Psychological and behavioral correlates of readiness to stop smoking

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This is a pre-print version

To cite this article:

Lucchiari, Claudio PhD; Masiero, Marianna PhD; Pravettoni, Gabriella PhD Psychological and Behavioral Correlates of Readiness to Stop Smoking, Journal of Addictions Nursing: 7/9 2020 - Volume 31 - Issue 3 - p 194-202 doi: 10.1097/JAN.0000000000000349

Link to the article:

https://journals.lww.com/jan/Abstract/2020/07000/Psychological_and_Behavioral_Correlates_of.9.aspx

Abstract

Accruing evidence strongly suggests that the motivation to give up smoking is a crucial predictor of tobacco cessation attempt. However, even motivated people often fail in their attempts and relapse is very common, even if most people who smoke are confident that the desire to quit is enough to change and maintain abstinence. According to this framework, the main objective of the current study was to identify psychological and lifestyle patterns, that might characterize people who smoke cigarettes with different motivations to quit. A secondary aim was to compare the characteristics of people who are currently smoking with people who stopped or never smoked.

A convenient sample of 360 volunteers (179 women, 181 men), with a mean age of 55 years (S.D. = 14.33) participated in this study. Participants completed a battery of psychological and behavioral scales aimed at assessing psychological characteristics, as well as, dependence level and readiness to stop.

Our results strongly suggest that the behavior of people who smoke differs as a function of specific psychological variables. People who currently smoke may fall in two different clusters: in the first one, they have a healthy lifestyle and high self-perceived vitality and vigor, while those who fall in the second report lower psychological wellbeing and unhealthier lifestyle. Unfortunately, the actual lifestyle does not seem to modulate the motivation to quit and consequently people keep on smoking anyway, even though some participants tend to adopt compensative behaviors. However, the adoption of a healthier lifestyle might favor a successful cessation attempt once achieved a ready-to-stop motivation level.

*Keywords***:** tobacco smoking; cessation; motivation; personality; lifestyle; decision-making.

Abstract word count: 260

Psychological and behavioral correlates of readiness to stop smoking

Several studies indicated that the motivation to give up smoking is an important predictor of a smoking cessation attempt (Yong, Borland, Cummings, & Partos, 2018). It also modulates success and abstinence. Unfortunately, even people with high motivation to stop also fail. In fact, the success rate is very low and relapse frequent (Sheffer et al., 2018; Smith & Chapman, 2014). Furthermore, Balmford and Borland (2008) found that most people who smoke believe that their desire to quit would be enough to cease definitively consumption of cigarettes and to maintain an abstinent behavior. However, this is only a cognitive illusion. Indeed, according to research evidence, the initial motivation leading to the attempt to quit is not sufficient to ensure abstinence over time (Hyland et al., 2006; Zhou et al., 2009). Additionally, the motivation level tends to decrease after a failed attempt, in particular, in highly motivated individuals, since initial higher expectations may result in dissatisfaction. Consequently, it is often difficult to sustain abstinence even for previously high-motivated people (Borland et al., 2010). The motivation to quit only appears to play a crucial role in predicting quit attempts (Smits et al., 2016), but not the final outcome. Consequently, other psychological factors other than motivation need to be investigated as shown by a number of studies (Higashibata, Wakai, Okada, Nakagawa & Hamajima, 2016; Masiero, Riva, Oliveri, Fioretti & Pravettoni, 2018; Yong et al., 2018).

Overall, the choice to start smoking is now considered to be embedded in a complex set of individual features, attitudes, beliefs, psychological traits and physical processes (e.g. neuro-adaptation; Dietz et al., 2013); these factors regulate motivation, influencing the "*smoking career*" (initiating, maintaining, and attempts to give up). Normally, cigarette-smoking initiation occurs during the early-adolescence as "experimentation" (Sargent, Gabrielli, Budney, Soneji & Wills, 2017), and it is motivated by different drivers, for example, the desire to be involved in a peer group (Simons-Morton & Farhat, 2010), the need to develop a socially accepted self-image (Hertel & Mermelstein, 2012), or as a strategy to improve one's own social competences. Broadly, the

changeover from occasional and intermittent smoking to regular smoking occurs during the young adulthood (20-30 years old), and this shift increases the risk for lung cancer, respiratory diseases and cardiovascular events (Liao, Huang, Huh, Pentz & Chou, 2013).

Cigarette smoking responds to different needs (Folan et al., 2017), which can be described across a rational *continuum* range from enhancing cognition to relaxation. Cognition-related needs lead to use of cigarettes to contrast boredom, promote concentration or increase cognitive performance. For example, several people who habitually smoke report that smoking a cigarette is often a strategy to deal with problems that occur during their daily working. On the other side, tobacco may be assumed to promote relaxation (e.g. "I consider a high pleasure smoking when I'm reading an interesting book") or to cope with negative emotions (anxiety, depression, fear, and frustration). Consequently, a number of motivations sustains smoking and it easily becomes a stable and pervasive behavioral trait (Bethea, Murtagh & Wallace, 2015). Cigarette smoking turns out to be a sort of individual lifestyle modulator able to broadly shape the mind. Often this leads to the adoption of different unhealthy behaviors in a sort of maladaptive spiral (Nooijen et al., 2017). Actually, cigarette smoking is frequently associated with an unhealthy diet, a poor sleeping quality, sedentary lifestyle and higher alcohol consumption (Cowan, MacLean & Vernarelli, 2017; Poisson et al., 2012; La Vecchia, Negri, Parazzini, Franceschi & Decarli, 1992). For example, it has been highlighted that people who smoke often have a poor diet characterized by a higher intake of fatty foods, dairy products and red meat, and a lower intake of fruits and vegetables (Alkerwi et al., 2017).

Also, people who do not smoke or have stopped smoke generally report a better physical and psychological health status than those who smoke (Haibach, Homish & Giovino, 2013). This datum may be due to a reduction in symptoms generally linked to cigarette smoking (e.g., cough, breath shortness) and/or to the attenuation of the nicotine pharmacological effect on arousal (Piper, Kenford, Fiore & Baker, 2012; Sarna, Bialous, Cooley, Jun & Feskanich, 2008). More generally,

people who do not smoke, who adhere to a healthy diet, and who practice regular physical activity have a reduced risk of all-cause mortality (Prinelli et al., 2015)

The individual lifestyle also effects quitting motivation and the probability of quitting attempt success. It has been observed that a high motivation to quit is frequently associated with the adoption of a healthier lifestyle (nutrition, physical activity, alcohol consumption, and sleep quality) and a specific belief system. In particular, Haibach and colleagues (2012) reported in their study that people who smoke a cigarette and who regularly consume fruits and vegetables have three times the probability of giving up smoking compared to those who had a low intake of these products. Similarly, people who made at least an attempt to give up cigarette smoking are expected to be more interested in having an active lifestyle than others. This may be due to a higher self-efficacy that drives people toward behaviors thought to be healthier (Sheeran et al., 2016). Indeed, people who opted for a healthy lifestyle might develop a higher self-efficacy thanks to successes achieved in improving their lifestyle and this might help during a cessation attempt (Smits et al., 2016).

Another factor associated with smoking cessation attempts and success is psychological wellbeing. People who smoke and experience good emotional wellbeing tend to have a higher level of motivation to quit, and consequently try to quit more frequently compared to people with worse emotional wellbeing (Doran et al., 2006; Ussher, Taylor, & Faulkner, 2012). Overall, those smoke feel they are able to change their smoking behavior seem to be able to adopt a healthier lifestyle also having better emotional wellbeing. However, despite the evidence about the association between motivation to stop smoking and lifestyle, relatively few studies were carried out on the role of the emotional and physical wellbeing, and on the relationship between these factors.

According to this background, the main objective of the current study was to identify the psychological, physical and lifestyle characteristics that define the motivation to stop. Furthermore, we wanted to compare the lifestyle patterns of people who habitually smoke cigarettes with people who stopped and people who have never smoked in their life. Coherently, we defined two main

research hypothesis. First, we supposed that individuals who experience a high level of emotional wellbeing have a higher level of motivation to quit. Secondly, because cigarette smoking is a part of the individual lifestyle, we assumed that people who currently smoke, who stopped smoking and who had never smoked would show different patterns with regard to food consumption, physical activity, and sleeping quality. In addition, we hypothesized a positive association between cigarette smoking and unhealthy behaviours.

Methods

A convenience sample was recruited in collaboration with the Interdisciplinary Research Centre on Decision (IRIDe) of the University of Milan through announcements over the Internet. The study was carried out between May 2014 and January 2015. A researcher to provide full details of the study, evaluate inclusion criteria (see the list of inclusion criteria) and disclose any ethical issues subsequently contacted people who responded. The informed consent was signed during the first meeting. Participants completed the questionnaires in about 30 minutes. The study was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2001 (World Medical Association) and all procedures followed were in accordance with the ethical standards of the local ethical board. Our criteria list was determined by the need to have a homogeneous sample of people having a long story of smoking and with a similar level of dependence (chronic smoking). In this way, our analyses may be more focused and straightforward. Furthermore, we wanted to exclude the presence of people suffering from a severe mental illness, since psychological wellbeing parameters are a core part of the study and mental illness might introduce difficulties in data interpretation.

Inclusion criteria: being 30 or older; not reporting a history of important psychiatric disorders (previous diagnosis of psychosis and Major Depressive Disorders); for those who smoke more than 10 cigarettes per day at the time of study and are not attending a smoking cessation program.; individuals who have stopped must have smoked for at least five consecutive years;

Instruments

We recorded demographic (gender, age, and job), status (currently smoking, formerly smoking, never smoking), personal characteristics (weight, height, educational level) and smoking behavior (starting age, numbers of daily cigarettes) by the use of an *ad-hoc* personal form. Then, we evaluated nicotine dependence as measured by the Fagerström Test for Nicotine Dependence (Heatherton, Kozlowski, & Fagerström, 1991) and motivation level as measured by the Motivation to Stop Questionnaire (Marino, 2000). The Profile of Mood State (POMS) (McNair, Lorr & Droppleman, 1992) was used to assess emotional wellbeing, while physical and mental health was assessed by the Short Form of Health Survey (SF-12; Ware, Kosinski & Keller, 1996). Finally, Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman & Kupfer, 1989) was used to assess the quality of the sleep and a set of *ad-hoc* items were used to evaluate diet (food and beverage consumption) and physical exercise.

Fagerström Test for Nicotine Dependence (FTND). This was used to evaluate the level of nicotine dependence (Heatherton et al., 1991). The FTND is a self-administered questionnaire made up of six items. The scale assesses three dimensions concerning the average daily amount of cigarettes smoked; the nicotine compulsion; the general level of dependence. The FNTD consists of two items on a 4 point Likert scale (0-3) and four dichotomous items (Yes = 1; No = 0). The total score ranges from 0 to 10 (0-2 very low dependence; 3-4 low dependence; 5 medium dependence; 6-7 high dependence; 7-10 very high dependence).

Profile of Mood States (POMS). This is a self-administered and validated questionnaire used to evaluate mood or feeling in the previous week (McNair et al., 1992). The Italian version is composed of 58 items. Individuals are asked to rate, on a 5-point Likert scale, ranging from 0 to 4 (not at all; a little; moderately; quite a bit; extremely), how they feel with respect to different emotional states. The POMS is largely used to evaluate mood state in research as well in psychiatric outpatients, medical patients, and in sports psychology. We transformed row scores in standard t-points using the norms described in Farnè et al. (1991) for the Italian population.

The POMS is divided into six subscales each describing positive or negative feeling: tension-anxiety (9 items addressing tense, shaky, on edge, panicky, relaxed, uneasy, restless, nervous and anxious; t-points range 34-85), anger-hostility (12 items addressing anger, peeved, grouchy, spiteful, annoyed, resentful, bitter, ready to fight, rebellious, deceived, furious and bad tempered , t-points range 40-99), fatigue-inertia (7 items addressing worn out, listless, fatigued, exhausted, sluggish, weary and bushed , t-points range 37-88), depression-dejection (15 items addressing unhappy, sorry for things done, sad, blue, hopeless, unworthy, discouraged, lonely, miserable, gloomy, desperate, helpless, worthless, terrified and guilty, t-points range 41-91), vigor-activity (8 items addressing lively, active, energetic, cheerful, alert, full of pep, carefree and vigorous, t-points range 24-72), confusion-bewilderment (7 items addressing unable to concentrate, muddled, bewildered, efficient, forgetful, and uncertain about things, t-points range 32-92). The timing to complete was 15-20 minutes.

Short Form Health Survey (SF-12). This is a self-administered questionnaire to evaluate psychological and physical health. It is the short version of the 36-item Short-Form Health Survey (SF-36) and it is composed of 12 items. The questionnaire allows one to identify two main indexes: the Mental Component Summary (MCS-12) and the Physical Component Summary (PCS-12), respectively describing the general psychological and physical health status of respondents (Ware et al., 1996). Each index is composed of different dimensions aimed to measure the psychological and physical aspects involved in health assessment.

In particular, the Physical Health (PCS) is composed by the following dimensions: physical functioning (PF); role functioning-physical (RP); bodily pain (BP); general health (GH). Instead, the Mental Component Summary (MCS) is composed by the following dimensions: vitality (V); social functioning (SF); role functioning-emotional (RE); mental health (MH). Both MCS-12 and PCS-12 require combining the 12 items in such a way that they compare to a population-based norm with a mean score of 50.0 and a standard deviation of 10.0. They range from 0 to 100, where a zero score indicates the lowest level of health and 100 indicates the highest level of health.

Motivation to Stop Smoking questionnaire. This questionnaire has been developed and validated by Marino (2000). It is composed of four multiple-choice questions; each is assigned a score ranging from 1 to 4. The total score allows responders to be classified into one of four motivational levels: 4-6 low (not yet seriously considered to stop smoking); 7-10 medium (the person evaluated both the benefits of stopping and the risks of smoking); 11-14 high (there are moments in which the person is determined to stop smoking); 15-16 very high (the person is ready to stop smoking).

Personal, Health and Lifestyles Assessment Items. Lifestyle was evaluated by assessing food and beverage consumption, sleep quality and physical activity. For food and beverage consumption, we assembled items taken from previous research, following the Food Frequency Questionnaire (FFQ) style (Cade, Burley, Warm, Thompson & Margetts, 2004; Cade, Thompson, Burley & Warm, 2003; Hu et al., 1999). In particular, three items assessed daily caffeine and alcohol intake. Similarly, the frequency of consumption of the following foods was requested: fruit and vegetables, dairy products, sugary food, meat, and fish. The form of this questionnaire was the same as in the FFQ, where responders were asked to report how often they have drunk or eaten a specific nutrient on a daily and/or weekly base during the past year.

- Sleep quality was evaluated by the use of the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989). This scale is composed of 4 open answer items (people who respond have to indicate for example when they usually go to bed and how many hours they stay in bed) and 5 items based on a 4-point Likert scale (not during the past month (0), Less than once a week (1), Once or twice a week (2); Three or more times a week (3)). The total score is the sum of seven components and ranges from 0-21; scores higher than 5 indicate poor sleep quality.

Finally, physical activity was assessed by one *ad-hoc* item that evaluates the time spent doing moderate physical activity in a normal week (1 hour or less, more than 1 hour and less than 3, more than 3 hours and less than 6; 6 hours or more). The items were provided with a list of examples of what is meant by moderate physical activity.

Participants

A convenient sample of 360 people (179 women, 181 men), with a mean age of 55 years (S.D. = 14.33) participated in the study. People who participated were divided into currently smoking people (37.10%), formerly smoking people (42.20%) and nonsmoking people (20.70%). People who smoke reported to consume a mean of 21.82 (S.D.= 12.03) cigarettes per day (range from 11 to 80). Mean starting age was 21.72 (S.D. = 8.29).

Statistical analysis

Descriptive statistics were used to describe sample characteristics. The multivariate linear regression model, one-way ANOVA, and t-test were used to compare groups, while K-means Cluster Analysis was performed in order to find variables patterns. Data analysis was carried out using the Statistical Package for Social Sciences - SPSS software version 21.

Results

Most of the individuals who smoke had a medium to very high nicotine dependence level as measured by the FTND, while their motivation to stop was generally ranging between medium to high. Indeed, only a low percentage of people scored as "ready to stop" (see table 1) by the Motivation to Stop Scale.

Table 1 here Dependence level of currently smoking participants as measured by the Fagerstrom scale and Readiness-to-stop as measured by the Motivational scale

We performed a series of one-way ANOVA in order to find differences in behavioral variables (food and beverage consumption, physical activity) with regard to smoking status (currently smoking, formerly smoking, nonsmoking) of people who participated in the study. In particular, significant differences were found for vegetable and fruit consumption ($F(2, 342) = 29.842$, $p < .001$), caffeine consumption ($F(2, 342) = 6.433$, $p < .001$), red meat ($F(2, 342) = 3.976$, $p = .020$) and fish ($F(2, 342) = 3.708$, $p = .026$). Also, physical activity was statically different

between groups (F (2, 342) = 4.487, p =. 033). Fisher's Least Significant Difference (LSD) post-hoc analysis revealed that people who are currently smoking consumed more fruit and vegetables than those who never smoked (p = .014), while people in the nonsmoking group eat more fruit and vegetables than who stopped smoking (p < .001). People who smoke consume more caffeine than who those do not smoke (p =.001), and people in the formerly smoking group consume more caffeine than people who do not smoke (p = .002). With regard to habitual intake of meat and fish intake, people who stopped smoking eat more red meat than people who do not smoke (p = .005), while people who stopped eating more fish than people who are currently smoking (p =. 008) and do not smoke (p = .038). No statistical differences were found with regard to alcohol consumption, sleep quality and physical activity (see table 2).

Table 2 here Food and beverage consumptions. The table shows eating and drinking daily consumption for currently smoking, formerly smoking and never smoking groups.

Considering psychological wellbeing, the only significant difference was found for the vigor-vitality scale of the POMS (F (2, 342) = 6.216, p =.011). In particular, the least significance difference (LSD) post-hoc test showed that the nonsmoking and formerly smoking people report more self-perceived vigor-vitality than who current smoke (respectively p = .037 and p = .032).

Finally, a significant difference was found with regard to physical wellbeing as measured by the PCS-12 score of the FS-12 questionnaire (F (2, 342) = 5.324, p = .041). In particular, people in the currently smoking group reported less physical wellbeing than those who had stopped smoking (p = .046) and never smoked (p = .025).

Cluster analysis

Since heterogeneous data about lifestyle (diet, physical activity, mood, and health) were found in the three groups considered in the previous analysis, we wanted to test if some of these features might distinguish specific patterns of people who smoke, in order to establish some

classification useful to understand the relationship between a certain lifestyle and other variables, such as wellbeing and readiness to stop. Hence, we decided to perform a Cluster Analysis for k means in order to classify people in the currently smoking group in homogenous clusters. We obtained two clusters of people characterized by specific behavioral, emotional and physical parameters (see table 3). Cluster 1 (55% of the sample) characterized by a higher level in MCS-12 and in POMS vigor-activity sub-scales, and a lower level of tension-anxiety, anger-hostility, fatigue-inertia, and confusion-bewilderment. Cluster 2 (45% of the sample) characterized by a lower level in MCS-12 and in vigor-activity, and with a higher level of tension-anxiety, anger-hostility, fatigue-inertia, and confusion-bewilderment. No significant differences were present between the two clusters about PCS-12 level. The people falling into the two clusters were not statistically different with respect to gender, age, motivational score, and dependence level.

Table 3 here Cluster composition (POMS subscales)

Succesively, we performed a series of independent t-tests in order to evaluate behavioral differences in Cluster 1 and Cluster 2, taking into consideration diet (food and beverage consumption), sleep quality, and physical activity. People falling in Cluster 1 (called "unstressed") consume more vegetables and fruit ($t(133) = 2.115$, $p = .037$), more red meat ($t(133) = 1.995$, $p = .042$), more fish ($t(133) = 2.315$, $p = .029$) than people falling in Cluster 2 (called "distressed one"). They also reported better sleep quality ($t(133) = 2.985$, $p = .004$) and practice more weekly physical activity ($t(133) = 2.211$, $p = .031$).

Notably, people falling into the two clusters though being very different with regard to behavior and psychological wellbeing were not significantly different for nicotine dependence and motivation to stop level.

A series of ANOVA one-way were run in order to assess the difference in lifestyles between people falling in Cluster 1 (the "Unstressed") and people falling in Cluster 2 (the "Distressed").

A four-level status variable (cluster 1, cluster 2, having stopped smoking, and never smoked) was used as an independent variable, while lifestyle parameters as dependent variables (fruit and vegetable consumption; red meat consumption; alcohol consumption, sleep quality, and physical exercise)

Statistical differences were found for fruit and vegetable consumption ($F(3, 336) = 5.461$, $p = .001$), red meat consumption ($F(3,336) = 3.345$, $p = .015$), physical activity ($F(3,336) = 2.783$, $p = .044$) and sleep quality ($F(3,336) = 6.596$, $p < .000$). In particular, LSD post-hoc analysis revealed that people who never smoked eat less red meat than other groups. People falling into cluster 2 have the worst sleep quality, while those who fall in cluster 1 show a sleep quality similar to those who stopped smoking and never smoked. Individuals in cluster 1 consume the highest quantity of fruit and vegetables, even more than those who never smoked and who stopped smoking, while individuals in cluster 2 consume a significantly lower amount. Individuals in cluster 2 report do less physical activity, while people in the other groups show similar values.

Readiness to give up smoking analysis

Finally, we were interested in the relationship between psychological variables, lifestyle and the readiness to give up smoking. In order to analyze this link, we performed a multivariate linear regression analysis entering only participants who are currently smoking. The model included, as a dependent variable, motivation to stop level measured by the related questionnaire (ranging from 4 to 19), and as independent variables: dependence level; PCS-12; MCS-12; tension-anxiety; anger-hostility; fatigue-inertia; depression-dejection; vigor-activity; confusion-bewilderment; alcohol consumption; caffeine consumption; physical activity; sleeping quality. Each independent variable was put in the model simultaneously.

No statistical associations between motivational to stop level, SF-12 subscales (PCS-12, MCS-12), most POMS dimensions (tension-anxiety, anger-hostility, confusion-bewilderment) and behavioral variables (nutrition, alcohol and caffeine consumption, physical activity and sleeping quality) considered in the regression model.

Only vigor-activity was found to be a significant predictor of the motivation to stop level (Beta = .446, p = .023; see figure 1).

Figure 1 here Scatter plot of Readiness-to-stop as a function of Vigor-activity subscale of POMS score.

Discussion

Our data suggest that people who smoke show different lifestyle patterns so that it is not possible to define a prevailing lifestyle. Analyzing the behavior of people who participated, we found some differences, but not all were as we expected. For instance, people who smoke tend to consume more fruit and vegetables compared to people who never smoked. At the same time, they also consume more coffee and they have worse physical health as measured by SF-12. In contrast, we did not find any significant differences with respect to alcohol consumption and physical activity between groups. Hence, we cannot deduce that people who smoke have a maladaptive lifestyle, worse than people who never smoked.

However, if we classify people who smoke by psychological variables, we may find two smoking clusters with very different characteristics. In particular, people who smoke with a moderate level of psychological distress show significant lower consumption of fruit and vegetables, also reporting a poorer sleep quality. On the other hand, people who smoke with a higher level of self-perceived psychological wellbeing (as measure by POMS and SF-12) tend to consume much fruit and vegetables. Comparing people who smoke and fall into cluster 1 (Unstressed) or cluster 2 (Distressed) , with people who never smoked and have stopped, we found that people in the distressed cluster actually show a lower consumption of fruit and vegetables, practice less physical activity and have a poorer sleep quality, coherently with other studies (Doran et al., 2006; Liao et al., 2013; Poisson et al., 2012). On the contrary, people falling into the healthier unstressed cluster (who feel strong and healthy) show a higher level of fruit and vegetable

consumption and, generally, have a healthier lifestyle. It is likely that people who feel “vigorous” enact some kind of compensative behavior so to face with the cognitive dissonance created by the fact that smoking is continued also knowing the negative effect that it might have on health (Clark, McCann, Rowe & Lazenbatt, 2004). Furthermore, the statistical trend observed by the linear regression model is interesting since it suggests that the evaluation of only one psychological dimension (self-perceived vigor-activity) might be used to predict motivation to stop, a dimension not always easy to measure in many contexts.

The possibility to generalize our data is surely limited by methodological issues. In particular, a larger and more balanced sample would be needed in order to provide evidence in support of our hypotheses. Further, in evaluating lifestyle we used easy-to-use and brief instruments made of few items that do are not as reliable as longer standardized instruments, in particular when studying individual diets. Finally, it is well-known that FFQ-like instruments should be coupled with another instrument (e.g., the 24-hour recalls) in order to get a clear picture of the individual diet. This is true also for the evaluation of the physical activity.

Conclusion

Our data strongly suggest that the behaviors of people who habitually smoke are modulated by different psychological and physical variables (Knäuper, Rabiau, Cohen & Patriciu, 2004; Radtke, Scholz, Keller & Hornung, 2012). However, we cannot state that cigarette smoking is especially associated with a specific behavioral pattern. Indeed, we found that some people who smoke have a healthy lifestyle while others have a poor diet and a sedentary life. These two groups are characterized by significant differences in psychological wellbeing. Unfortunately, the actual lifestyle doesn't seem to modulate the motivation to stop and consequently both healthy and unhealthy people keep on smoking, even though healthy people tend to adopt compensatory behaviors. A similar effect was found in a sample of people from a Nursing Science course. Individuals who kept on smoking during their studies showed a less favorable attitude toward the promotion of anti-smoking programs (Clark et al., 2004). This trend is confirmed by a recent meta-analysis, on nurses smoking habits, conducted by Duaso and colleagues (2017). The authors affirmed that nurses who smoke are less inclined to support patients to quit smoking (Duaso, Bakhshi, Mujika, Purssell & While, 2017). Similar results are observed for a physician who smokes compared to those who never smoked. Specifically, physicians who smoke provided fewer suggestions and advice to aid quitting compared to physicians who have never smoked (Duaso, Mcdermott, Mujika, Purssell & While, 2014), maybe as the result of cognitive dissonance (Clark et al., 2004; Duaso et al., 2017, 2014). We argue that this dissonance pushes for a change in attitudes and, as in our case, in actual behaviors. In this cognitive path, people who smoke often develop beliefs and cognitive biases that may sustain smoking behavior even beyond the actual behavior (Gorini, Masiero & Pravettoni, 2016; Masiero, Riva, Fioretti & Pravettoni, 2016; Masiero et al., 2018; McCusker, 2001).

Furthermore, smoking often serves as self-medication to relieve depression and anxiety (Lerman et al., 1998; Fluharty, Taylor, Grabski, & Munafò, 2016). In particular, people may feel that smoking is useful to cope with stressful situations, e.g. in the workplace (Perdikaris, Kletsiou,

Gymnopoulou, & Matziou, 2010). For example, different studies showed that nurses tend to relapse when facing distress in their work (e.g, Rezk-Hanna et al., 2018).In this case, smoking is an adaptive behavior and to stop might lead to distress. Furthermore, it's easy to claim that people who smoke and suffer from depression have a lower motivation to change their status quo, since important behavioral changes, e.g. stop smoking, are obviously emotionally demanding (Kropff et al., 2016). On the contrary, previous studies (Hyland et al., 2006; Liao et al., 2013) showed that the adoption of a healthy lifestyle might favor motivation to stop and the probability of stay abstinent. In particular, since our data suggest a correlation between a healthier lifestyle and the self-perceived sense of psychological health and vigor, we may argue that this feeling may be linked with a high self-efficacy, since people who feel vigorous may also experience the energy to achieve goals and change habits if they wish (Ryan & Frederick, 1997; Schlegel, Hicks, King, & Arndt, 2011).

Starting from these considerations, we have some suggestions for improving the efficacy of smoking cessation programs. In particular, it's clear that not all people who smoke have the same psychological and behavioral characteristics and, consequently, smoking cessation programs should take into consideration these differences. In particular, in our opinion, it's unlikely that promoting a healthier diet or a more active lifestyle may directly increase the success rate of anti-smoking programs (Heikkinen, Patja & Jallinoja 2010). On the other hand, this strategy might generate an adverse reaction for some, since they would need a more targeted approach to treat distress and emotional problems. Finally, in other cases improving the lifestyle of people who smoke might result in the strengthening of the smoking behavior, since some people could develop a biased feeling of control and a lowered motivation to stop (McCusker, 2001; Geller, Lippke, & Nigg, 2017).

Prospective studies are needed to confirm our results and to test the relationship between individual characteristics we found positively associated with a high motivation to stop and success rate of tobacco smoking cessation. However, our data suggest pivotal practical implication in a clinical context, where health personnel may be called to promote smoking cessation. First,

acquiring data about the lifestyle of people who smoke may help to understand the cognitive architecture that sustains smoking. This way it is possible to adapt the communication used so not to collude with cognitive biases and behavioral compensations enacted by the person who smokes. At the same time, collecting data about psychological wellbeing may direct health personnel towards more supportive communication, starting with the consideration that smoking is somehow useful to a person. Health professionals could use these data to try to develop an effective relationship with the patient, instead of just transmitting information and/or suggesting changes (Heikkinen et al., 2010). Furthermore, in order to break the barriers that limit the ability of nurses to provide smoking cessation interventions to patients, it would be important to address nurses' health behaviours and promote changes within nurse education (Wills & Kelly, 2017).

Furthermore, future research should approach the problem of characterizing individual psychological and physical patterns to carry on tailored smoking cessation interventions aimed at maximizing the probability of success.

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