

Tobacco smoking, related harm and motivation to quit smoking in people with schizophrenia spectrum disorders

Pasquale Caponnetto,^{1,2} Riccardo Polosa,¹ Deborah Robson,³ Linda Bauld^{4,5}

¹University of Catania, Italy; ²University of Stirling, UK; ³King's College London, UK; ⁴Usher Institute, College of Medicine and Veterinary Medicine, University of Edinburgh, Edinburgh, UK; ⁵UK Centre for Tobacco & Alcohol Studies, Nottingham, UK

Abstract

This narrative review focuses on the topic of tobacco smoking amongst people with schizophrenia spectrum disorders. We searched PubMed, PsycInfo and Scopus databases for schizophrenia spectrum disorders and smoking and included articles about the epidemiology of tobacco smoking in people with schizophrenia spectrum disorders, examining the relationship between smoking and mental health. This narrative review describes that a higher prevalence, frequency and impact of both high nicotine dependence and its harmful effects in patients with schizophrenia spectrum disorders compared with those in the general population. Despite several existent theories, the reasons for high smoking rates, the high dependence on nicotine and severity of nicotine withdrawal symptoms are not fully understood. The main aim of this paper is to inform mental health personnel and particularly clinical and health psychologists about the impact and role of tobacco smoking for smokers with schizophrenia spectrum disorders.

Correspondence: Pasquale Caponnetto, Department of Clinical and Experimental Biomedicine, University of Catania, Italy.
E-mail: pcapon@unict.it

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Prevalence of smoking

Around 60-90% of people with schizophrenia are estimated to smoke, compared with 15-24% of the adult general population (Keltner & Grant, 2006; Ziedonis *et al.*, 2008; Diaz *et al.*, 2009; Kotov *et al.*, 2010; Dickerson *et al.*, 2013; Smith *et al.*, 2014, Davies 2014). The difference of 30 percentage points from 60% to 90% is large and may reflect the geographic location of the study or a different classification system used for schizophrenia spectrum disorders diagnosis, for example DSM classification used by the American Psychiatric Association (APA) or International Classification of Diseases (ICD) classification used by the WHO. Alternatively, the wide range in prevalence may be due to methodological differences between studies. As in the general population, in the study of de Leon & Diaz (2005), more males than females with schizophrenia were smokers (76% of males vs 50% of females).

Hughes *et al.* (1986) reported that people with chronic mental illness had substantially higher smoking rates than control samples across age, sex, marital, socioeconomic, and alcohol use subgroups, and the smoking rate was particularly high (88%) in patients with schizophrenia.

The association between smoking and mental health conditions becomes stronger relative to the severity of the mental health condition, with the highest levels of 70% smoking found in psychiatric in-patients (RCP, 2013; Jochelson *et al.*, 2007).

DSM-V (APA, 2013) describes 157 specific diagnoses. It is therefore important not to view 'mental health conditions' as one group, just as one would not consider 'physical health' as one condition. It is true that there is a high level of smoking prevalence amongst individuals with mental health conditions but it varies according to the actual mental health conditions, e.g. schizophrenia, anxiety disorders, major depression, bipolar disorder (Caponnetto, 2014). Rates of cigarette smoking amongst adults in the United States and United Kingdom are two to four times higher in people with current mood, anxiety, and psychotic disorders than in those without mental illness (Lasser *et al.*, 2000; RCP, 2013). Between 2004 and 2011, after controlling for risk factors such as income, education, and employment, current smoking rates dropped from 19.2% to 16.5% in US residents without mental illness but not in those with mental illness (Cook *et al.*, 2014).

Smoking behaviour

A study with more than 9000 people with severe psychotic disorders found that these people had a higher risk of having ever smoked 100 cigarettes (odds ratio (OR) 4.61, 95% confidence interval (CI) 4.3 to 4.9) relative to the general population after



controlling for sex, race, age, and geographical region (Hartz *et al.*, 2014).

A meta-analysis of five studies across four countries established that tobacco smoking was associated with a schizophrenia diagnosis (OR = 5.9), heavier smoking (ORs ranged 1.9–6.4), higher nicotine dependence and lower cessation rates compared with general population controls (de Leon & Diaz, 2005). Even patients with first-episode psychosis are much more likely to smoke than age-matched controls, as confirmed in a meta-analysis (OR = 6.04) (Myles *et al.*, 2012).

In 2013, Zhang *et al.* enrolled 244 drug-naive smokers with schizophrenia and 256 healthy controls matched for gender, age and education, completed the Fagerström Test for Nicotine Dependence and showed that smokers with schizophrenia spectrum disorders are heavier smokers than those without a mental health condition (Zhang *et al.*, 2013). However, it is important to outline that the study conducted by Zhang *et al.*, (2013) included exclusively never-medicated participants presenting with first episode of schizophrenia.

In 2005, Tidey *et al.* enrolled 20 smokers with schizophrenia spectrum disorder and 20 smokers without psychiatric disorders and measured their smoking topography. The participants were matched on age, gender, daily cigarette rate, years of regular smoking and nicotine dependence. Tidey *et al.* (2005) reported that smokers with schizophrenia spectrum disorders take more frequent puffs and inhale more carbon monoxide (CO) per traditional cigarette and are highly dependent on nicotine compared with people in the general population. A study by Williams *et al.* (2010a) with 21 participants (11 with schizophrenia spectrum disorders and 10 without) who smoked 20-30 traditional cigarettes per day (CPD) found that smokers with schizophrenia spectrum disorders also extract more nicotine from their cigarettes compared with controls without schizophrenia spectrum disorders and have higher levels of nicotine in their blood after smoking one cigarette (Williams *et al.*, 2010a). However, these two studies were limited by small sample sizes. A further study by Williams *et al.* (2011), using a larger sample, measured serum nicotine levels and ad libitum smoking behaviour for 24 + two hours using a topography device in 75 smokers with schizophrenia compared with 86 control smokers without mental illness. They reported that smokers with schizophrenia differed from smokers without schizophrenia in that they took more frequent puffs per traditional cigarettes smoked, which was associated with greater nicotine intake, and waited less time between puffs.

Effect of smoking on the mortality and physical health of people with schizophrenia spectrum disorders

As a result of high smoking rates, people with a mental health condition also have high mortality rates compared with the general population. Therefore, quitting smoking is particularly important for this group since smoking is the single largest contributor to their reduced life expectancy (Campion *et al.*, 2014). The deleterious effects of smoking seem particularly pronounced and burdensome amongst people with schizophrenia (Brown *et al.*, 2000; Kelly *et al.*, 2011). Smokers with schizophrenia die early from diseases associated with smoking (15–20 years earlier than the general population) and this is often due to preventable smoking-related health conditions rather than suicide (Saha *et al.*, 2007).

In the United States, results from a retrospective longitudinal national review of premature mortality amongst 1,138,853 adults

with schizophrenia demonstrated excess deaths from lung cancer, cardiovascular and respiratory diseases (Olsson *et al.*, 2015). It is important to note that the findings from this research showed an excess of deaths especially due to cardiovascular and respiratory disease for which traditional cigarette use is a fundamental risk factor (but not the only one, because the use of other substances, such as alcohol, was also involved). The authors highlight a number of limitations in their study such as lack of considering the side effects of some antipsychotics, such as Clozapine, on cardiovascular parameters.

In people with schizophrenia spectrum disorder, the risk of mortality is doubled (Heiberg *et al.*, 2018). About 50% of deaths in patients with chronic mental illness are due to tobacco-related cancers, respiratory diseases, and cardiovascular conditions (Kelly *et al.*, 2011; Callaghan *et al.*, 2014). Callaghan *et al.* (2014) found among individuals hospitalized with a primary psychiatric diagnosis in the USA from 1990 to 2005, tobacco-related conditions comprised approximately 53% (23,620/44,469) of total deaths in the schizophrenia cohort, 48% (6,004/12,564) in the bipolar cohort, and 50% (35,729/71,058) in the depression cohort. This included an increased risk of tobacco-related deaths from cancer (standardised mortality ratio (SMR) 1.30, 95% CI 1.3–1.4), cardiovascular disease (SMR 2.46, 95% CI 2.41–2.50) and respiratory diseases (SMR 2.45, 95% CI 2.41–2.48) (Callaghan *et al.*, 2014). However, these data refer exclusively to smokers who received in-patient treatment and cannot be generalized to other smokers treated as outpatients. Moreover, people with schizophrenia who smoke have poorer health compared with people with schizophrenia who do not smoke (Aubin *et al.*, 2012). An increased rate of smoking amongst subjects with schizophrenia spectrum disorders contributes to multiple negative health effects compared with the general population (Beary *et al.*, 2012). Specifically, several studies have shown that people with schizophrenia spectrum disorders have a significantly higher prevalence of cancer (Sokal *et al.*, 2004), respiratory diseases (Sokal *et al.*, 2004; Carney *et al.*, 2006; Batki *et al.*, 2009; Partti *et al.*, 2015), and CVDs (Sokal *et al.*, 2004; Carney *et al.*, 2006; Batki *et al.*, 2009) compared with the general population (Sokal *et al.*, 2004; Carney *et al.*, 2006; Batki *et al.*, 2009). A study conducted by Partti *et al.* (2015), showed smokers with schizophrenia had a greater likelihood of suffering from comorbid chronic obstructive pulmonary disease (COPD) compared with the general population, reporting an OR of 4.23 (1.61, 11.10). Based on these findings, COPD is more common in smokers with schizophrenia spectrum disorders compared with the general population. Other studies have also shown an increased risk of death from cancer (Tran *et al.*, 2009; Partti *et al.*, 2015) and cardiovascular disease (Druss *et al.*, 2001; Osborn *et al.*, 2007; Lawrence *et al.*, 2013) with an approximately 12-fold increased risk of cardiovascular death in smokers compared with non-smokers (Kelly *et al.*, 2011).

Effect of smoking on the mental health of people with schizophrenia spectrum disorders

Amongst smokers with schizophrenia spectrum disorders, smoking is associated with depressive symptoms, increased hospitalizations, stress, poor treatment outcomes, low quality of life, and enhanced psychotic symptoms (Dixon *et al.*, 2007).

In schizophrenia spectrum disorders, smoking traditional cigarettes is associated with increased hospitalizations (Ziedonis *et al.*, 1994). Kobayashi *et al.* (2010) conducted a retrospective study

with 460 discharged patients with schizophrenia spectrum disorders in Japan. Smoking status and hospital psychiatric readmissions were reviewed and it was observed that psychiatric hospital readmission rates were significantly higher in smokers with schizophrenia compared with smokers without schizophrenia (HR = 1.78). Participants were voluntarily admitted to psychiatric hospitals for the first time and findings cannot be generalized to other populations or to people in different stages of this illness. Smoking is also associated with an increased need for higher psychiatric medication doses. Cigarette smoking increases the activity of the cytochrome P450 1A2 (CYP1A2) liver enzyme system, thus reducing the blood concentrations of many drugs (Sagud *et al.*, 2009) and this process can also have an impact on antipsychotic medication. A meta-analysis conducted by Tsuda *et al.* (2014) found that two commonly used antipsychotics in the treatment of schizophrenia spectrum disorders, olanzapine and clozapine, should be increased by 30% and 50%, respectively, in smokers compared with non-smokers in order to obtain an equivalent olanzapine or clozapine blood levels.

It has been suggested that smoking could act as a trigger for mental ill-health (West & Jarvis, 2005). Two recent meta-analyses conducted respectively by Gurillo *et al.* (2015) and Hunter *et al.* (2018) showed that smokers of traditional cigarettes have an ~two-fold increased risk of developing schizophrenia spectrum disorders. Gurillo *et al.* (2015) included five studies and reported an increased risk of developing a schizophrenia spectrum disorder in smokers compared with non-smokers (RR = 2.18; 95% CI 1.23–3.85). Also, Hunter *et al.* (2018) included five studies and reported a similar result (RR = 1.99; 95% CI 1.10–3.61), but in conclusion, further studies are needed to explore the association between traditional cigarette smoking as a predictor of developing a schizophrenia spectrum disorder.

Theory explaining high smoking rates and high nicotine dependence in smokers with schizophrenia spectrum disorders

The reasons for the high frequency of both high smoking prevalence and high nicotine dependence among patients with schizophrenia spectrum disorders are incompletely understood. Illness-related factors, patient-related factors and health service-related factors have been considered in an attempt to find a reason for this but have failed to arrive at decisive conclusions.

Illness-related factors

Studies have presented a number of illness-related reasons for high smoking rates and high nicotine dependence in smokers with schizophrenia spectrum disorders.

Nicotine evokes its physiological effects by binding with nicotine acetylcholine receptors (nAChRs) and strengthens rewards from brain stimulation; nAChRs also play an essential role in cognitive processes such as memory and learning (Yann *et al.*, 2008) and researchers have shown abnormalities of nAChRs in people with schizophrenia (D'Souza & Markou, 2012; Parikh *et al.*, 2014).

Schizophrenia is linked to elevated dopamine levels in dorsal striatum and reduced cortical dopamine release (Howes *et al.*, 2017). Dopamine is a neurotransmitter influenced by nAChRs (Albuquerque *et al.*, 2009). All antipsychotic medications act on the dopaminergic system by blocking dopamine receptors of the D2-type family (Ellenbroek, 2012). Nicotine increases dopamine levels in the striatum by stimulating its release via nicotinic receptors and decreasing its degradation by inhibiting monoamine oxidase A and

B. These produce a stimulation effect and a reduction of anti-psychotic extrapyramidal side effects (Sagud *et al.*, 2009). It has been suggested that in people with schizophrenia spectrum disorders, traditional cigarette smoking is a way to self-medicate by reducing problems associated with antipsychotic treatment (e.g. extrapyramidal symptoms) and reducing positive and negative psychotic symptoms (Leonard & Adams, 2006), attempting to remediate cognitive performances as a result of the underlying schizophrenia spectrum disorders symptoms and stimulating attention and working memory (Sacco *et al.*, 2005).

However, some aspects of the above theories are questionable. For example, if smoking traditional cigarettes reduces problems associated with antipsychotic treatment, tobacco consumption in smokers with schizophrenia should be influenced by changes of antipsychotic drugs. Also, smokers and non-smokers with schizophrenia should show significant differences in their behaviours in terms of positive and negative symptoms phenomenology.

In a recent systematic review and meta-analysis, Huang *et al.* (2019) explored the effect of traditional cigarette smoking on different psychopathological positive and negative symptoms of schizophrenia. Their meta-analysis of 24 studies examined positive and negative symptoms scores as assessed by the Positive and Negative Syndrome Scale (PANSS) or the Scale for the Assessment of Positive Symptoms (SAPS) and the Scale for the Assessment of Negative Symptoms (SANS) in 2322 smokers and 2319 non-smokers with schizophrenia spectrum disorders and showed that smokers had more severe positive symptoms than non-smokers (SMD = 0.33, 95% CI: 0.16 to 0.50, $P < 0.001$) but did not find any significant difference between smokers and non-smokers for negative symptoms (SMD = 0.11, 95% CI: -0.06 to 0.28, $P = 0.21$). This systematic review and meta-analysis (Huang *et al.*, 2019) also investigated extrapyramidal side effects of smokers and non-smokers with schizophrenia spectrum disorders and showed less severe extrapyramidal side effects in smokers than non-smokers (SMD = -0.20, 95% CI: -0.38 to -0.02, $P = 0.03$). The strength of this systematic review and meta-analysis is that it included a large number of studies; however, it is important to consider that different diagnostic scales (using different items and therefore producing different scores) were used.

Kumari & Postma (2005) suggested the smoking rate in people with schizophrenia increased due to nicotine's improving effect on schizophrenia symptoms. Studies have described positive neurocognitive effects of nicotine in principal cognitive domains (attention, processing speed, working memory, and psychomotor abilities) in individuals with cognitively impaired people with schizophrenia. The association between tobacco addiction and neurocognitive performance in smokers with schizophrenia spectrum disorders is unclear. Several studies have demonstrated that nicotine administration has a role in enhancing cognition in schizophrenia, particularly for the attention/vigilance domain (Harris *et al.*, 2004; Smith *et al.*, 2005; Hahn *et al.*, 2013). Furthermore, these studies assessed several cognitive tests with different outcomes but the majority failed to control for multiple comparisons on cognitive assessment and the brief duration of these studies have not confirmed the long-term benefits to attention/vigilance. Recently, evidence has demonstrated that smoking may have a detrimental effect on the working memory (Lee *et al.*, 2015) and hippocampal volume (Schneider *et al.*, 2014) of people with schizophrenia. A recent systematic review and meta-analysis of comparative studies conducted by Wang *et al.* (2019) explored cognitive functions in smokers and non-smokers with schizophrenia spectrum disorders and found that smokers with



schizophrenia spectrum disorders had lower neurocognitive performance in cognitive tasks than non-smokers with schizophrenia spectrum disorders.

Research conducted by Barr *et al.* (2008a) examined the effect of transdermal nicotine (14 mg nicotine patches) and placebo in non-smoking individuals with schizophrenia ($n=28$) and healthy controls ($n=32$) in a within-subject study and showed that nicotine improved cognitive performance in both groups in terms of attention, but patients with schizophrenia showed greater improvement in inhibition and impulse control compared with healthy controls. In a second study, Jubelt *et al.* (2008) investigated the effect of transdermal nicotine on episodic memory performance in non-smoking individuals with ($n=10$) and without schizophrenia ($n=12$). Compared with placebo control conditions, both groups increased in processing speed and accuracy in recognising novel objects but there was a trend for a stronger nicotine-induced effect in schizophrenic patients in the reduction of false alarms and this is important considering that memory deficits are associated with functional impairment in schizophrenia and that impaired novelty detection has been linked to the positive symptoms of schizophrenia. However, it's important to consider that these findings refer to non-smokers with schizophrenia using nicotine not delivered by traditional cigarettes.

Further studies have assessed the impact of nicotine intake on cognitive function in people with schizophrenia spectrum disorders (D'Souza & Markou, 2012). Despite the differences in level of nicotine dependence, severity of nicotine withdrawal, craving and satiety and method of nicotine administration (gum, transdermal patch, nicotine nasal spray) amongst participants in several different research studies, findings suggest nicotine administration has a role to play in enhancing cognition in schizophrenia, particularly for attention/vigilance (Harris *et al.*, 2004; Smith *et al.*, 2005; Hahn *et al.*, 2013). However, none of these studies has used cognitive psychodiagnostic tools specifically designed for people suffering from schizophrenia spectrum disorders, such as the Brief Assessment of Cognition in Schizophrenia (BACS) (Kefee *et al.*, 2004), or MATRICS Consensus Cognitive Battery (MCCB) scales (Nuechterlein *et al.*, 2008), but have instead used psychodiagnostic tools created for the general population such as the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) (Randolph *et al.*, 1998), Spatial Attentional Resource Allocation Task (SARAT) (Hahn *et al.*, 2006), and Singleton Detection Task or Continuous Performance Task (CPT) (Conner, 2000).

A Spanish study (Aguilar *et al.*, 2005) explored the association between frequency of smoking and severity of positive symptoms and number of hospitalisations amongst 250 outpatients with schizophrenia. Patients were classified into three categories: highly dependent smokers, mildly dependent smokers and non-smokers. High PANSS total scores and positive symptoms were less frequent in mildly dependent smokers than in non-smokers or highly dependent smokers. The highly dependent smokers had the worst outcomes. Aguilar *et al.* (2005) argued that their data did not support the self-medication hypothesis but rather suggested a complex interaction between nicotine dependence and symptoms of schizophrenia.

The self-medication theory has generated further criticism; for example Manzella *et al.* (2015) generated a list of predictions from the self-medication hypothesis applied to smoking traditional cigarettes in patients with schizophrenia spectrum disorders and concluded that further consideration of the neurophysiological data was needed to resolve the countering effects of nicotine-dopamine interactions on negative and positive symptoms of schizophrenia. Secondly, the evidence is contradictory that smokers with

schizophrenia spectrum disorders have fewer signs and symptoms than non-smoking patients. Thirdly, there is no information whether smoking traditional cigarettes reduces undesirable side effects of antipsychotic pharmacological treatments while leaving unmodified the positive effects of these drugs.

Environmental and genetic aspects play roles in the aetiology and progress of nicotine addiction and schizophrenia. Patients affected by schizophrenia have abnormal expression of certain genes which are common to nicotine addiction and schizophrenia disorder (Riley *et al.*, 2000; Mexal *et al.*, 2010; Purcell *et al.*, 2014; Owen *et al.*, 2016). However, this does not completely explain the high smoking rates in smokers with schizophrenia spectrum disorders.

Patient-related factors

Another possible explanation could be that smokers with schizophrenia spectrum disorders have a subjectively more rewarding experience when smoking compared with others. For example, Spring *et al.* (2003) studied the reward value of smoking traditional cigarettes (compared with other pleasant activities, e.g., eating their favourite candy, seeing a movie, receiving a gift) in individuals with schizophrenia ($n=26$) as well as healthy controls ($n=26$). All participants were nicotine-dependent, heavy smokers who had smoked since their teenage years and there were no differences between groups in the number of cigarettes smoked per day at baseline (BL). Their findings showed that participants did not differ in their perception of negative consequences related to smoking traditional cigarettes. However, smokers with schizophrenia differed significantly from controls in their evaluation of positive smoking-related effects. Although they recognized smoking related disadvantages to the same extent as the general population, they perceived more benefits and found traditional cigarettes more appealing than alternative rewards, indicating that their higher smoking rates are mediated by reward-related experiences. However, this study only considered that traditional cigarette smoking, and not exclusively nicotine, had greater reward value for smokers with schizophrenia. Future research should differentiate between nicotine and cigarette smoking and its reinforcing effects associated with sensorial and behavioural impact on reward perception.

In 298 smokers with psychosis living in the community, Baker *et al.* (2007) reported that, compared with general population samples, patients with psychosis were more likely to indicate that addiction, stimulation and stress management were reasons for smoking traditional cigarettes. Greater smoking severity was also associated with greater perceived stress, poorer overall subjective quality of life, and lower satisfaction with finances, health, leisure activities, and social relationships (Dixon 2007). Some people with schizophrenia perceive that smoking traditional cigarettes helps to manage stress, whereas heavy smokers report increased stress levels.

A study of Esterberg & Compton conducted in 2005 used semi-structured interviews to explore reasons for smoking amongst 12 smokers (ages 19 to 43 years, median 25.5) with schizophrenia spectrum disorders. Their findings showed many reported perceived benefits associated with smoking traditional cigarettes, including that smoking traditional cigarettes was considered important to decrease anxiety, relieve boredom and increase motivation and concentration. McCloughen *et al.* (2003) suggested that high smoking rates and high nicotine dependence in smokers with schizophrenia are explained by personal and social factors: many people with schizophrenia spectrum disorders are unemployed and inactive, and smoking was reported to relieve boredom and improve

low self-esteem.

Kelly *et al.* (2012) examined the perceived consequences and benefits of cigarette smoking and motivation for quitting in 100 nontreatment-seeking smokers who had schizophrenia or schizoaffective disorder and 100 people without a psychiatric disorder. People with schizophrenia reported that cigarette smoking made socialising easier compared with the control group. They also had a lower appreciation for health risks associated with cigarette smoking than controls. Potential health consequences were found to be a less compelling reason to quit smoking compared with the control group.

Health service- and health professionals-related factors

Smoking cigarettes is frequently socially accepted amongst smokers with schizophrenia spectrum disorders (Trainor & Leavey, 2017; Twyman *et al.*, 2014) and many smokers with schizophrenia spectrum are not offered smoking cessation treatment from health professionals (Goldberg, 2010; Trainor *et al.*, 2017). Two studies found that smokers with schizophrenia spectrum disorders were less likely to be advised to quit compared with smokers without schizophrenia spectrum disorders (Briskman *et al.*, 2012; Duffy *et al.* 2012). Brown *et al.* (2015) studied the perceptions of 49 mental health professionals in providing the “5 A’s” (ask, advise, assess, assist, arrange) of smoking cessation to smokers with schizophrenia. Clinicians rated a perceived lack of interest amongst patients and the impact of delivering the intervention on staff time as the greatest barriers to smoking cessation in this population. Health service and mental health professionals have an important role in encouraging quit attempts and can guide the application of smoking cessation treatment in clinical practice (Prochaska, 2011) but several mental health professionals believe stopping smoking traditional cigarettes may worsen their patients’ condition, and some mental health professionals feel that they are taking away one of their patients’ only pleasures in life (Ratschen *et al.*, 2009; Johnson *et al.*, 2010); hence, health service- and health professionals-related barriers are other possible reasons for high smoking rates in people affected by schizophrenia spectrum disorders.

Motivation to quit smoking in the general population and motivation to quit smoking in people with schizophrenia spectrum disorders

Generally, motivation is theorised as willingness to change (Biener & Abrams, 1991) and plays a central role in the smoking cessation process (Baker *et al.*, 2004). Past and recent studies show that motivation to quit is a key factor in successful quit rates (Biener & Abrams, 1991; Jardin & Carpenter, 2012). In relapse prevention theory (Witkiewitz & Marlatt, 2004), motivation is an important element in quitting smoking and avoiding relapse.

One theory regarding motivation to quit is “PRIME” theory (West., 2009). This theory of motivation considers plans, responses, impulses, motives and evaluations as important factors in motivation to quit. This theory suggests smokers’ evaluative beliefs about smoking traditional cigarettes, internal impulses and external triggers, have an important impact on the decision about smoking cessation. Another model used to explain motivation to quit smoking is the Transtheoretical Model (Prochaska & DiClemente, 1983), which assumes that a smoker goes through precontemplation, contemplation, preparation, action, and maintenance stages of behaviour, each having a different level of motivation, before quitting successfully

Data from general population studies indicate that motivation to quit is strongly related to quit attempts but not to successful smoking cessation (West *et al.*, 2001; Zhou *et al.*, 2009). However, other studies have found that higher levels of motivation increase the likelihood of maintaining smoking cessation (Boardman *et al.*, 2005; Heppner *et al.*, 2011), implying that there are different opinions about how motivation to quit relates to successfully quitting smoking in the general population. A study by Ussher *et al.* (2016) addressed how motivation to quit smoking, assessed prior to a quit attempt in a sample of treatment-seeking smokers, predicted short-term quit rates at four weeks and medium-term at six or 12 months abstinence and showed that baseline motivation to quit was not important in determining the success of quit attempts.

Studies on motivation to quit traditional cigarettes have been mainly undertaken with the general population and very few studies have focused on the motivation to quit in special populations such as patients affected by schizophrenia spectrum disorders. Siru *et al.* (2009) conducted a systematic review of motivation to quit in people with mental health disorders compared with the general population. Fourteen studies were identified and people with psychotic disorders were found to be less motivated to quit smoking than individuals with depression. Addington *et al.* (1997) showed, amongst a sample of 60 smokers with schizophrenia, that more than 50% of the sample were motivated to reduce or to quit smoking traditional cigarettes and showed the same reasons to reduce or to quit reported by the general population, principally health worries and social encouragement. Etter *et al.* (2004) evaluated the stages of change in 151 patients with schizophrenia spectrum disorders compared with 742 people in the general population. The level of motivation to quit was similar in both groups. Amongst current smokers, the distribution of stages of change was similar in patients with schizophrenia or schizoaffective disorder (precontemplation 79%, contemplation 18%, preparation 3%) and in the general population sample (74%, 22%, and 4%, $p = 0.6$).

As part of an RCT to test the efficacy of bupropion in 41 smokers with schizophrenia, Mann-Wrobel *et al.* (2011) assessed motivation and confidence to quit: 61.5% considered quitting in the next month and 85% in the following six months, with 70% motivated to quit forever. However, half of the participants reported low levels of confidence in quitting.

Therefore, even though there is evidence that motivation to quit in smokers with schizophrenia spectrum disorders is quite similar to those of smokers without mental illness, it is evident that it is more difficult to help them to quit (Streck *et al.*, 2018). Therefore, additional effective strategies of traditional cigarette smoking cessation, reduction and THR approach are needed.

Conclusions

This narrative review included literature about the epidemiology of tobacco smoking in people with schizophrenia spectrum disorders, examined the relationship between smoking and mental health and showed a higher prevalence, frequency and impact of both high nicotine dependence and its harmful effects in patients with schizophrenia spectrum disorders compared with the general population. People with schizophrenia spectrum disorders die on average earlier than the general population. Despite several existent theories, the reasons for high smoking rates are not fully understood. This review highlights the importance of increasing treatment options for this group of smokers, who find quitting difficult and



have lower quit rates than the general population. Effective approaches are urgently needed to address the persistently high smoking rates in smokers with schizophrenia spectrum disorders. Smoking cessation or Harm Reduction strategies could help to further reduce the health, financial and psychosocial parity gap experienced by this population.

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