



# Cigarette dependence and depressive symptoms as predictors of smoking status at five-year follow-up after a workplace smoking cessation program

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## ARTICLE INFO

### Keywords:

Smoking  
Smoking cessation  
Workplace  
Depression

## ABSTRACT

Workplace smoking cessation interventions increase quit rates compared to no treatment or minimal interventions. However, most studies report data up to one year. This study aims to evaluate long-term effects of a worksite smoking cessation intervention based on cognitive behavioral cessation groups combined with first-line medications, and determine to what extent cigarette dependence (FTCD) and depressive symptoms may influence results at five-year follow-up. Participants were invited to answer a short survey five years after starting the program. A total of 90.4% ( $n = 227$ ) of those who had attended at least one treatment session and were alive, completed the survey. At the five-year follow-up, 29.5% participants reported continuous abstinence. Low scores in the FTCD and low depressive symptoms at baseline predicted continuous abstinence. Three out of four continuous abstainers at twelve months remained abstinent at the five-year follow-up. The study shows that workplace smoking cessation interventions have long-term effects and supports the traditional one-year follow-up period to assess smoking cessation.

## 1. Introduction

In Spain, smoking is the leading cause of death for men and it is rising among women (GBD 2013 Risk Factors Collaborators, 2015), killing 125 men and 40 women daily (Gutiérrez-Abejón et al., 2015). Nonetheless, 27.6% of men and 18.6% of women who are 15 or older smoke daily (Instituto Nacional de Estadística, 2015). On the other hand, quitting smoking at any age reduces smoking-related mortality (Thun et al., 2013).

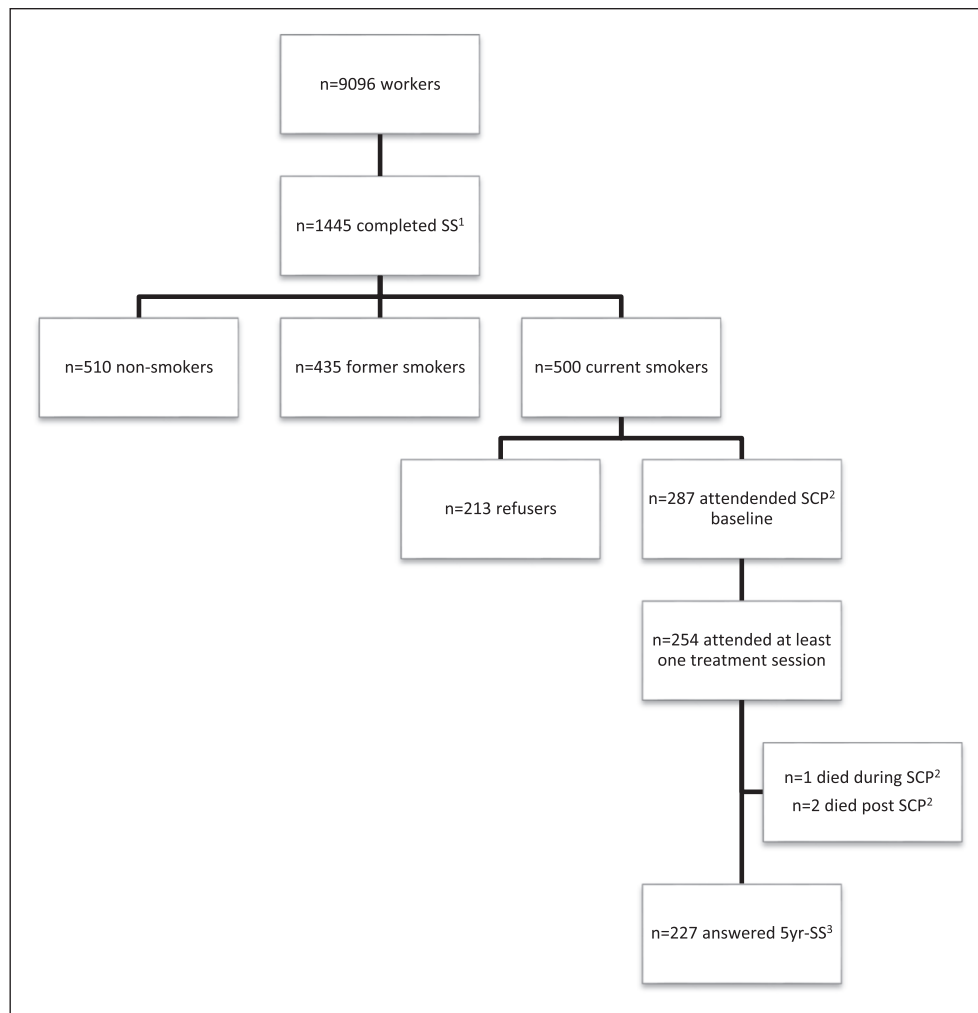
The workplace can be a practical setting to help people to stop smoking. Large groups of smokers can be reached and treated, recruitment can be easy and can provide access to young men, who are otherwise difficult to reach by smoking cessation clinics (Fishwick et al., 2013). It is also in the employers' own interest to reduce smoking among the staff, resulting in gains in productivity and attendance (Parrott, Godfrey, & Raw, 2000).

Several studies have been published on the effectiveness of workplace interventions for smoking cessation (Cahill & Lancaster, 2014). Interventions may be applied at the workplace as a whole or to individual workers. In interventions targeting individual workers, group therapy, individual counseling, pharmacological treatments, and multiple intervention programs (a combination of interventions)

increase cessation rates compared to no treatment or minimal interventions (Cahill & Lancaster, 2014). Although follow-up for 6 or 12 months has been proposed as a common standard (West, Hajek, Stead, & Stapleton, 2005), a meta-analysis that examined relapse rates after this period could not estimate the incidence of relapse accurately due to the small sample sizes of included studies (Hughes, Peters, & Naud, 2008). Actually, only a few studies have tested the effectiveness of workplace interventions beyond one year (Bertera, Oehl, & Telephak, 1990; Hennrikus et al., 2002; Jason, Salina, McMahon, Hedeker, & Stockton, 1997; Sala, Serra, Serrano, Corbella, & Kogevinas, 2005; Salina et al., 1994; Tanaka et al., 2006). In fact, there is a paucity of studies reporting long-term data (i.e., more than three years) on smoking abstinence maintenance after a workplace smoking cessation intervention. To our knowledge, there is only one study using a multiple intervention targeting individual smokers that report data at a five-year follow-up. Olsen et al. (1991) showed that 36% of the participants who had quit at the conclusion of the Smoking Cessation Incentive Program, remained long-term quitters after five years.

The Fagerström Test for Cigarette Dependence (FTCD, previously known as the Fagerström Test for Nicotine Dependence; Fagerström, 2012) is the most common cigarette dependence measure (Heatherton,

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<sup>1</sup> Smoking Survey

<sup>2</sup> Smoking Cessation Program

<sup>3</sup> Five-year Smoking Survey

Fig. 1. Flow chart of participants.

Kozlowski, Frecker, & Fagerstrom, 1991; Meneses-Gaya, Zuardi, Loureiro, Alexandre, & Crippa, 2009). The FTCD has not obtained consistently predictive validity across studies (Piper et al., 2004). For example, Etter (2005) concluded that the FTCD did not predict smoking cessation at one month follow-up in participants who answered an online survey. Piper et al. (2004) showed that the FTCD did not predict cessation eight weeks after the quit date. Fidler, Shahab, and West (2010) found that the FTCD did not predict cessation at six months in a survey of a representative sample of adult smokers. However, Ferguson et al. (2003) showed that the FTCD predicted 6-month tobacco abstinence in smokers treated for cigarette dependence, and Kozlowski, Porterc, Orleansd, Popeb, and Heathertone (1994) concluded that FTCD scores were associated with quitting at the end of week 5 in participants of a group smoking cessation program, and it also predicted abstinence at the 16-month follow-up in participants involved in a self-help program. Breslau and Johnson (2000) showed that smokers with a FTCD score of 4 or higher were less likely to quit in a 3-year follow-up. Fagerström, Russ, Yu, Yunis, and Foulds (2012) also concluded that baseline FTCD scores predicted abstinence outcomes in several endpoints up to 52 weeks in 10 randomized placebo-controlled clinical trials of varenicline. More recently, Ussher, Kakar, Hajek, and West (2016) showed that FTCD scores predicted quitting at 4 weeks, 6 months and 12 months post-quit. In conclusion, most studies with

smoking cessation treatment seekers conclude that the FTCD predicts cessation. However, its predictive validity has been tested in a 3-year period at most (Breslau & Johnson, 2000) and it is unclear to what extent cigarette dependence can predict more long-term results.

Epidemiologic studies have suggested that depressive symptoms are common among smokers (Anda et al., 1990). In addition, depressive symptoms have been associated with poor smoking cessation outcomes at the population level (Anda et al., 1990; McClave et al., 2009). In clinical trials, high levels of baseline depressive symptoms have been associated with reduced odds of cessation (Berlin & Covey, 2006; Cosci, Bertoli, Pistelli, & Carrozzi, 2016; Kinnunen, Doherty, Militello, & Garvey, 1996; Rodríguez-Cano et al., 2016; Thorndike et al., 2008). Surprisingly, to our knowledge, depression has exceptionally been included in workplace interventions research as a dependent variable but not as an independent or moderator variable (Lang et al., 2000). In a previous work, Nieva, Bruguera, Valero, and Casas (2010) showed that depressive symptoms predicted lower abstinence rates at the 3-, 6-, and 12-month follow-up in a multiple workplace intervention (Nieva et al., 2010). As the effect of depressive symptoms at longer follow-up in workplace interventions remains unknown, we conducted a second part of the research by Nieva et al. (2010) in the present study.

This study aims to evaluate long-term maintenance effects of a worksite smoking cessation intervention based on cognitive behavioral

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