



Smoking Cessation

Predictors of adolescent smoking cessation and smoking reduction

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ABSTRACT

Objective: To investigate the processes of change, demographic, health- and smoking-related predictors of both smoking cessation and smoking reduction in adolescents.

Methods: Data were drawn from a sample of 755 adolescent smokers who participated in a study testing the efficacy of a text messaging-based intervention for smoking cessation. Demographic, health- and smoking-related variables were assessed at baseline. Five processes of smoking cessation, derived from the Transtheoretical Model and the Social Cognitive Theory, as well as outcome measures were assessed at 6-month follow up. Univariate and multivariate regression analyses were conducted to identify baseline and process variables to predict smoking abstinence and smoking reduction.

Results: Male gender (OR = 0.43, $p < .01$), lower alcohol consumption (OR = 0.90, $p = .05$) and a lower number of cigarettes smoked per day at baseline (OR = 0.87, $p < .01$) predicted smoking abstinence. Baseline physical activity predicted smoking reduction (OR = 1.04, $p = .03$). None of the examined process variables significantly predicted smoking abstinence. The process variable “counter-conditioning” predicted smoking reduction (OR = 1.46, $p = .03$).

Conclusions: Baseline predictors of smoking cessation differ from predictors of smoking reduction. Dynamic or modifiable variables play an important role in predicting adolescent smoking cessation.

Practice implications: Counter-conditioning might be an important element in adolescent smoking cessation interventions.

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1. Introduction

Tobacco smoking in young people continues to be a serious problem. A survey of 15- and 16-year-old adolescents covering 36 European countries revealed that the smoking prevalence rate of 28% having used cigarettes during the past 30 days has remained stable over the last 4 years [1]. There is both limited evidence of smoking cessation interventions demonstrating efficacy in young people and little is known about which intervention elements are crucial for successful smoking cessation [2,3]. The 2013 Cochrane Review for smoking cessation interventions for those younger than 20 years [3] identified 28 trials of sufficient quality, of which only 3 found statistically significant evidence of an intervention effect. The authors concluded that there is not yet sufficient evidence to recommend implementation of any one intervention model and

that there continues to be a need for well-designed adequately powered randomized controlled trials.

Compared with adult smokers, adolescent smokers show lower levels of cigarette consumption and are more often occasional than daily smokers [4,5]. Light and intermittent smoking compared to heavy smoking are under more stimulus control and often occur under the influence of alcohol and in social situations [6,7]. Therefore, mechanisms of adolescent smoking cessation might differ from those of adults. The identification of psychosocial and smoking related predictors for adolescent smoking cessation might help to increase our understanding of smoking cessation in adolescents and to develop effective smoking cessation interventions for this relevant target group.

Recent studies which examined psychosocial predictors of smoking cessation in adolescents could not find a direct relation of parental and peer smoking on smoking abstinence, however parental and peer smoking were inversely related to smoking cessation through nicotine dependence [8–10]. Smoking-related variables that relatively consistently predicted adolescent cessation were nicotine dependence, e.g. a smaller number of cigarettes smoked [8,11–13] lower alcohol consumption [13,14] as well as

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smoking cessation self-efficacy [11,12,15]. Motivation for quitting or readiness to quit was found to be a significant predictor of smoking cessation in some studies [11,16], however, a recent study that tested readiness to quit and nicotine dependence within one model revealed that only nicotine dependence remained significant [8].

Although various theoretical models, mainly the Transtheoretical Model [17], the theory of planned behavior [18] and the Social Cognitive Theory [19], were applied for adolescent smoking cessation interventions, only few studies have addressed the relevance of the processes derived from these models. Kleinjan et al. [20] examined the relations between the processes of change derived from the Transtheoretical Model and stage transitions among adolescent smokers. Their results showed that out of the 10 examined processes only “counter-conditioning” was effective in changing adolescent smoking behavior.

The aims of this study were to investigate a comprehensive set of demographic, health- and smoking-related predictors of both smoking cessation and smoking reduction in adolescents. Furthermore, we tested whether the use of various processes of change derived from major theoretical models for adolescent smoking cessation predicted smoking cessation or reduction. The results of this study might increase our understanding of how specific intervention elements and participants’ characteristics may influence adolescent smoking cessation.

2. Methods

2.1. Participants

The data for this study were collected within the randomized controlled trial “Efficacy of a text messaging (SMS)-based smoking cessation intervention for adolescents and young adults” (Trial registration: Current Controlled Trials ISRCTN19739792). The study was approved by the Local Ethics Committee of the Canton of Zurich, Switzerland and the Cantonal Office for Secondary Education in Zurich. The main results of this study as well as the study procedure are reported in detail elsewhere [21].

In Switzerland, vocational schools are typically post-secondary public schools and are analogous to American community colleges. They are part of the dual educational system that combines apprenticeships in a business-context and vocational training in a school-context. Vocational schools provide general education and specific skills for each particular profession.

Directors of vocational schools and contact teachers for addiction prevention from 57 vocational schools in the Swiss cantons of Zurich, Aargau, Basel, Zug and Schwyz were invited to participate with some of their classes in a study testing the efficacy of a text messaging-based smoking cessation program. Of these schools, 24 vocational schools with a total of 177 school classes agreed to participate in the study. All students of the participating vocational school classes were invited by externally trained staff to participate in an anonymous online health survey during a regular school lesson reserved for health education. Participation was on a voluntary basis. The assessments were conducted between October 2011 and May 2012. At the time of the assessment, 2657 students were present in the school classes, of whom 2638 (99.3%) completed the assessment. Afterwards, the students were invited to complete an online screening. The survey included the assessment of demographic data, alcohol consumption, weekly physical activity, tobacco smoking status, number of smoking friends and ownership of a mobile phone. Using these data, daily or occasional smoking students who owned a mobile phone were invited to participate in a study testing the efficacy of a text messaging based smoking cessation intervention. After receiving informed consent online, the following smoking-related variables

were assessed: stage of change, number of cigarettes smoked per day, past quit attempts, and age of smoking onset. From 1012 eligible persons, who met the inclusion criteria for study participation, a total of 755 persons (74.6%) participated in the study. Ninety classes consisting of 372 students were randomly assigned to the intervention group and 88 classes consisting of 383 students were assigned to the control group.

The fully automated intervention program consisted of (1) an online assessment of individual smoking behavior and attitudes toward smoking cessation, (2) a weekly SMS-assessment of smoking-related target behaviors, and (3) two weekly feedback messages tailored to the data of the online and the SMS-assessments. Within the online assessment, participants of the intervention group received online questions assessing outcome expectancies of smoking cessation, situations or circumstances in which craving for cigarettes usually occurs and alternative strategies to handle these craving situations. During the 3-month intervention period, participants received one text message per week to assess smoking-related target behaviors. For all participants, the stage of change combining smoking status and intention to quit according to the Health Action Process Approach (HAPA) [22] was assessed in even weeks. In odd weeks, the number of cigarettes smoked per day or week in smokers in the preintentional stages was assessed. Smokers in the intention or action stage were asked whether they applied individually chosen strategies to cope with craving situations assessed at baseline. The feedback messages were tailored to the HAPA stages and addressed: (1) the risks of smoking, (2) the monetary costs of smoking, (3) the social norms of smoking, (4) outcome expectancies, and (5) motivation to reduce the number of cigarettes smoked (6) social support for smoking cessation, (7) strategies to cope with craving situations, (8) tips for preparing for smoking cessation (9) reward for staying abstinent. On the second level, the feedback messages were tailored according to the individual information provided at the baseline assessment as well as through the weekly SMS assessments.

Control group participants were informed that they were assigned to the control group and could not participate in the SMS-program. Follow-up assessments were completed in 559 (74.0%) of the 755 study participants. The 7-day smoking abstinence rate at follow-up was 12.5% in the intervention group and 9.6% in the control group (ITT: $p = .92$). The mean number of cigarettes smoked per day at follow-up was lower in the intervention group than in the control group (ITT: $p < .01$). No differences between the study groups were observed in stage of change (ITT: $p = .82$) and quit attempts (ITT: $p = .38$).

2.2. Measures

2.2.1. Baseline measures

2.2.1.1. Demographic variables. The screening assessment included the following demographic variables: gender, age, school education and immigration background. Common Swiss levels of educational attainment were assessed: (1) none, (2) secondary school, (3) extended secondary school and (4) technical or high school. We assessed the country of birth of both parents of the students to identify a potential immigrant background. Based on this information, participants were assigned to one of the following categories: (1) neither parent born outside Switzerland, (2) one parent born outside Switzerland or (3) both parents born outside Switzerland.

2.2.1.2. Health-related variables. The following health-related variables were assessed: physical activity and alcohol use. Self-reported moderate to vigorous physical activity (VPA) was

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