ORIGINAL INVESTIGATION

Trajectories of Cigarette Smoking From Adolescence to Adulthood as Predictors of Unemployment Status

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ABSTRACT

Introduction: This longitudinal study examined the association between trajectories of cigarette smoking and unemployment across a 29-year time period from mean age 14 to mean age 43.

Methods: Participants came from a community-based random sample of residents in 2 upstate New York counties. Data were collected at 7 timepoints.

Results: Using growth mixture modeling, 5 trajectory groups of cigarette smokers were identified. The trajectory groups were as follows: heavy/continuous smokers, occasional smokers, late-starting smokers, quitters/decreasers, and nonsmokers. Multivariate logistic regression analysis was used to study the relationship between the participant's trajectory group membership and unemployment in the fifth decade of life. The association was determined with controls for age, gender, current cigarette use, current alcohol use, current marijuana use, physical diseases, occupation, educational level, past unemployment experience, socioeconomic status measures of family of origin, depressive mood, and self-control from adolescence through the early 40s. The findings indicate that patterns of adolescent and young adult cigarette smoking have implications for later unemployment. Overall, the results showed that people who fell into the categories of heavy/continuous smokers (adjusted odds ratio [*AOR*] = 3.84) and occasional smokers (*AOR* = 4.03) were more likely to be unemployed at mean age 43 when compared with nonsmokers. There was no significant difference between the quitters/decreasers and the nonsmokers with respect to unemployment.

Conclusions: Intervention programs designed to deal with unemployment should consider focusing on heavy/continuous and occasional cigarette smokers as risk factors for unemployment.

INTRODUCTION

The economic recession of 2008 had lasting repercussions for the U.S. labor market. Compared with the pre-recession rate of 4.6%, the national unemployment rate in 2012 was 8.1%. According to the U.S. Current Population Survey, approximately 12.5 million Americans were jobless and looking for work in the last year (U.S. Department of Labor, Bureau of Labor Statistics, 2013). Research has shown that these 12.5 million unemployed Americans, compared with the 91.9% employed Americans, are more likely to experience problems with their finances and have diminished physical health (Gallo, Bradley, Siegel, & Kasl, 2000; Kroll & Lampert, 2011; Olesen, Butterworth, Leach, Kelaher, & Pirkis, 2013) and higher rates of mortality (Jin, Shah, & Svoboda, 1995; Kroll & Lampert, 2011; Leino-Arjas, Liira, Mutanen, Malmivaara, & Matikainen, 1999; Martikainen & Valkonen, 1996).

Empirical evidence also suggests that unemployment is often linked with single marital status (Leino-Arjas et al., 1999),

mental disorders (Butterworth, Leach, Pirkis, & Kelaher, 2012; Heponiemi et al., 2007; Leino-Arjas et al., 1999; Olesen et al., 2013), and stress (Leino-Arjas et al., 1999; Metcalfe et al., 2003). In addition, unemployment is linked with behaviors such as substantial alcohol consumption (Metcalfe et al., 2003; Virtanen, Janlert, & Hammarström, 2013a).

Another important correlate of unemployment is cigarette smoking. Cross-sectional research has demonstrated a relationship between cigarette use and unemployment (De Vogli & Santinello, 2005; Lee, Crombie, Smith, & Tunstall-Pedoe, 1991; Schunck & Rogge, 2010). However, because of the nature of cross-sectional studies, conclusions are limited about the time-order of the relationship between these two variables. To address the limitations of cross-sectional studies, several longitudinal studies have been conducted. For example, Virtanen et al. (2013a) followed a cohort of 1,083 people from age 18 to 42 and reported that smoking was a predictor of long-term unemployment between ages 31 and 42. In partial support of this finding, Jusot, Khlat, Rochereau, & Serme (2008) followed

employees aged 30–54 for ten years and found that smoking was a precursor of unemployment in men who smoked heavily, but not in women smokers. Overall, several studies (De Vogli & Santinello, 2005; Hammarström & Janlert, 2003; Lee et al., 1991; Schunck & Rogge, 2010; Virtanen et al., 2013a; Virtanen, Janlert, & Hammarström, 2013b) have reported that smoking and unemployment are related. However, to our knowledge, no study has examined patterns of different trajectories of cigarette smoking from adolescence to adulthood as they relate to unemployment in adulthood. This study addresses this issue and fills an important research gap in the literature.

Several investigations have found that factors such as gender, age, childhood antisocial behavior, limited parental resources, poor self-control in childhood, previous unemployment and occupation, and lower family socioeconomic position may be related to both cigarette smoking and unemployment (Azmat, Güell, & Manning, 2006; Lander, Rasmussen, & Mortensen, 2012; Leino-Arjas et al., 1999; Love & Torrence, 1989; Moffitt et al., 2011; Montgomery, Bartley, Cook, & Wadsworth, 1996). Therefore, these related factors were statistically controlled in this study's analyses of the association of smoking trajectories with adult unemployment.

Operating within a life-span developmental perspective, we followed youngsters in a community sample from early adolescence into adulthood, extending previous studies (e.g., Jusot et al., 2008; Leino-Arjas et al., 1999; Virtanen et al., 2013a) by covering a larger age range. This study is unique in that it considers several different patterns of cigarette smoking, as opposed to only comparing smokers to nonsmokers in relation to unemployment. Furthermore, we examine the extent to which the trajectories of cigarette smoking predict unemployment with control on several significant psychosocial factors.

Previous trajectory analyses (Brook, Balka, Zhang, Pahl, & Brook, 2011) have identified five groups of smokers. One trajectory group is characterized by chronic, heavy cigarette smokers, and another consists of nonsmokers. There are also three intermediate trajectory groups, which consist of occasional smokers, late starters, and quitters/decreasers. We hypothesized that the chronic/heavy smokers, the occasional smokers, and the late starters are more likely to become unemployed than the nonsmokers. Further, the quitters/decreasers might not differ significantly from the nonsmokers with regard to unemployment.

MATERIALS AND METHODS

Participants and Procedure

Data on the participants in this study came from a community-based random sample residing in one of two upstate New York counties (Albany and Saratoga) first assessed in 1983. The participants' mothers were interviewed about the participants in 1975 (T1, $N = 976$) to assess problem behavior among youngsters. The sampled families were generally representative of the population of families in the two upstate New York counties. There was a close match of the participants on family income, maternal education, and family structure with the 1980 census. Interviews of the participants were conducted in 1983 (T2, $N = 756$), 1985–1986 (T3, $N = 739$), 1992 (T4, $N = 750$), 1997 (T5, $N = 749$), 2002 (T6, $N = 673$), 2007 (T7, $N = 607$),

and 2012–2013 (T8, $N = 528$). The mean ages (SDs) of participants at the follow-up interviews were 14.1 (2.8) at T2, 16.3 (2.8) at T3, 22.3 (2.8) at T4, 27.0 (2.8) at T5, 31.9 (2.8) at T6, 36.6 (2.8) at T7, and 43.0 (2.8) at T8, respectively. There were 806 participants for whom we have data at two or more timepoints between T2 and T7. These participants were included in the smoking trajectory analyses.

Extensively trained and supervised lay interviewers administered interviews in private. Written informed consent was obtained from participants and their mothers in 1983, 1985–1986, and 1992, and from participants only in 1997, 2002, 2005–2006, and 2012–2013. The institutional review board of the New York University School of Medicine authorized the use of human subjects in this research study. Earlier waves of the study were approved by the institutional review boards of the Mount Sinai School of Medicine and New York Medical College. Additional information regarding the study methodology is available in prior publications (e.g., Brook, Whiteman, Gordon, & Cohen, 1986).

Measures

Cigarette Smoking

The data were obtained from interviewer-administered questionnaires. At each follow-up wave (T2–T7), questions about tobacco use (adapted from the Monitoring the Future study; Johnston, O'Malley, Bachman, & Schulenberg, 2006) were asked. In order to measure the lifetime quantity and frequency of using tobacco from childhood to the mid-30s, the questions asked about the frequency of using tobacco during the period from the last timepoint through the current time wave. Specifically, the questions used asked about the lifetime frequency and quantity of tobacco use in childhood and early adolescence for T2 (1983; prior to T2), the frequency and quantity of tobacco use during the past two years in adolescence for T3 (1985–1986; T2–T3), the frequency and quantity of tobacco use during the past five years in the early 20s for T4 (1992; T3–T4), the frequency and quantity of tobacco use during the past five years in the late 20s for T5 (1997; T4–T5), the frequency and quantity of tobacco use during the past five years in the late 20s and early 30s for T6 (2002; T5–T6), and the frequency and quantity of tobacco use during the past five years in the mid-30s for T7 (2007; T6–T7). The measure of cigarette smoking at each timepoint had a scale coded as none (0), less than daily (1), 1–5 cigarettes/day (2), about half a pack a day (3), about a pack a day (4), and about 1.5 packs a day or more (5). The mean (SD) tobacco use scores at each point in time were 0.59 (1.10), 0.78 (1.31), 1.37 (1.63), 1.36 (1.62), 1.24 (1.65), and 1.22 (1.73) for T2–T7, respectively. The measure of cigarette smoking has been found to predict young adult psychiatric disorders (Brook, Brook, Zhang, Cohen, & Whiteman, 2002) and health problems (Brook, Brook, Zhang, & Cohen, 2004).

Unemployment Experience in the Past 12 Months

At T8, the participants responded to a question about the number of weeks in the past 12 months during which they were unemployed and looking for work (The options were as follows: 0 = none or never worked for pay [86.26%], 1 = 1–2 weeks [0.76%], 2 = 3–4 weeks [1.72%], 3 = 5–9 weeks [2.29%], 4 = 10–14 weeks [1.72%], 5 = 15–20 weeks [1.15%],

6 = 21–26 weeks [1.53%], 7 = 27–36 weeks [0.38%], and 8 = 37 or more weeks [4.20%]). Participants who answered "5–9 weeks (3)" or longer were characterized as having an unemployment experience and assigned a score of 1. There were 59 (11.2%) participants who had been unemployed in the past 12 months for at least 5 weeks prior to T8.

Control Variables

Control variables were as follows: T8 age, gender, T8 frequency of cigarette smoking in the past year (Johnston et al., 2006), T8 being a professional (e.g., accountant, doctor, architect, and so on), T8 being a skilled worker (e.g., mechanic, carpenter, or police officer), T8 educational level, T8 marijuana use ("During the past 5 years, how often did you use marijuana or hashish?"; Johnston et al., 2006), T8 alcohol use ("How often did you usually drink alcohol in the past 5 years?"; Johnston et al., 2006), T8 number of physical diseases (e.g., diabetes, chronic bronchitis, heart disease), T5–T7 unemployment experience (unemployed for 5 weeks or longer), T2 family income in the past year before tax, T2 highest parental educational level (grade or years of schooling completed), T2–T8 depressive mood (five items; α = 0.75–0.91; e.g., "Over the last few years, how much were you bothered by feeling low in energy or slowed down?"; Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974), and T2–T8 self-control (seven items; α = 0.69–0.78; e.g., "You

generally rely on careful reasoning in making up your mind"; Brook, Brook, Gordon, Whiteman, & Cohen, 1990). (Table 1 presents the coding, the means (*N* or %), and *SD*s for these control variables.)

Analysis

The participants with missing data regarding unemployment at T8 (*N* = 278) were excluded from the analyses of the association between earlier trajectories of cigarette smoking and adult unemployment. Except for a higher percentage of females (54.9% in the sample of 528 participants vs. 37.8% in the sample of 278 participants; $\chi^2(1) = 21.4$, $p < .001$) and having a greater T2 parental educational level (13.7 [*SD* = 2.49] vs. 13.0 [*SD* = 2.56]; $t = 3.6$, $p < .001$), there were no differences between those included in the analysis of adult unemployment (*N* = 528) compared with those who were excluded (*N* = 278) from it with respect to age ($t = -0.47$, $p = .64$), T2 family income ($t = 1.94$, $p = .053$), T2 cigarette smoking ($t = -0.31$, $p = .76$), and T2 psychological symptoms such as depressive mood ($t = -0.13$, $p = .89$) and earlier self-control ($t = 0.24$, $p = .81$).

Mplus software (Muthén & Muthén, 2010) was used to identify the developmental trajectories of cigarette use (*N* = 806). For missing data (primarily due to individuals' nonparticipation in waves of data collection), we applied the

Table 1. Details on Control Variables (N=528)

Variables	Coding	Mean (SD) or %
Age	Years	43.01 (2.78)
Gender	Female (0) – male (1)	45%
T8 cigarette smoking	Not at all (0) – 1.5 packs a day (6)	0.80 (1.55)
T8 being a professional	No (0) – yes (1)	51%
T8 being a skilled worker	No (0) – yes (1)	27%
T8 alcohol use	Never (0) – every day (7)	3.53 (2.08)
T8 marijuana use	Not at all (0) – every day (9)	1.11 (2.22)
T8 educational level	Less than high school diploma (1) – doctoral degree or equivalent (6)	3.27 (1.29)
T8 physical diseases	Number of diseases: 0 – 27	3.25 (2.55)
T5 unemployment 5 weeks or longer	No (0) – yes (1)	9.5%
T6 unemployment 5 weeks or longer	No (0) – yes (1)	8.3%
T7 unemployment 5 weeks or longer	No (0) – yes (1)	5.7%
T2 family income	Under $2,000 (0) – $50,000 or more (12)	8.81 (2.43)
T2 parental educational level	Grade or years of schooling completed: 0 – 20	13.70 (2.49)
T2 depressive mood	Not at all (0) – extremely (4)	1.09 (0.28)
T3 depressive mood	Not at all (0) – extremely (4)	1.05 (0.64)
T4 depressive mood	Not at all (0) – extremely (4)	1.12 (0.70)
T5 depressive mood	Not at all (0) – extremely (4)	1.04 (0.71)
T6 depressive mood	Not at all (0) – extremely (4)	0.88 (0.71)
T7 depressive mood	Not at all (0) – extremely (4)	1.04 (0.77)
T8 depressive mood	Not at all (0) – extremely (4)	0.91 (0.81)
T2 self-control	False (1) – true (4)	2.78 (0.49)
T3 self-control	False (1) – true (4)	2.77 (0.46)
T4 self-control	False (1) – true (4)	2.84 (0.49)
T5 self-control	False (1) – true (4)	2.99 (0.48)
T6 self-control	False (1) – true (4)	3.20 (0.46)
T7 self-control	False (1) – true (4)	3.11 (0.46)
T8 self-control	False (1) – true (4)	3.12 (0.47)

full information maximum likelihood approach (Schafer & Graham, 2002). The dependent variable (smoking at each timepoint) was treated as a censored normal variable. The highest trajectory polynomial was set as cubic. We used the minimum Bayesian Information Criterion (BIC) to determine the number of trajectory groups (G). To assure finding the maximum of the likelihood function, we used 50 random sets of starting values. Each participant was assigned to a trajectory group with the largest Bayesian posterior probability (BPP). The observed trajectory for a group was the average of tobacco use at each timepoint for participants assigned to the group (see Figure 1).

SAS was then used to perform logistic regression analyses to investigate the associations between the trajectory group membership and unemployment status ($N = 528$). The dependent variable was the indicator variable of unemployment status at T8. Because specifying which trajectory group an individual belongs to is subject to error, we used the BPPs of belonging to each trajectory group as the independent variables (see Datta & Satten, 2000). Because one group was chosen as the reference, the number of independent trajectory variables was G-1, where G was the number of trajectory groups. First, bivariate logistic regression analyses of the trajectories of tobacco use and unemployment status at T8 were conducted. Second, multivariate logistic regression analyses were conducted between the BPPs of the smoking trajectories and unemployment status at T8, controlling for T8 age, gender, T8 frequency of cigarette smoking in the past year, T8 professional status, T8 skilled worker status, T8 educational level, T8 marijuana use, T8 alcohol use, T8 physical diseases, T5–T7 unemployment experience, T2 family income, T2 parental educational level, T2–T8 depressive mood, and T2–T8 self-control (see the Supplementary Appendix Table 1 for the Pearson correlation coefficients among the variables).

RESULTS

Trajectories of Cigarette Use

Trajectory solutions were calculated for the three-trajectory group model (likelihood = −5071; BIC = 10,275), the four-trajectory group model (likelihood = −4993; BIC = 10,153), and the five-trajectory group model (likelihood = −4926; BIC = 10,052). The six-trajectory group model did not converge. The five-trajectory group model had the best BIC score and thus was used. Figure 1 presents the observed trajectory and percentage for each of five-trajectory groups. For the trajectory groups, the mean BPP of the participants who were assigned to that group ranged from 84% to 97%.

The trajectory smoking groups were named: heavy/continuous smokers (19.5%), late starters (10.7%), occasional smokers (18.1%), quitters/decreasers (8.2%), and nonsmokers (43.6%). As shown in the figure, the heavy/continuous smokers started smoking in early adolescence and smoked about one pack a day in their late 20s and later. In contrast, the late starters started smoking in late adolescence but achieved the same amount of smoking (i.e., one pack a day) as the heavy/continuous smokers in the late 20s and subsequently. The occasional smokers had an increasing smoking level from adolescence to the early 20s and then stayed at an average level of less than daily smoking during adulthood. The quitters/decreasers started smoking as early as the heavy/continuous smokers and achieved their highest level of smoking (i.e., daily smoking) in late adolescence. The participants then tapered off to nonsmoking.

Smoking Group Memberships as Predictors of Unemployment Experience

Table 2 presents the results of the multivariate logistic regression analyses. Compared with nonsmokers, heavy/continuous
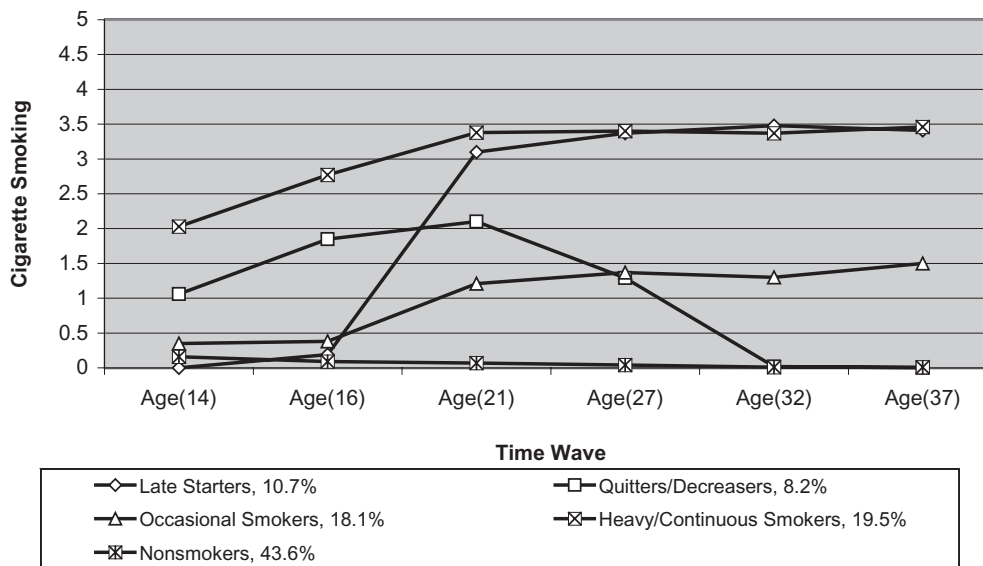

Figure 1. Developmental trajectories of cigarette smoking extending from adolescence to age 37 years ($N = 806$).
Note. Smoking score categories: 5.00 = 1.5 packs a day or more, 4.00 = one pack per day, 3.00 = 1/2 pack per day, 2.00 = 1–5 cigarettes a day, 1.00 = less than daily smoking, and 0.00 = none.

smokers and occasional smokers had a significantly higher likelihood (*AOR* = 3.84 and *AOR* = 4.03, respectively) of having the experience of unemployment at T8, even after controlling for the covariates. There was no significant difference between the quitters/decreasers and the nonsmokers with respect to unemployment at T8 either with or without controlling for the covariates. Moreover, there were no significant differences between the late starters, the heavy/continuous smokers, and the occasional smokers with respect to T8 unemployment with or without controlling for the covariates. Among the control variables, unemployment at T6 (*AOR* = 2.52) and depressive mood at T6 and T8 (*AOR* = 1.86 and *AOR* = 2.55, respectively) were significantly associated with a greater likelihood of experiencing unemployment at T8. Greater self-control at T5 (*AOR* = 0.20) was significantly associated with a lower likelihood of having the experience of unemployment at T8.

DISCUSSION

To our knowledge, this is the first study designed to examine the association between the trajectories of cigarette smoking over time beginning in adolescence and unemployment in adulthood. In support of our hypotheses, the findings indicate that patterns of heavy continuous smoking and occasional smoking are associated with an increased likelihood of subsequent unemployment in adulthood. This association held despite control on a number of independent variables including T8 age, gender, T8 frequency of cigarette smoking in the past year, T8 being a professional, T8 being a skilled worker, T8 educational level, T8 alcohol use, T8 marijuana use, T8 physical diseases, T5–T7 unemployment experience, T2 family income, T2 parental educational level, T2–T8 depressive mood, and T2–T8 self-control. Of interest is the finding that there was no significant difference between the quitters/decreasers and the nonsmokers with respect to unemployment.

Compared with nonsmokers, starting to smoke in late adolescence is associated with an increased likelihood of unemployment in adulthood without controlling for other covariates (see Supplementary Appendix Table 2). However, this association is no longer significant after the addition of the control variables. It is possible that the trajectories of cigarette smoking are related to a configuration of the control variables (e.g., depressive mood, T6 unemployment), which in turn is associated with unemployment.

Overall, our findings are in accord with those of Virtanen et al. (2013a), who found that heavy smokers were more likely to encounter long-term unemployment in midlife compared with nonsmokers after controlling for unemployment earlier in life (Virtanen et al., 2013a). Our findings are partially consistent with those of Jusot et al. (2008), who found that smoking is a predictor of unemployment among men. In contrast to the results of Jusot et al. (2008), our findings indicate that both the trajectories of heavy/continuous and occasional cigarette smoking are associated with unemployment in both men and women. However, our findings are inconsistent with those of Reine, Novo, and Hammarström (2004), who reported that the association between cigarette smoking and unemployment was only significant in "young" people (21-year-olds) but not in older people. The differences between the results of this study

Table 2. Multivariate Logistic Regression: Trajectories of Cigarette Smoking With Nonsmokers as the Reference Group on T8 Unemployment Status (Unemployed in the Past 12 Months for 5 Weeks or More = 1; *N* = 528)

Independent variables	T8 unemployed in the past 12 months for 5 weeks or more (11.2%) *AOR* (95% CI)
Heavy/continuous smokers	3.84 (1.23–10.02)*
Late starters	1.57 (0.43–5.73)
Occasional smokers	4.03 (1.22–13.37)*
Quitters/decreasers	1.51 (0.48–4.76)
Age	0.98 (0.85–1.12)
Gender (male = 1)	1.02 (0.51–2.06)
T8 cigarette smoking	0.95 (0.75–1.19)
T8 being a professional	0.72 (0.29–1.82)
T8 being a skilled worker	1.48 (0.65–3.34)
T8 alcohol use	0.93 (0.79–1.10)
T8 marijuana use	1.13 (0.996–1.28)
T8 educational level	1.09 (0.77–1.54)
T8 physical diseases	1.02 (0.89–1.16)
T5 unemployment	2.12 (0.79–5.68)
T6 unemployment	2.52 (1.01–6.30)*
T7 unemployment	1.98 (0.69–5.69)
T2 family Income	0.91 (0.78–1.05)
T2 parental educational level	1.06 (0.90–1.25)
T2 depressive mood	0.83 (0.48–1.42)
T3 depressive mood	0.68 (0.36–1.26)
T4 depressive mood	1.64 (0.90–2.98)
T5 depressive mood	0.54 (0.29–1.02)
T6 depressive mood	1.86 (1.05–3.30)*
T7 depressive mood	0.93 (0.51–1.70)
T8 depressive mood	2.55 (1.59–4.09)***
T2 self-control	0.98 (0.46–2.07)
T3 self-control	0.66 (0.27–1.59)
T4 self-control	1.69 (0.67–4.27)
T5 self-control	0.20 (0.07–0.54)*
T6 self-control	2.66 (0.995–7.10)
T7 self-control	3.05 (0.90–10.32)
T8 self-control	2.23 (0.79–6.26)

Note. AOR = adjusted odds ratio.
All of the independent variables were included in the equation of the multivariate logistic regression analyses.
*$p < .05$; ***$p < .001$.

and the study by Reine et al. (2004) may be due to the fact that this study examined different trajectories of cigarette smoking, or to the fact that there was an economic recession beginning in 2008.

In this study, we examined factors other than the trajectories of cigarette smoking, which may be related to unemployment. These other factors served as control variables in this study. According to the literature, such factors include age, gender, educational level, occupation, current alcohol use, current marijuana use, physical diseases, prior experience of unemployment, depressive mood, low self-control, low parental educational level, and family income in childhood as well as overall economic conditions (Azmat et al., 2006; Lander et al.,

2012; Leino-Arjas et al., 1999; Love & Torrence, 1989; Moffitt et al., 2011; Montgomery et al., 1996). Of importance is the fact that the associations between the trajectories of heavy/continuous and occasional smoking and unemployment remained significant even after controlling for a wide range of possible confounding factors.

Previous research has suggested that cigarette smokers may experience long-term unemployment (Leino-Arjas et al., 1999; Ryan, Zwerling, & Jones, 1996; Virtanen et al., 2013a, 2013b). In accord with Virtanen et al., 2013a, we found that an earlier experience of unemployment (T6, during the 2000 economic recession) is correlated with later unemployment at T8. One possible explanation is that people who are out of work may suffer from a deteriorating labor market both during the initial period of unemployment and in the long run (Eliason & Storrie, 2006).

Although not studied in this research, several factors may serve to mediate the relation between cigarette smoking and unemployment. One factor that may mediate between the trajectories of cigarette smoking and unemployment is the occurrence of increased absences from work due to smoking. Prior research has demonstrated that smokers are more likely to be absent from work than nonsmokers (Ryan et al., 1996; Weng, Ali, & Leonardi-Bee, 2013). According to the meta-analysis of Weng et al. (2013), current smokers are absent for an average of 2.74 more days per year than nonsmokers. Smoking is also connected to a variety of physical diseases, such as heart disease, cancer, stroke, and respiratory disease (U.S. Department of Health and Human Services, Public Health Service, & Office of the Surgeon General, 2010). It is conceivable that the observed increase in absenteeism in smokers is the result of smoking-related illnesses. This hypothesis is supported by the fact that the U.S. Department of Tobacco Control estimates that employers pay an excess of $5,816 annually for each employee who smokes cigarettes due to increased health care costs and absenteeism (Berman, Crane, Seiber, & Munur, 2013). The World Bank estimates that the use of tobacco results in a global economic loss as a result of health care costs and lost productivity (Weng et al., 2013). Consequently, it may be that smokers are discriminated against in the labor market due to increased medical costs. Taken together, increased absenteeism and the extra cost of employing smokers could possibly be associated with greater unemployment for cigarette smokers.

Financial stress may also serve to intervene between the relationship between patterns of cigarette smoking and unemployment. In a cross-sectional study by Siahpush, Borland, and Scollo (2003), individuals age 15 and over reported that household smoking was a predictor of financial stress. Money spent on cigarettes may contribute to financial stress. Financial stress, in turn, may predict psychological symptoms and ultimately unemployment. Another mechanism that potentially mediates the relationship between cigarette smoking and unemployment is a decline in cognitive functioning. Despite the fact that the evidence is not conclusive, a number of studies (Hill, Nilsson, Nyberg, & Bäckman, 2003; Lessov-Schlaggar et al., 2013; Paul et al., 2006; Richards, Jarvis, Thompson, & Wadsworth, 2003) have reported that cigarette smoking can hinder cognitive functioning (e.g., verbal memory, free recall, and so on), which would inhibit the smoker's ability to perform work-related tasks, potentially leading to unemployment. Of course, there may also be a reciprocal relationship between heavy/continuous smoking, late-starting smoking, occasional

smoking, and unemployment, which may then be correlated with later continuous smoking.

There are a few limitations to this study. First of all, we relied on self-report measures of cigarette smoking. This may lead to underreporting of tobacco use; however, prior research has shown that self-reports of cigarette smoking do yield reliable results (Patrick et al., 1994). Second, this study is limited because the sample was comprised of predominantly White participants. Related to this, about 50% of the participants lived in the Albany/Saratoga areas at T8. Therefore, these findings may not be generalizable to racial/ethnic minority groups or individuals living in other parts of the country. Third, some participants were lost due to attrition or death, as individuals who smoke cigarettes die at a younger age (U.S. Department of Health and Human Services, Public Health Service, & Office of the Surgeon General, 2010). Fourth, it is not possible to infer causality based on the results of this study. The fact that the trajectories of cigarette smoking precede unemployment does not necessarily mean that they cause unemployment. Fifth, it is entirely possible that there is a bi-directional (or more complex) association between smoking trajectories and unemployment. For example, earlier unemployment and the accompanying psychological stresses may predict later cigarette smoking. Sixth, the 2008 economic recession may have had an impact on our findings regarding the relationship of the trajectories of cigarette smoking and unemployment. To deal with this in part, we controlled for time-varying factors of unemployment between T5 and T7. Future research would benefit from examining the relation of trajectories of cigarette smoking and unemployment under macro-economic conditions (e.g., national unemployment).

Despite these limitations, this study has several strengths. First, the participants were followed from the second to the fifth decades of life. The age range of this study spans several developmental stages. Second, the study takes a life-course perspective, which allows us to time-order the associations between the trajectories of cigarette smoking and unemployment, unlike cross-sectional studies. Third, we controlled for a wide array of variables, such as unemployment at T5–T7, cigarette smoking, marijuana use, alcohol use, and physical diseases at T8, and several behavioral and social factors in the participants' lives, such as T2 parental education, T2 family income, T8 occupation, T8 educational level, T2–T8 depression, and T2–T8 self-control.

CONCLUSIONS

In conclusion, our results present evidence that long-term patterns of chronic smoking and occasional smoking may predict unemployment in adulthood. Given the results that these patterns of cigarette smoking are associated with greater unemployment, eliminating cigarette smoking in individuals may lead to better psychological and physical health, and ultimately, less unemployment. Quitters were similar to nonusers with regard to the rate of unemployment. It is conceivable that if smokers quit or significantly reduce their cigarette use, their risk of unemployment may be somewhat diminished. Assuming these findings are replicated, these results highlight the importance of referring those who smoke cigarettes and

are at risk for unemployment to take part in smoking cessation programs in order to reduce the risk of unemployment. Those who have a history of cigarette smoking should be advised that continuing to smoke, even occasionally, may increase their risk of unemployment.

Prevention programs armed with this knowledge will be in a better position to educate youth on the personal risks that may be associated with cigarette smoking during adolescence. By teaching adolescents and young people more than just the health risks associated with smoking, prevention programs may be more effective in deterring adolescents from initiating cigarette use given its association with a high rate of unemployment. Future research should focus on determining the mechanisms that underlie the association between cigarette smoking and unemployment and on determining if our findings are generalizable to ethnic minorities.

SUPPLEMENTARY MATERIAL

Supplementary Appendices can be found online at http://www.ntr.oxfordjournals.org

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DECLARATION OF INTERESTS

None declared.

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