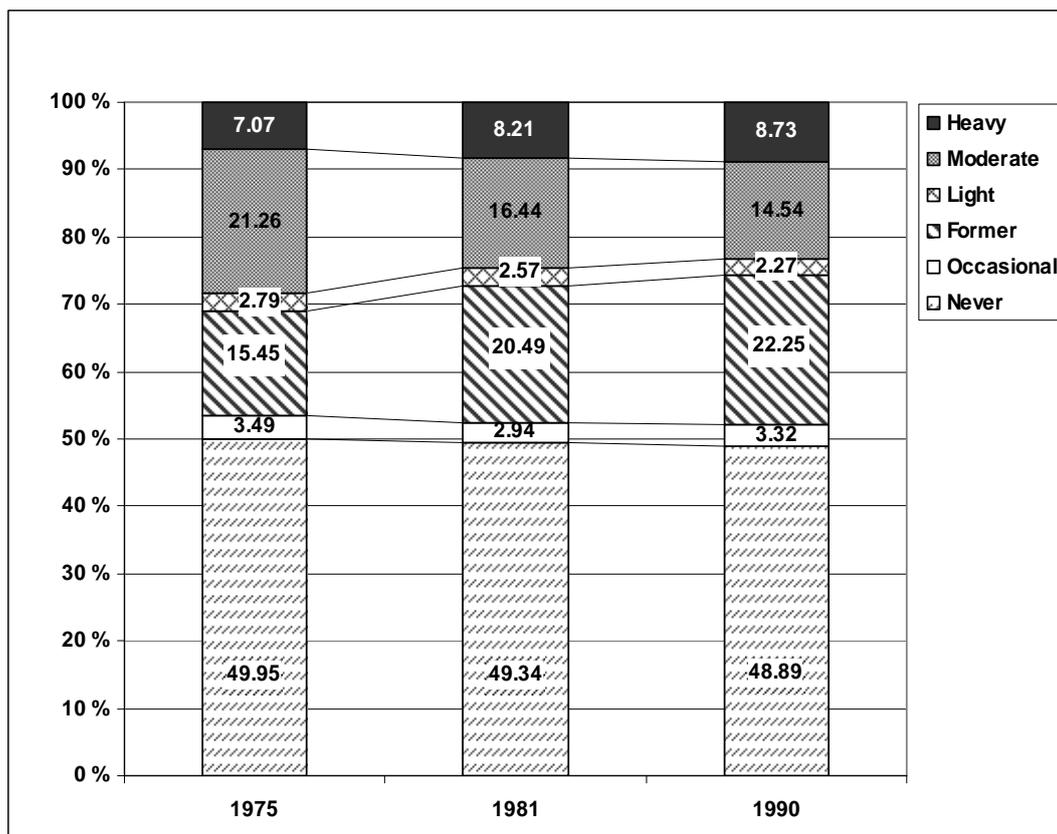


Figure 3. Proportions of smoking categories among the total population in each survey (based on those who participated in all surveys, n=11,037).

5 Discussion

Several characteristics, such as being female, single, young and well-educated, were associated with light *vs.* heavy smoking. A more favorable lifestyle profile seems to characterize light smokers. Inhalation of tobacco smoke was negatively associated with light smoking at baseline, and in 1981 among consistent light smokers but not among increasers. Slow nicotine metabolism is associated with lesser craving and puffing (12,16). Also, light smokers, being better educated, are rarely in poor socioeconomic positions correlating with higher nicotine intake per cigarette (30). However, Shiffman (9) demonstrated that light smokers compensate for the nicotine level needed by inhaling as much as heavy smokers. Here, it should be considered whether light smoking had been consistent or preceded by heavier use.

Concerning mental health profile, heavy smokers were more stressed and dissatisfied than light smokers. Longitudinally, those light smokers who became heavy smokers were less satisfied and more stressed at baseline than others. This is in line with studies demonstrating that heavy smoking associates with perceived stress (31) and is used to self-medicate negative moods (9). Longitudinally, moving in with a partner associated with cessation and constant light smoking, suggesting that it is likely to acquire healthier smoking patterns when starting a relationship. High education predicted consistent light *vs.* increased smoking. Similar changes in marital and socioeconomic status have been earlier shown to associate with smoking cessation (32).

Smokers entering and leaving the category of light smokers form a dynamic process and may rejoin this group after being part of another category in-between. This study demonstrated that among light smokers, the proportions of new smokers, relapsing quitters, constant light smokers and smoking reducers were almost equal. However, heavy smokers were more likely to become moderate or former smokers than light smokers. Nicotine tolerance probably complicates maintaining light smoking after heavy consumption. However, those regular smokers who significantly reduce CPD are more likely to quit in future (10,33). Physicians significantly less often advise light than heavy smokers to quit (4,18), although they may need similar interventions (19). Temporary low-rate smoking is common among relapsed former smokers before a new quit attempt (2) or returning to regular smoking. Light smoking should not be recommended as a harm reduction alternative for quitting. Even smoking 1-5 CPD

increases morbidity and mortality (20), and heavy smokers reducing their CPD probably do not lengthen their life expectancy (34).

This study has several strengths. The long-term follow-up of the Finnish Twin Cohort provided large longitudinal data in the presence of a large number of covariates, letting not only characteristics of light smokers in a certain year but also the consistency and predictive factors of light smoking to be examined. Earlier studies characterizing light smokers have had remarkably shorter follow-up times. According to a study within the same cohort (35), smokers more often than non-smokers dropped out from follow-up. However, similar proportions of the missing subjects reported being smokers in the previous survey than is the share of smokers in the population.

A limitation is that the characteristics that predicted light smoking in 1975 may not be the same as today. Trends in smoking patterns are affected by Finnish tobacco legislation, which originates from 1976. Ever since, smoking prevalence has declined in all socioeconomic groups (36). The increasing proportion of former smokers over the survey (Figure 3) may reflect Finland's tobacco policy, which has developed mainly during the 1970-80s. Although data on use of smokeless tobacco was not collected in this study, its use was rare in Finland during the 1970-1980s (37).

In conclusion, at population level the share of light smokers remained rather stable. However, at individual level light smoking pattern was inconsistent, since substantial proportions of light smokers relatively soon quit or increased smoking. Stable light smokers form a relatively small fraction of daily smokers. The different smoking histories and tendencies to change smoking patterns should be taken into account when considering the health consequences of light smoking.

Acknowledgments

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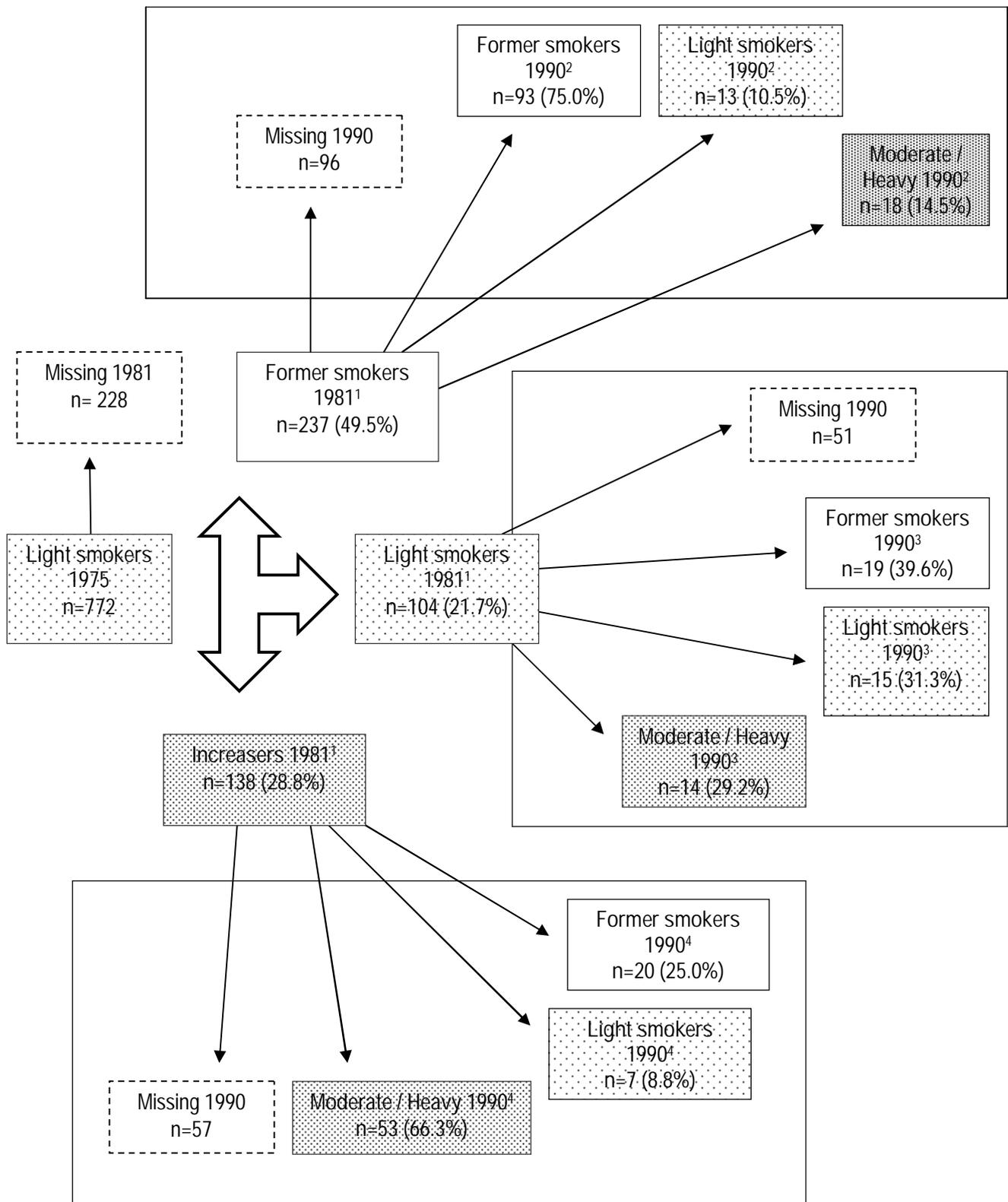
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Appendix 1

Figure 1. Future smoking patterns of baseline light smokers.



Notes:

Misclassifications / illogical reports have not been included in the analysis:

¹ N=65, ² N=17, ³ N=5, ⁴ N=1

In 1981 only those baseline respondents who proved to be twins were included in the survey. In 1990 only those born 1930-1958, with the co-twin resident in Finland, who had answered in one of the previous surveys, were included.

Appendix 2

Table 1. Characteristics of light smokers (<5 CPD) compared to moderate (5-9 and 10-19 CPD) and heavy (≥ 20 CPD) smokers; with Odds Ratios (OR) and 95% Confidence Intervals (CI) for likelihood of being light *versus* heavy smoker

Characteristics in 1975		Light Smokers	Moderate Smokers		Heavy Smokers	Light vs. Heavy Smoking	
		< 5 CPD (n=772)	5-9 CPD (n=1,905)	10-19 CPD (n=4,557)	≥ 20 CPD (n=2,668)	OR (95%CI) ^a	
<i>Socio-demographic characteristics</i>		<i>n</i>					
<i>Age</i>							
	Mean (SD)	9,902	30.0 (11.9)	30.0 (12.8)	30.1(11.7)	34.6 (11.3)	0.98 (0.97, 0.99)***
<i>Age classification (%)</i>							
	18-25	3,882	47.5	49.9	41.8	24.8	1.00 (ref)
	26-30	1,852	18.5	15.3	19.3	20.2	0.59 (0.45, 0.77) ***
	31-40	2,004	17.2	16.0	18.8	26.6	0.46 (0.35, 0.60) ***
	41-	2,164	16.7	18.9	20.1	28.5	0.48 (0.37, 0.62) ***
<i>Sex (%)</i>							
	Men	9,902	36.5	39.8	65.4	84.3	1.00 (ref)
	Women		63.5	60.2	34.6	15.7	8.53 (7.03, 10.35)***
<i>Marital status (%)</i>							
	Single / never married	3,909	46.6	45.3	40.7	31.3	1.00 (ref)
	Living with a partner	5,286	47.0	49.7	52.5	59.6	0.69 (0.56, 0.86) ***
	Separated / widowed	697	6.4	5.0	6.8	9.1	0.39 (0.26, 0.58) ***
	Missing	10					
<i>Education (%)</i>							
	Lower than senior high school	9,043	84.6	90.8	92.2	92.9	1.00 (ref)
	Senior high school or higher	835	15.4	9.2	7.8	7.1	1.78 (1.29, 2.46) ***
	Missing data	24					
<i>Tobacco-related characteristics</i>							
<i>Age of smoking onset</i>							
	Mean (SD)	9,822	20.1	19.3	18.1	17.8	1.16 (1.13, 1.20) ***
<i>Ever smoked pipe or cigars (%)</i>							
	No	6,065	80.8	81.4	61.8	41.1	1.00 (ref)
	Yes	3,803	19.2	18.6	38.2	58.9	0.36 (0.29, 0.45) ***
	Missing data	34					
<i>Ever regularly smoked pipe (%) (among ever pipe/cigar smokers)</i>							
	No	1,786	46.3	49.7	49.3	44.8	1.00 (ref)
	Yes	1,988	53.7	50.3	50.8	55.2	1.03 (0.73, 1.47)

Missing data	29					
Ever regularly smoked cigars (%) (among ever pipe/cigar smokers)						
No	2,972	75.0	80.5	79.2	77.3	1.00 (ref)
Yes	820	25.0	19.6	20.8	22.7	1.05 (0.70, 1.58)
Missing data	11					
Inhalation pattern (%)						
No	682	16.8	9.5	5.5	4.6	1.00 (ref)
Yes	9,203	83.3	90.5	94.5	95.4	0.21 (0.15, 0.29) ***
Missing data	17					
Smoking unfiltered cigarettes (%)						
Sometimes or always	1,038	6.0	7.6	9.5	16.1	0.73 (0.51, 1.03)
Never	8,714	94.0	92.4	90.5	83.9	1.00 (ref)
<i>Other lifestyle characteristics</i>						
Alcohol use (%)						
Binge drinker	4,508	24.3	29.0	47.2	61.6	0.29 (0.24, 0.36) ***
Others	5,343	75.7	71.0	52.8	38.5	1.00 (ref)
Missing data	51					
Physical activity (%)						
Sedentary	1,891	15.8	15.4	18.2	24.7	1.0 (ref)
Intermediate	7,087	76.1	75.8	72.2	68.0	1.88 (1.47, 2.40) ***
Conditioner	859	8.1	8.8	9.6	7.3	2.02 (1.34, 3.04) ***
Missing data	65					
Coffee drinking (cups per day)						
Mean (SD)	9,767	4.5 (2.7)	4.7 (2.7)	5.4 (3.0)	6.5 (3.7)	0.83 (0.80, 0.86) ***
Tea drinking (cups per day)						
Mean (SD)	6,489	0.8 (1.2)	0.7 (1.2)	0.7 (1.2)	0.8 (1.4)	1.13 (1.05, 1.23) ***
<i>Mental health characteristics</i>						
Life satisfaction ^b						
Mean (SD)	9,870	9.0 (3.1)	8.8 (3.0)	9.0 (3.0)	9.5 (3.3)	0.96 (0.93, 0.99) **
Stress of daily activities ^c						
Mean (SD)	9,598	11.7 (3.8)	12.0 (3.7)	11.8 (3.7)	11.1 (3.9)	1.03 (1.00, 1.06) *

^a Logistic regressions: age adjusted for sex; sex adjusted for age; all other characteristics adjusted for sex and age simultaneously

^b Higher score indicating increasing dissatisfaction

^c Higher score indicating lower stress level

*** p<.001; ** p<.01; * p<.05

Appendix 3

Table 2. Characteristics of those baseline light smokers (<5 CPD) who remained light smokers compared to those who became former smokers or increased their smoking (5-9, 10-19 CPD or ≥ 20 CPD); with Odds Ratios (OR) and 95% Confidence Intervals (CI) for likelihood of being light *versus* former smoker and light *versus* increaser

Characteristic in 1975 or Change from 1975 to 1981	Smoking in 1981 among light smokers in 1975					
	<i>n</i>	Former Smokers (<i>n</i> =237)	Constant Light Smokers (<i>n</i> =104)	Increasesers (<i>n</i> =138)	Light <i>versus</i> former OR (95%CI) ^a	Light <i>versus</i> increaser OR (95%CI) ^a
<i>Socio-demographic characteristics</i>						
Age (1975)						
Mean (SD)	479	27.0 (9.3)	30.7 (11.2)	26.8 (9.6)	1.03 (1.00, 1.06) *	1.03 (1.01, 1.06) *
Age classification (%)						
18-25	265	58.2	41.4	60.9	1.00 (ref)	1.00 (ref)
26-30	85	16.9	25.0	13.8	2.53 (1.19, 5.40) *	1.74 (0.69, 4.38)
31-40	77	18.6	12.5	14.5	1.42 (0.44, 4.54)	0.53 (0.12, 2.29)
41-	52	6.3	21.2	10.9	11.8 (1.33, 104.2) *	0.51 (0.04, 6.04)
Sex (%)						
Men	164	30.4	37.5	38.4	1.00 (ref)	1.00 (ref)
Women	315	69.6	62.5	61.6	0.82 (0.50, 1.36)	1.16 (0.67, 2.00)
Change of marital status (%)						
Living with a partner constantly	210	45.9	58.2	35.1	1.00 (ref)	1.00 (ref)
Constantly single	115	17.3	27.6	35.8	1.43 (0.78, 2.62)	0.54 (0.29, 1.01)
Constantly separated / widowed	15	3.0	3.1	3.7	0.60 (0.15, 2.39)	0.44 (0.11, 1.76)
Alone in 1975 -> with a partner in 1981	121	32.9	11.2	25.4	0.34 (0.16, 0.73) **	0.33 (0.14, 0.77) *
With a partner in 1975 -> alone in 1981	2	0.9	0.0	0.0	Not estimated.	Not estimated.
Change of education (%)						
Lower than senior high school in 1975-1981	388	78.1	80.8	86.9	1.00 (ref)	1.00 (ref)
Senior high school or higher	67	17.3	15.4	7.3	1.01 (0.53, 1.92)	2.87 (1.18, 6.97) *
Lower in 1975 but higher in 1981	23	4.6	3.9	5.8	1.02 (0.32, 3.3)	0.90 (0.24, 3.35)
<i>Tobacco-related characteristics</i>						
Age of smoking onset						
Mean (SD)	474	18.9 (4.6)	19.9 (5.9)	18.9 (5.5)	1.00 (0.94, 1.06)	0.99 (0.92, 1.04)

Ever smoked pipe or cigars (1975)						
No	389	81.4	84.6	78.3	1.00 (ref)	1.00 (ref)
Yes	90	18.6	15.4	21.7	0.55 (0.26, 1.17)	0.61 (0.30, 1.28)
Ever regularly smoked pipe (1975)						
No	44	48.8	37.5	56.7	1.00 (ref)	1.00 (ref)
Yes	45	51.2	62.5	43.3	1.51 (0.40, 5.67)	1.44 (0.37, 5.65)
Missing data	1					
Ever regularly smoked cigars (1975)						
No	68	77.3	68.8	76.7	1.00 (ref)	1.00 (ref)
Yes	22	22.7	31.3	23.3	1.57 (0.45, 5.43)	1.09 (0.29, 4.17)
Inhalation pattern						
No	66	13.9	15.5	12.3	1.00 (ref)	1.00 (ref)
Yes	412	86.1	84.5	87.7	1.16 (0.58, 2.31)	1.06 (0.49, 2.32)
Smoking unfiltered cigarettes						
Sometimes or always (%)	21	2.2	5.8	7.4	1.00 (ref)	1.00 (ref)
Never (%)	450	97.8	94.2	92.7	1.48 (0.33, 6.62)	0.52 (0.15, 1.76)
<i>Other lifestyle characteristics</i>						
Alcohol use						
Binge drinker	113	20.8	17.3	33.3	0.79 (0.41, 1.52)	0.42 (0.21, 0.84) *
Others	365	79.2	82.7	66.7	1.00 (ref)	1.00 (ref)
Physical activity 1975						
Sedentary	75	14.8	14.4	18.1	1.00 (ref)	1.00 (ref)
Intermediate	366	78.9	78.9	70.3	1.03 (0.51, 2.07)	1.34 (0.64, 2.81)
Conditioner	38	6.3	6.7	11.6		
Coffee drinking (cups per day)						
Mean of 1975 (SD)	472	4.3 (2.7)	4.4 (2.4)	4.5 (2.6)	0.99 (0.90, 1.08)	0.94 (0.85, 1.05)
<i>Mental profile characteristics</i>						
Life satisfaction ^b						
Mean of 1975 (SD)	479	9.0 (3.3)	8.7 (2.8)	9.0 (2.9)	0.96 (0.89, 1.03)	0.97 (0.88, 1.06)
Stress of daily activities ^c						
Mean of 1975 (SD)	474	12.4 (3.3)	11.4 (4.0)	12.0 (3.8)	0.95 (0.89, 1.01)	0.97 (0.91, 1.04)

^a Logistic regressions: age adjusted for sex; sex adjusted for age; all other characteristics adjusted for sex and age simultaneously

^b Higher score indicating increasing dissatisfaction

^c Higher score indicating lower stress level

*** p<.001; ** p<.01; * p<.05

Appendix 4

Acceptance letter from the Society for Research on Nicotine and Tobacco (SRNT).

Appendix 5

Poster presented in the Annual Conference of the SRNT, September 23rd – 26th 2008.

Appendix 6

Article published in Nicotine and Tobacco Research on July 11th 2009.