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

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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.

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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 (Olfson *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.

References

Addington, J., el-Guebaly, N., Addington, D., & Hodgins, D. (1997). Readiness to stop smoking in schizophrenia. *The Canadian Journal of Psychiatry/La Revue canadienne de psychiatrie 42*(1), 49-52.

Addington, J., el-Guebaly, N., Campbell, W., Hodgins, D. C., & Addington, D. (1998). Smoking cessation treatment for patients with schizophrenia. *The American Journal of Psichiatry*, *155*(7), 974-6.

Adriaens, K., Van Gucht, D., Declerck, P., & Baeyens, F. (2014). Effectiveness of the electronic cigarette: An eight-week Flemish study with six-month follow-up on smoking reduction, craving and experienced benefits and complaints. *International journal of environmental research and public health, 11*(11), 11220–11248.

Aguilar, M.C., Gurpegui, M., Diaz, F.J., & de Leon, J. (2005). Nicotine dependence and symptoms in schizophrenia: naturalistic study of complex interactions. *Br J Psychiatry*, *186,* 215–221.

Alberg, A. J., &Samet, J. M., (2003). Epidemiology of lung cancer. *Chest, 123*, 21-49.

Albuquerque, E.X., Pereira, E.F., Alkondon, M., and Rogers, S. W. (2009). Mammalian nicotinic acetylcholine receptors: from structure to function. *Physiol. Rev. 89*, 73–120.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: Author.

Andreasen, N.C. (1983). The Scale for the Assessment of Negative Symptoms (SANS). Iowa City, Iowa: The University of Iowa.

Andreasen, N.C. (1984). The Scale for the Assessment of Positive Symptoms (SAPS). Iowa City, Iowa: The University of Iowa.

Andresen, N.C., Flaum, M., Arndt, S., Alliger, R., & Swayze, V. W. (1991). Positive and negative symptoms: Assessment and validity. *Negative vs Positive Schizophrenia*. (pp. 28–51). Springer, Berlin, Heidelberg.

Andrew, A., Knapp, M., McCrone, P., Parsonage, M., & Trachtenber, M. (2012). Effective Interventions in schizophrenia: the economic case.

Anthenelli, R.M., Benowitz, N.L., West, R., St Aubin, L., McRae, T., Lawrence, D., et al. (2016). Neuropsychiatric safety and efficacy of varenicline, bupropion, and nicotine patch in smokers with and without psychiatric disorders (EAGLES): a double-blind, randomised, placebo-controlled clinical trial. *The Lancet*, *387*(10037), 2507-2520.

Aubin, H.J., Rollema, H., Svensson, T.H., & Winterer, G. (2012). Smoking, quitting, and psychiatric disease: a review. *Neuroscience and Biobehavioral Reviews, 36*(1), 271–284.

Backhaus, I., D'Egidio, V., Grassucci, D., Gelardini, M., Ardizzone, C., & La Torre, G. (2017). Link between perceived smoking behaviour at school and students smoking status: a large survey among Italian adolescents. *Public Health,151*, 169 -176.

Baker, T.B., Brandon, T.H., Chassin, L (2004). Motivational Influences on Cigarette Smoking *Annual Review of Psychology*, *55(*1), 463-491.

Baker, A., Richmond, R., Haile, M., Lewin, T.J., Carr, V.J., Taylor, R.L., et al. (2006). A randomized controlled trial of a smoking cessation intervention among people with a psychotic disorder. *The American Journal of Psychiatry*, *163* (11), 1934-42.

Baker, A., Richmond, R., Haile, M., Lewin, T.J., Carr, V.J., Taylor, R.L., et al. (2007). Characteristics of smokers with a psychotic disorder and implications for smoking interventions. *Psychiatry Research,150*(2), 141–152.

Ball & Tasaki (1992). The Role and Measurement of Attachment in Consumer Behavior. Journal of Consumer Psychology*, 1*, 155-172.

Bandura, A., & Walters, R.H. (1963). *Social learning and personality development*. New York: Holt Rinehart and Winston.

Barnett, P. G., Wong, W., Jeffers, A., Hall, & S. M., Prochaska, J. J. (2015). Cost effectiveness of smoking cessation treatment initiated during psychiatric hospitalization: Analysis from a randomized, controlled trial. *The Journal of clinical psychiatry*, *76*(10), 1285–91.

Barr, R. S., Culhane, M. A., Jubelt, L. E., Mufti, R. S., Dyer, M. A., Weiss, A. P., et al. (2008a). The effects of transdermal nicotine on cognition in nonsmokers with schizophrenia and nonpsychiatric controls. *Neuropsychopharmacology, 33*(3), 480-90.

Barr, A. M., Procyshyn, R. M., Hui, P., Johnson, J. L., &Honer, W. G. (2008b). Self-reported motivation to smoke in schizophrenia is related to antipsychotic drug treatment. *Schizophrenia Research*, *100*(1-3)*,* 252–260.

Batki, S. L., Meszaros, Z. S., Strutynski, K., Dimmock, J. A., Leontieva, L., Ploutz-Snyder, R., et al. (2009). Medical comorbidity in patients with schizophrenia and alcohol dependence. *Schizophrenia research, 107*(2-3), 139–146.

Bauld, L., Bell, K., McCullough, L., Richardson, L., & Greaves, L. (2010). The effectiveness of NHS smoking cessation services: a systematic review. *Journal of Public Health*, 32 (1), 71-82.

Beary, M., Hodgson, & R., Wildgust, H. J. (2012). A critical review of major mortality risk factors for all-cause mortality in first-episode schizophrenia: clinical and research implications. *Journal of Psychopharmacology,26* (5suppl)*,* 52–61.

Belita, M., &Sidani, S. (2015). Attrition in Smoking Cessation Intervention Studies: A Systematic Review. *Canadian Journal of Nursing Research*, *47*(4), 21–40.

Bennett, M. E., Wilson, A. L., Genderson, M., & Saperstein, A. M. (2013). Smoking cessation in people with schizophrenia. *Current Drug Abuse Reviews, 6*(3), 180-90.

Berg, C. J. (2015). Preferred flavors and reasons for e-cigarette use and discontinued use among never, current, and former smokers. *International journal of Public Health*, *61*(2), 225–236.

Berry, J. C. (1967). Antecedents of schizophrenia, impulsive character and alcoholism in males. *Paper presented at the 75th Annual Convention of the American Psychological Association*. Washington, DC.

Biener, L., & Abrams, D. B. (1991). The Contemplation Ladder: Validation of a measure of cessation. *Health Psychology, 10*(5), 360-365.

Boardman, T., Catley, D., Mayo, M. S., & Ahluwalia, J. S. (2005). Self-efficacy and motivation to quit during participation in a smoking cessation program. *International Journal of Behavioral Medicine, 12*(4), 266-272.

Bolliger, C. T., Zellweger, J. P., Danielsson, T., van Biljon, X., Robidou, A., Westin, A., et al. (2000). Smoking reduction with oral nicotine inhalers: double blind, randomised clinical trial of efficacy and safety. *BMJ, 321*(7257), 329-333.

Bourque, J., Lakis, J., Champagne, J., Stip E., Lalonde, P., Lipp, O., et al. (2013) Clozapine and visuospatial processing in treatment-resistant schizophrenia. *Cognitive Neuropsychiatry, 18*(6), 615-630.

Boyatzis, R.E. (1998): Transforming qualitative information: thematic analysis and code development. Sage

Bowen, D., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., et al. (2009). How We Design Feasibility Studies. *American journal of preventive medicine, 36*(5), 452-457.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101.

Brose, L. S., Brown, J., Hitchman, S. C., & McNeill, A. (2015). Perceived relative harm of electronic cigarettes over time and impact on subsequent use. A survey with 1-year and 2-year follow-ups. *Drug and Alcohol dependence, 157,* 106-111.

Brown, S., Inskip, H., & Barraclough, B. (2000). Causes of the excess mortality of schizophrenia. *The British journal of psychiatry*, *177*(3), 212–217.

Brown, C. H., Medoff, D., Dickerson, F. B., Fang, L. J., Lucksted, A., Goldberg, R. W., Dixon, L. B. (2015). Factors influencing implementation of smoking cessation treatment within community mental health centers. *Journal of dual diagnosis, 11*(2), 145–150.

Brown, A. & Xing C. (2015) *Patent U.S. Patent* 9, 215-895.

Bryman, A. (2012). *Social research methods*. Oxford university press.

Briskman, I., Bar, G., Boaz, M., & Shargorodsky, M. (2012). Impact of Co-Morbid Mental Illness on the Diagnosis and Management of Patients Hospitalized for Medical Conditions in a General Hospital. *The International Journal of Psychiatry in Medicine, 43*(4), 339–348.

Bullen, C., Howe, C., Laugesen, M., McRobbie, H., Parag, V., Willima, J., et al. (2013). Electronic cigarettes for smoking cessation: a randomized controlled trial. *The Lancet*, *382*(9905), 1629–1637.

Burns, D. M. (1991). Cigarettes and cigarette smoking. *Clinic in chest medicine*, *12*(4), 631–642.

Cahill, K., Stevens, S., Perera, R., & Lancaster, T. (2013). Pharmacological interventions for smoking cessation: an overview and network meta-analysis. *The Cochrane database of systematic reviews*, *31*(5).

Cahill, K., Stevens, S., Lancaster, T. (2014). Pharmacological Treatments for Smoking Cessation. *JAMA, 311*(2), 193–194.

Cahill, K., Lindson-Hawley, N., & Thomas, K. H. (2016). Nicotine receptor partial agonists for smoking cessation. *The Cochrane database of systematic reviews*, *18*(4).

Callaghan, R. C., Veldhuizen, S., Jeysingh, T., Orlan, C., Graham, C., Kakouris, G., et al. (2014). Patterns of tobacco-related mortality among individuals diagnosed with schizophrenia, bipolar disorder, or depression. *Journal of Psychiatric Research, 48*(1), 102-10.

Campion, J., Shiers, D., Britton, J., Gilbody, S., Bradshaw, T (2014). Primary Care Guidance on Smoking and Mental Disorders – 2014 update; *Royal College of General Practitioners & Royal College of Psychiatrists.*

Campagna, D., Cibella, F., Caponnetto, P., Amaradio, M. D., Caruso, M., Morjaria, J. B., et al. (2016). Changes in breathomics from a 1-year randomized smoking cessation trial of electronic cigarettes. *European Journal of Clinical Investigation*, *46*(8), 698-706.

Caponnetto, P., Keller, E., Bruno, C. M., & Polosa, R. (2013a). Handling relapse in smoking cessation: strategies and recommendations. *Internal and Emergency Medicine, 8*(1), 7–12.

Caponnetto, P., Russo, C., Bruno, C. M., Alamo, A., Amaradio, M. D., & Polosa, R. (2013b). Electronic cigarette: a possible substitute for cigarette dependence. *Monaldi Archives for Chest Disease: archivio Monaldi per le malattie del torace, 79*(1), 12–19.

Caponnetto, P., Campagna, D., Cibella, F., Morjaria, J. B., Caruso, M., Russo, C., et al. (2013c). Correction: EffiCiency and Safety of an eLectroniccigAreTte (ECLAT) as Tobacco Cigarettes Substitute: A Prospective 12-Month Randomized Control Design Study. *PLoS ONE 9*(1).

Caponnetto, P., Auditore, R., Russo, C., Cappello G. C., & Polosa, R. (2013d). Impact of an electronic cigarette on smoking reduction and cessation in schizophrenic smokers: a prospective 12-month pilot study. *International Journal of Environmental Research and Public Health*, *10*(2), 446-61.

Caponnetto P (2014). Silver linings and improvement of our resources for smoking cessation interventions. e-Letter, Tobacco Controll BMJ12 jun 2014https://tobaccocontrol.bmj.com/content/silver-linings-and-improvement-our-resources-smoking-cessation-interventions

Caponnetto, P., Polosa, R., Auditore, R., Minutolo, G., Signorelli, M., Maglia, M., et al. (2014). Smoking Cessation and Reduction in Schizophrenia (SCARIS) with e-cigarette: study protocol for a randomized control trial. *Trials*, *15*(1), 88.

Cappelleri, J. C., Bushmakin, A. G., Baker, C. L., Merikle, E., Olufade, A. O., & Gilbert, D. G. (2007). Confirmatory factor analyses and reliability of the modified cigarette evaluation questionnaire. *Addictive Behaviors*, *32*(5)*,* 912-923.

Carney, C. P., Jones, L., & Woolson, R. F. (2006). Medical comorbidity in women and men with schizophrenia: a population-based controlled study. *Journal of general internal medicine*, *21*(11), 1133–1137.

Carpenter, C.M., Wayne, G.F., Connolly, G.N. (2007). The role of sensory perception in the development and targeting of tobacco products. *Addiction, 102,* 136–147.

Carpenter, M. J., Heckman, B. W., Wahlquist, A. E., Wagener, T. L., Goniewicz, M. L., Gray, K. M., et al. (2017). A naturalistic, randomized pilot trial of E-cigarettes: uptake, exposure, and behavioral effects. *Cancer Epidemiology and Prevention Biomarkers*, *26*(12), 1-9.

Cather, C., Dyer, M. A., Burrell, H. A., Hoeppner B., Goff, D. C., &Evins, A. E. (2103). An open trial of relapse prevention therapy for smokers with schizophrenia. *Journal of Dual Diagnosis*, *9*(1), 87-93.

Cather, C., Pachas, G.N., Cieslak, K.M., Evins, A.E. (2017). Achieving Smoking Cessation in Individuals with Schizophrenia: Special Considerations. *CNS Drugs, 31*, 471.

Celermajer, D. S., Sorensen, K. E., Gooch, V. M., Spiegelhalter, D. J., Miller, O. I., Sullivan, I. D., et al. (1992). Non-invasive detection of endothelial dysfunction in children and adults at risk of atherosclerosis. *Lancet*, *340*(8828), 1111–1115.

Charmaz, K. (2006). *Constructing Grounded Theory A Practical Guide Through Qualitative Analysis.* New Delhi: Sage.

Chen, L. S., Baker, T., Brownson, R. C., Carney, R. M., Jorenby, D., Hartz, S., et al. (2016). Smoking Cessation and Electronic Cigarettes in Community MentalHealth Centers: Patient and Provider Perspectives.*Community Ment Health, 53*(6), 695-702.

Chen, R., Aherrera, C., Isicheye, P., Olmedo, S., Jarmul, J., Cohen, A., et al. (2017). Assessment of indoor air quality at an electronic cigarette (vaping) convention. *Journal of Exposure Science and Environmental Epidemiology*, *1*.

Chou, K. R., Chen, R., Lee, J. F., Ku, C. H., & Lu, R. B. (2004). The effectiveness of nicotine-patch therapy for smoking cessation in patients with schizophrenia. *International Journal of Nursing Studies*, *41*(3), 321-30.

Chue, P., & Lalonde, J.K., (2014). Addressing the unmet needs of patients with persistent negative symptoms of schizophrenia: emerging pharmacological treatment options. *Neuropsychiatric disease and treatment,10,* 777–789.

Cibella, F., Campagna, D., Caponnetto, P., Amaradio, M. D., Caruso, M., Russo, C., et al. (2016). Lung function and respiratory symptoms in a randomized smoking cessation trial of electronic cigarettes. *Clinical Science, 130*(21), 1929-1937.

Cobb, N. K., Byron, M. J., Abrams, D. B., & Shields, P. G. (2010). Novel nicotine delivery systems and public health: The rise of the "e-cigarette". *American Journal of Public Health, 100,* 2340-2342.

Cohen, L., Manion, L., & Morrison, K. (2011). Research methods in education (7th ed.). New York, NY: Routledge.

Conners, C. K. & Staff M. H. S. (2000*). Conners' Continuous Performance Test II: Computer Program for Windows Technical Guide and Software Manual.* North Tonawanda, NY: Multi-Health Systems.

Conrad, A. (2011). Exposure to tobacco smoke. *Cigarette Smoke Toxicity: Linking Individual Chemicals to Human Diseases*, 67-91.

Cook, B. L., Wayne, G. F., Kafali, E. N., Liu, Z., Shu, C., & Flores, M. (2014). Trends in smoking among adults with mental illness and association between mental health treatment andsmoking cessation. *JAMA*, *311*(2), 172-82.

Cooke, W. H., Pokhrel A., Dowling, C., Fogt, D. L., & Rickards, C. A. (2015). Acute inhalationof vaporized nicotine increases arterial pressure in young non-smokers: A pilot study. *Clinical Autonomic Research*, *25*(4), 267-270.

Cravo, A. S., Bush, J., Sharma, G., Savioz, R., Martin, C., Craige, S., et al. (2016). Arandomised, parallel group study to evaluate the safety profile of an electronic vapourproduct over 12 weeks. *Regulatory Toxicology and Pharmacology, 81*, S1-S14.

Creswell, J. W. (1998). Qualitative inquiry and research design: Choosing among five traditions. Thousand Oaks, CA, US: Sage Publications, Inc.

Cummins, S. E., Zhu, S. H., Tedeschi, G. J., Gamst, A. C., & Myers, M. G., (2014). Use of e-cigarettes by individuals with mental health conditions. *Tobacco Control*, *23*(3), 48–53.

Dalack, G. W., Becks, L., Hill, E., Pomerleau, O. F., & Meador-Woodruff, J. H. (1999). Nicotine withdrawal and psychiatric symptoms in cigarette smokers with schizophrenia. *Neuropsychopharmacology 21*(2), 195–202.

Dalack, G. W., & Meador-Woodruff, J. H. (1999). Acute feasibility and safety of a smoking reduction strategy for smokers with schizophrenia. *Nicotine & tobacco research, 1*(1), 53–57.

Davis, S. C. (2014). Annual Report of the Chief Medical Officer 2013: Public Mental Health Priorities-Investing in the Evidence. *Department of Health*.

Dawkins, L., Turner, J., Roberts, A., & Soar, K., (2013). 'Vaping' profiles and preferences: An online survey of electronic cigarette users. *Addiction, 108*(6), 1115–1125.

Dawkins, L., & Corcoran, O. (2014). Acute electronic cigarette use: Nicotine delivery and subjective effects in regular users. *Psychopharmacology*, *231*(2), 401–407.

Dawkins, L., Munafo, M., Christoforou, G., Olumegbon, N., & Soar, K. (2016). The effects of e-cigarette visual appearance on craving and withdrawal symptoms in abstinent smokers. *Psychology of addictive behaviors*, *30*(1), 101–105.

de Leon, J., Diaz, F. J., Rogers, T., Browne, D., Dinsmore, L., (2002). Initiation of daily smoking and nicotine dependence in schizophrenia and mood disorders. *Schizophr. Res. 56*, 47-54.

de Leon, J., & Diaz, F. J. (2005). A meta-analysis of worldwide studies demonstrates an association between schizophrenia and tobacco smoking behaviors. *Schizophrenia research*, *76*(2-3), 135–157.

De Marco, R., Accordini, S., Cerveri, I., Corsico, A., Sunyer, J., Neukirch, F., et al. (2004). An international survey of chronic obstructive pulmonary disease in young adults according to GOLD stages. *Thorax*, *59*(2), 120-125.

De Meo, D. L., Carey, V. J., Chapman, H. A., Reilly, J. J., Ginns, L. C., Speizer, F. E., et al. (2004). Familial aggregation of FEF25–75 and FEF25–75/FVC in families with severe, early onset COPD. *Thorax*, *59*(5), 396-400.

De Santis, L., Noel Ugarriza, D. (2000). The concept of theme as used in qualitative nursing research. West. *J. Nurs. Res. 22,* 351–372.

Devlin, N., & Brooks, R. (2017). EQ-5D and the EuroQol group: Past, present, future. *Applied Health Economics and Health Policy, 15*(2), 127–137.

Diaz, F. J., James, D., Botts, S., Maw, L., Susce, M. T., & De Leon, J. (2009). Tobacco smoking behaviors in bipolar disorder: a comparison of the general population, schizophrenia, and major depression. *Bipolar Disorders*, *11*(2), 154–165.

Dickerson, F., Stallings, C., Origoni, A. E., Vaughan, C., Khushalani, S., Schroeder, J., et al. (2013). Cigarette smoking among persons with schizophrenia or bipolar disorder in routine clinical settings, 1999–2011. *Psychiatric services, 64*(1), 44–50.

DiFranza, J. R., & Lew, R. A. (1996). Morbidity and mortality in children associated with use of tobacco products by other people. *Pediatrics*, *97*(4), 560-568.

Dixon, L., Medoff, D. R., Wohlheiter, K., Goldberg, C., Kreyenbuhl, R., Adams, J., et al. (2007). Correlates of severity of smoking among persons with severe mental illness. *American Journal on Addiction*, *16*(2), 101–110.

Doll, R., Peto, R., Boreham, J., & Sutherland, I. (2004). Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ*, *328*(7455), 1519–1528.

D'ruiz, C. D., O'connell, G., Graff, D. W., & Yan, X. S. (2017). Measurement of cardiovascular and pulmonary function endpoints and other physiological effects following partial or complete substitution of cigarettes with electronic cigarettes in adult smokers. *Regulatory Toxicology and Pharmacology*, *87*, 36-53.

Drummond, M. F., O'Brien, B., Stoddart, G. L., & Torrance, G. W. (1997). *Methods for the Economic Evaluation of Health Care Programmes.* Oxford: Oxford University Press.

D'Souza, M. S., & Markou, A. (2012). Schizophrenia and tobacco smoking comorbidity: nAChR agonists in the treatment of schizophrenia-associated cognitive deficits. *Neuropharmacology, 62*(3), 1564-1573.

D'Souza, D. C., Esterlis, I., Carbuto, M., Krasenics, M., Seibyl, J., Bois, F., et al. (2012). Lower β2*-nicotinic acetylcholine receptor availability in smokers with schizophrenia. The American Journal of Psychiatry, 169(3), 326-34.

Duffy, S. A., Kilbourne, A. M., Austin, K. L., Dalack, G. W., Woltmann, E. M., Waxmonsky, J., & Noonan, D. (2012). Risk of smoking and receipt of cessation services among veterans with mental disorders. *Psychiatric services (Washington, D.C.), 63*(4), 325–332.

El Dib, R., Suzumura, E. A., Akl, H., Gomaa, A., Agarwal, Y.,

Chang, M., et al. (2017). Electronic nicotine delivery systems and/or electronic non-nicotine delivery systems for tobacco smoking cessation or reduction: A systematic review and meta-analysis. *BMJ open, 7*(2), e012680.

Elis, O., Caponigro, J. M., &Kring, A. M. (2013). Psychosocial treatments for negative symptoms in schizophrenia: Current practices and future directions. *Clinical Psychology Review, 33*(8), 914-928.

Eldridge, S. M., Lancaster, G. A., Campbell, M. J., Thabane, L., Hopewell, S., Coleman, C. L., et al. (2016). Defining feasibility and pilot studies in preparation for randomised controlled trials: development of a conceptual framework. *PLoS ONE*, *11*(3).

Ellenbroek B. A. (2012). Psychopharmacological treatment of schizophrenia: what do we have, and what could we get? *Neuropharmacology 62*, 1371-1380.

Esterberg, M., & Compton, M. (2005). Smoking behavior in persons with schizophreniaspectrum disorder: A qualitative investigation of the transtheoretical model. *Social Science and Medicine*, *61*, 293–303.

Esterlis, I., Bois, F., Pittman, B., Picciotto, M. R., Shearer, L., Anticevic, A., et al. (2013). In vivo evidence for B2 nicotinic acetylcholine receptor subunit upregulation in smokers as compared with nonsmokers with schizophrenia. Biological Psychiatry, 76(6), 495-502.

Etter, J. F. (2010). Electronic cigarettes: a survey of users. BMC public health, 10(1), 231.

Etter, J.F, Bullen, C. (2011). Electronic cigarette: users profile, utilization, satisfaction and perceived efficacy. *Addiction, 106,* 2017–2028.

Etter, M., Mohr, S., Garin, C., & Etter, J. F. (2004). Stages of change in smokers with schizophrenia or schizoaffective disorder and in the general population. *Schizophrenia Bulletin, 30*(2), 459.

Evins, A. E., Mays, V. K., Rigotti, N. A., Tisdale, T., Cather, C., & Goff, D. C. (2001). A pilot trial of bupropion added to cognitive behavioral therapy for smoking cessation in schizophrenia. *Nicotine & tobacco research, 3*(30), 397-403.

Evins, A. E., Cather, C., Rigotti, N. A., Freudenreich, O., Henderson, D. C., Olm-Shipman, C. M., et al. (2004). Two-Year Follow-Up of a Smoking Cessation Trial in Patients with Schizophrenia: Increased Rates of Smoking Cessation and Reduction. *Journal of Clinical Psychiatry, 65*(3), 307-11.

Evins, A. E., Cather, C., Deckersbach, T., Freudenreich, O., Culhane, M. A., Olm-Shipman, C. M., et al. (2005). A double-blind placebo controlled trial of bupropion sustained-release for smoking cessation in schizophrenia. *Journal of Clinical Psychopharmacology*, *25*(3), 218-25.

Evins, A. E., Cather, C., Pratt, S. A., Pachas, G. N., Hoeppner, S. S., Goff, D. C., et al. (2014). Maintenance treatment with varenicline for smoking cessation in patients with schizophrenia and bipolar disorder: a randomized clinical trial. *JAMA*, *311*(2), 145-54.

Ezzati, M., & Lopez, A. D. (2003). Estimates of global mortality attributable to smoking in 2000. *The Lancet, 362*(9387), 847-852.

Faner, R., Tal-Singer, R., Riley, J. H., Celli, B., Vestbo, J., MacNee, W., et al. (2014). Lessons from ECLIPSE: A review of COPD biomarkers. *Thorax, 69*(7), 666-672.

Fagerström, K. (2012). Determinants of tobacco use and renaming the FTND to the Fagerström Test for Cigarette Dependence. *Nicotine & tobacco research, 14*(1), 75-78.

Farsalinos, K. & E., Polosa, R. (2014). Safety evaluation and risk assessment of electronic cigarettes as tobacco cigarette substitutes: a systematic review. *Therapeutic Advances in Drug Safety*, *5*(2), 67-86.

Farsalinos, K. E., Spyrou, A., Tsimopoulou, K., Stefopoulos, C., Romagna, G., &Voudris V. (2014a). Nicotine absorption from electronic cigarette use: comparison between first and new-generation devices. *Sci Rep,4*, 4133.

Farsalinos, K. E., Romagna, G., Tsiapras, D., Kyrzopoulos, S., & Voudris, V. (2014b). Characteristics, perceived side effects and benefits of electronic cigarette use: a worldwide survey of more than 19,000 consumers. *International Journal of Environmental Research and Public Health*, *11*(4), 4356-4373.

Farsalinos, K., Cibella, F., Caponnetto, P., Campagna, D., Morjaria, J. B., Battaglia, E., et al. (2016). Effect of continuous smoking reduction and abstinence on blood pressure and heart rate in smokers switching to electronic cigarettes. *Internal and Emergency Medicine*, *1*(10), 1-10.

Fiore, M. C., Jaen, C. R., Baker, T. B., Bailey, W. C., Benowitz, N., Curry, S. J., et al. (2008). Treating tobacco use and dependence: 2008 update, US Department of Health and Human Services, Public Health Service, *Respiratory care, 53*(9), 1217-22.

Flanders, W. D., Lally, C. A., Zhu, B. P., Henley, S. J., & Thun, M. J. (2003). Lung cancer mortality in relation to age, duration of smoking, and daily cigarette consumption: results from Cancer Prevention Study II. *Cancer research, 63*(19), 6556-6562.

Flick, Uwe. (1998/2002/2006). An Introduction to Qualitative Research (1st-3rd edition). London: Sage.

Fogt, D. L., Levi, M. A., Rickards, C. A., Stelly, S. P., & Cooke, W. H. (2016). Effects of acute vaporized nicotine in non-tobacco users at rest and during exercise. *International Journal of Exercise Science, 9*(5), 607-615.

Foulds, J., Veldheer, S., Yingst, J., Hrabovsky, S., Wilson, S. J., Nichols, T. T., et al. (2015). Development of a questionnaire for assessing dependence on electronic cigarettes among a large sample of ex-smoking E-cigarette users. *Nicotine Tob Res, 17*(2), 186-92.

Franco, T., Trapasso, S., Puzzo, L., & Allegra, E. (2016). Electronic cigarette: Role in the primary prevention of oral cavity cancer. *Clinical Medicine Insights: Ear, Nose and Throat*. *9,* 7-12.

Filia, S. L., Baker, A. L., Gurvich, C. T., Richmond, R., Lewin, T. J., & Kulkarni, J. (2014). Gender differences in characteristics and outcomes of smokers diagnosed with psychosis participating in a smoking cessation intervention. *Psychiatry Research, 215*(3), 586– 593.

George, T.P, Ziedonis, D.M., Feingold, A., Pepper, W.T., Satterburg, C.A., Winkel, J., et al. (2000). Nicotine transdermal patch and atypical antipsychotic medications for smoking cessation in schizophrenia. *Am J Psychiatry, 157,* 1835–1842.

George, T.P., Vessicchio, J.C., Termine, A., Bregartner, T.A., Feingold, A., Rounsaville, B.J., et al. (2002). A placebo-controlled trial of bupropion for smoking cessation in schizophrenia. *Biological Psychiatry, 52,* 53–61.

Gallus, S., Zuccaro, P., Colombo, P., Apolone, G., Pacifici, R., Garattini, S., et al. (2006). Effects of new smoking regulations in Italy. *Ann Oncol,* 17: 346-347.

Gallus, S., Lugo, A., Colombo, P., Pacifici, R., La Vecchia, C. (2013). Smoking prevalence in Italy 2011 and 2012, with a focus on hand-rolled cigarettes. *Prev Med,* 56: 314-318.

Gilbert, H. A. (1965). *Smokeless non-tobacco cigarette* (3,200.819). Retrieved from http://www.njgasp.org/patents/US3200819

Giovenco, D. P., & Delnevo, C. D. (2018). Prevalence of population smoking cessation by electronic cigarette use status in a national sample of recent smokers. *Addictive behaviors*, *76*, 129-134.

Glasser, A. M., Collins, L., Pearson, J. L., Abudayyeh, H., Niaura, R. S., Abrams, D. B., & Villanti, A. C. (2017). Overview of

electronic nicotine delivery systems: a systematic review. *American journal of preventive medicine*, *52*(2), e33-e66.

Godfrey, C., Parrott, S., Coleman, T., Pound, E. (2005). The cost-effectiveness of the English smoking treatment services: evidence from practice. *Addiction 100*(2), 70-83.

Goldberg, J. O. (2010). Successful Change in Tobacco Use in Schizophrenia. *Journal of the American Psychiatric Nurses Association, 16*(1), 30–35.

Goldenson, N. I., Kirkpatrick, M. G., Barrington-Trimis, J. L., Pang, R. D., McBeth, J. F., Pentz, M. A., et al. (2016). Effects of sweet flavorings and nicotine on the appeal and sensory properties of e-cigarettes among young adult vapers: Application of a novel methodology. *Drug and alcohol dependence*, *168*, 176-180.

Goniewicz, M. L., Smith, D. M., Edwards, K. C., Blount, B. C., Caldwell, K. L., Feng, J., al. (2018). Comparison of Nicotine and Toxicant Exposure in Users of Electronic Cigarettes and Combustible Cigarettes. *JAMA Network Open, 1*(8):e18593

Gonzalez, A., Zvolensky, M. J., Vujanovic, A. A., Leyro, T. M., & Marshall, E. C. (2008). An evaluation of anxiety sensitivity, emotional dysregulation, and negative affectivity among daily cigarette smokers: relation to smoking motives and barriers to quitting. *Journal of psychiatric research, 43*(2), 138–147.

Gorman, G.E. (2005). *Qualitative Research for the Information Professional: A Practical Handbook* (2nd ed.). London: Facet.

Green, J., Willis, K., Hughes, E., Small, R., Welch, N., Gibbs, L., & Daly, J. (2007). Generating best evidence from qualitative research: The role of data analysis. Australia and New Zealand *Journal of Public Health, 31(6),* 545– 550.

Guichenez, P., Clauzel, I., Cungi, C., Quantin, X., Godard, P., & Clauzel, A. M. (2007). The contribution of cognitive-behavioural therapies to smoking cessation. *Revue des maladies respiratoires*, *24(2)*, 171-182.

Guo, X., Zhai, J., Liu, Z., Fang, M., Wang, B., Wang, C., et al. (2010). Effect of antipsychotic medication alone vs combined with psychosocial intervention on outcomes of early-stage schizophrenia. *Archives of general psychiatry*, *67*, 895-904.

Hahn, B., Ross, T. J., & Stein, E. A. (2006). Neuroanatomical dissociation between bottom–up and top–down processes of visuospatial selective attention. *Neuroimage*, *32*(2), 842-853.

Hahn, B., Harvey, A. N., Concheiro-Guisan, M., Huestis, M. A., Holcomb, H. H., & Gold, J. M. (2013). A Test of the Cognitive Self-Medication Hypothesis of Tobacco Smoking in Schizophrenia. *Biological psychiatry*, *74*(6), 436-443.

Haijma, S. V., Van Haren, N., Cahn, W., Koolschijn, P. C. M., Hulshoff Pol, H. E., & Kahn, R. S. (2013). Brain volumes in schizophrenia: a meta-analysis in over 18 000 subjects. *Schizophrenia bulletin*, *39*(5), 1129-1138.

Hajek, P., Phillips-Waller, A., Przulj, D., Pesola, F., Myers Smith, K., Bisal, N., et al. (2019). A randomized trial of e-cigarettes versus nicotine-replacement therapy. *New England Journal of Medicine*, *380*(7), 629-637.

Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in practice*. New York (NY): Taylor and Francis.

Harris, J. G., Kongs, S., &Allensworth, D., (2004). Effects of nicotine on cognitive deficits in schizophrenia. *Neuropsychopharmacology*, *29*(7), 1378.

Hartmann-Boyce J, McRobbie H, Bullen C, Begh R, Stead LF, Hajek P. (2016) Can electronic cigarettes help people stop smoking, and are they safe to use for this purpose? Cochrane Database of Systematic Reviews Issue 9.

Hartz, S. M., Pato, C. N., Medeiros, H., Cavazos-Rehg, P., Sobell, J. L., Knowles, J. A., et al. (2014). Comorbidity of severe psychotic disorders with measures of substance use. *JAMA psychiatry*, *71*(3), 248-254.

Hefner, K., Rosenheck, R., Merrel, J., Coffman, M., Valentine, G., & Sofuoglu, M. (2016). E-cigarette use in VA service users with mental health and substance use disorders. *Journal of dual diagnosis*, *12*(2), 109-117.

Hefner, K., Valentine, G., & Sofuoglu, M. (2017). Electronic Cigarettes and Mental Illness: Reviewing the Evidence for Help and Harm Among Those with Psychiatric and Substance Use Disorders. *The American journal on addictions*, *26*(4), 306-315.

Heiberg, I.H., Jacobsen, B.K., Nesvåg, R., Bramness, J.G., Reichborn-Kjennerud. T., Næss, Ø., et al. (2018). Total and cause-specific standardized mortality ratios in patients with schizophrenia and/or substance use disorder. *PLoS ONE 13*(8): e0202028.

Helen, G. S., Dempsey, D. A., Havel, C. M., Jacob III, P., & Benowitz, N. L. (2017). Impact of e-liquid flavors on nicotine intake and pharmacology of e-cigarettes. *Drug and alcohol dependence*, *178*, 391-398.

Heppner, W. L., Ji, L., Reitzel, L. R., Castro, Y., Correa-Fernandez, V., Vidrine, J. I., et al. (2011). The role of prepartum motivation in the maintenance of postpartum smoking abstinence. *Health Psychology*, *30*(6), 736-745.

Hickling L.M., Perez-Iglesias R., McNeill A., Dawkins L., Moxham J., Ruffell T., et al. (2018). A pre-post pilot study of electronic cigarettes to reduce smoking in people with severe mental illness. *Psychological Medicine,* 1–8

Himelhoch, S., & Daumit, G. (2003). To whom do psychiatrists offer smoking-cessation counseling? *American Journal of Psychiatry*, *160*(12), 2228-2230.

Holloway, I., &Todres, L. (2003). The status of method: flexibility, consistency and coherence. *Qualitative research*, *3*(3), 345-357.

Hon, L. (2003). U.S. Patent 8393331 B2 Electronic Atomization Cigarette, https://docs.google.com/viewer?url=patentimages.storage.googleapis.com/pdfs/US8393331.

Horst, W. D., Klein, M. W., Williams, D., &Werder, S. F. (2005). Extended use of nicotine replacement therapy to maintain smoking cessation in persons with schizophrenia. *Neuropsychiatric disease and treatment*, *1*(4), 349-355.

Howes, O. D., McCutcheon, R., Owen, M. J., & Murray, R. M. (2017). The role of genes, stress, and dopamine in the development of schizophrenia. *Biological psychiatry*, *81*(1), 9-20.

Huang, H., Dong, M., Zhang, L., Zhong, B.L., Ungvari, G.S., Yuan, Z., et al. (2019). Psychopathology and extrapyramidal side effects in smoking and non-smoking patients with schizophrenia: Systematic review and meta-analysis of comparative studies. Prog *Neuropsychopharmacol Biol Psychiatry, 8*(92), 476-482.

Hughes, J. R., Hatsukami, D. K., Mitchell, J. E., & Dahlgren, L. A. (1986). Prevalence of smoking among psychiatric patients. *TheAmerican Journal of Psychiatry*, *143*(8), 993-997.

Hughes, J. R., & Carpenter, M. J. (2006). Does reduction increase future cessation and decrease disease risk? A qualitative review. *Nicotine & Tobacco Research, 8*(6), 739–749.

Hughes, J.R., Stead, L.F., Lancaster, T. (2007). Antidepressants for smoking cessation. Cochrane database of systematic reviews (Online):CD000031.

Hunter, A., Murray, R., Asher L., Leonardi-Bee, J. (2018) The Effects of Tobacco Smoking, and Prenatal Tobacco Smoke Exposure, on Risk of Schizophrenia: A Systematic Review and Meta-Analysis. *Nicotine & Tobacco Research*, nty160

Hummel, K., Brown, J., Willemsen, M. C., West, R., & Kotz, D.

(2017). External validation of the Motivation to Stop Scale (MTSS): Findings from the International Tobacco Control (ITC) Netherlands survey. *European Journal of Public Health*, *27*(1), 129-134.

IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

Istituto Nazionale di Statistica (ISTAT) (2015). Annuario statistico Italiano 2013. Availableat: http://www.istat.it/it/files/2013/12/ASI_2013.pdf. (Accessed December 2, 2017).

Jardin, B. F., & Carpenter, M. J. (2012). Predictors of quit attempts and abstinence among smokers not currently interested in quitting. *Nicotine & Tobacco Research*, *14*(10), 1197-1204.

Jensen, R. P., Luo, W., Pankow, J. F., Strongin, R. M., & Peyton, D. H. (2015). Hidden formaldehyde in e-cigarette aerosols. *New England Journal of Medicine*, *372*(4), 392-394.

Jiménez-Ruiz, C. A., Masa, F., Miravitlles, M., Gabriel, R., Viejo, J. L., Villasante, C., et al. (2001). Smoking characteristics: Differences in attitudes and dependence between healthy smokers and smokers with COPD. *Chest*, *119*(5), 1365-1370.

Jochelson, J., &Majrowski B. (2007). Clearing the Air. Debating Smoke-Free Policies in Psychiatric Units. *King's Fund.*

Johnson, J. L., Moffat, B., &Malchy, L. (2010). In the shadow of a new smoke free policy: A discourse analysis of health care providers' engagement in tobacco control in community mental health. *International Journal of Mental Health Systems*, *4*(1), 23.

Joossens, L., &Raw, M. (2013). The tobacco control scale 2013 in Europe. Association of European Cancer leagues. 2014. Available at: http://www.europeancancerleagues.org/images/TobaccoControl/TCS_2013_in_Europe_13-03-14_final_1.pdf. (Accessed September 22, 2017).

Jordan, G., Lutgens, D., Joober, R., Lepage, M., Iyer, S. N., &Malla, A. (2014). The relative contribution of cognition and symptomatic remission to functional outcome following treatment of a first episode of psychosis. *Journal of clinical psychiatry*, *75*(6), e566-572.

Jubelt, L. E., Barr, R. S., Goff, D. C., Logvinenko, T., Weiss, A. P., &Evins, A. E. (2008). Effects of transdermal nicotine on episodic memory in non-smokers with and without schizophrenia. *Psychopharmacology*, *199*(1), 89-98.

JUUL. (2018). Manufacturing quality: what is JUUL? San Francisco, CA: JUUL Labs, Inc. https://support.juulvapor.com/home/learn/faqs/manufacturing-quality#materials. (Accessed June 14, 2018).

Kalkhoran, S., & Glantz, S. A. (2016). E-cigarettes and smoking cessation in real-world and clinical settings: a systematic review and meta-analysis. *The Lancet Respiratory Medicine*, *4*(2), 116-128.

Kee, C. (2018). Everything you need to know about the JUUL, including the health effects: Buzzfeed News, 2018.

Keefe, R. S., Goldberg, T. E., Harvey, P. D., Gold, J. M., Poe, M. P., & Coughenour, L. (2004). The Brief Assessment of Cognition in Schizophrenia: reliability, sensitivity, and comparison with a standard neurocognitive battery. *Schizophrenia research*, *68*(2-3), 283-297.

Kelly, D. L., McMahon, R. P., Wehring, H. J., Liu, F., Mackowick, K. M., Boggs, D. L., et al. (2011). Cigarette smoking and mortality risk in people with schizophrenia. *Schizophrenia Bulletin*, *37*(4), 832-838.

Kelly, D. L., Raley, H. G., Lo, S., Wright, K., Liu, F., McMahon, R. P., Heishman, S. J. (2012). Perception of smoking risks and motivation to quit among nontreatment-seeking smokers with and without schizophrenia. *Schizophrenia bulletin, 38*(3), 543–551.

Keltner, N. L., & Grant, J. S. (2006). Smoke, smoke, smoke that cigarette. *Perspectives in psychiatric cite*, *42*(4), 256-266.

Kendrick, A. H. (2010). Exhaled carbon monoxide devices in smoking cessation: physiology, controversies and equipment. *The buyers' guide to respiratory care products*, *13*, 180-189.

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. *Harvard review of psychiatry*, *4*(5), 231-244.

Khoudigian, S., Devji, T., Lytvyn, L., Campbell, K., Hopkins, R., & O'reilly, D. (2016). The efficacy and short-term effects of electronic cigarettes as a method for smoking cessation: A systematic review and a meta-analysis. *International journal of public health*, *61*(2), 257-267.

King, N., & Horrocks, C. (2010). *Interviews in qualitative research*. Los Angeles: Sage.

Kishi, T., & Iwata, N. (2015). Varenicline for smoking cessation in people with schizophrenia: systematic review and meta-analysis. *European archives of psychiatry and clinical neuroscience*, *265*(3), 259-268.

Kleine, S. S., & *Baker*, S. M. (*2004*). An *Integrative review of material possession* attachment. *Academy of Marketing Science Review*, (*1*), 1–39.

Knowles, S., Planner, C., Bradshaw, T., Peckham, E., Man, M-S., &Gilbody, S. (2016). Making the journey with me: a qualitative study of experiences of a bespoke mental health smoking cessation intervention for service users with serious mental illness. *BMC Psychiatry, 16:193.*

Kobayashi, M., Ito, H., Okumura, Y., Mayahara, K., Matsumoto, Y., & Hirakawa, J. (2010). Hospital Readmission in First-Time Admitted Patients with Schizophrenia: Smoking Patients Had Higher Hospital Readmission Rate Than Non-Smoking Patients. *The International Journal of Psychiatry in Medicine, 40*(3), 247–257.

Kopelowicz, A., Liberman, R. P., & Zarate, R. (2002). Psychosocial treatments for schizophrenia. In Nathan, P., E., & Gorman, J., M. (Eds.), A guide to treatments that Work, 2nd Edition (pp. 201–229). New York: Oxford University Press

Kotov, R., Guey, L. T., Bromet, E. J., & Schwartz, J. E. (2010). Smoking in schizophrenia: Diagnostic specificity, symptom correlates, and illness severity. *Schizophrenia bulletin*, *36*(1), 173-181.

Kotz, D., Brown, J., & West, R. (2013). Predictive validity of the Motivation To Stop Scale (MTSS): A single-item measure of motivation to stop smoking. *Drug and Alcohol Dependence*, *128*(1-2), 15-19.

Kowalczyk, W. J., Wehring, H. J., Burton, G., Raley, H., Feldman, S., Heishman, S. J., & Kelly, D. L. (2017). Predictors of the Perception of Smoking Health Risks in Smokers With or Without Schizophrenia. *Journal of dual diagnosis, 13*(1), 29–35.

Kreyenbuhl, J., Buchanan, R. W., Dickerson, F. B., & Dixon, L. B. (2010). The schizophrenia patient outcomes research team (PORT): Updated treatment recommendations 2009. *Schizophrenia bulletin*, *36*(1), 94-103.

Kumari, V., & Postma, P. (2005). Nicotine use in schizophrenia: The self medication hypotheses. *Neuroscience & Biobehavioral Reviews*, *29*(6), 1021-1034.

La Vecchia, C., Franceschi, S., & Levi, F. (2003). Epidemiological research on cancer with a focus on Europe. *European Journal*

of Cancer Prevention, *12*(1), 5-14.
Lasser, K., Boyd, J. W., Woolhandler, S., Himmelstein, D. U., McCormick, D., & Bor, D. H. (2000). Smoking and mental illness: a population-based prevalence study. *JAMA*, *284*(20), 2606-2610.
Lawn, S. J., Pols, R. G., & Barber, J. G. (2002). Smoking and quitting: a qualitative study with community-living psychiatric clients. *Social Science & Medicine*, *54*(1), 93-104.
Lawrence, D., Hancock, K.J., Kisely, S. (2013). The gap in life expectancy from preventable physical illness in psychiatric patients in Western Australia: retrospective analysis of population-based registers. *BMJ* 346: f2539
Lawler R (2018). Vaporization startup Pax Labs introduces Juul, its next-gen e-cigarette. Techcrunch.com 2015. https://techcrunch.com/2015/04/21/pax-juul/ (Accessed June 14, 2018).
Lawn, S. J., Pols, R. G., & Barber, J. G. (2002). Smoking and quitting: a qualitative study with community-living psychiatric clients. *Social science & medicine*, *54*(1), 93-104.
Lee, J., Green, M. F., Calkins, M. E., Greenwood, T. A., Gur, R. E., Gur, R. C., et al. (2015). Verbal working memory in schizophrenia from the consortium on the genetics of schizophrenia (COGS) study: the moderating role of smoking status and antipsychotic medications. *Schizophrenia Research*, *163*(0), 24–31.
Lee, Y. O., & Kim, A. E. (2015). 'Vape shops' and 'E-Cigarette lounges' open across the USA to promote ENDS. *Tobacco control*, *24*(4), 410-412.
Lenzenweger, M. F. (2006). Schizotypy: an organizing framework for schizophrenia research. *Current Directions in Psychological Science*, *15*(4), 162-166.
Leonard, S., & Adams, C. E. (2006). Smoking cessation and schizophrenia. *American Journal of Psychiatry*, *163*(11), 1877.
Levy, D. T., Yuan, Z., Luo, Y., & Abrams, D. B. (2017). The relationship of E-cigarette use to cigarette quit attempts and cessation: insights from a large, nationally representative US survey. *Nicotine & Tobacco Research*, 1-9.
Lindson-Hawley, N., Aveyard, P., & Hughes, J. R. (2012). Reduction versus abrupt cessation in smokers who want to quit. *Cochrane Database of Systematic Reviews*, *14*(11).
Ling, P. M., &Glantz, S. A. (2005). Tobacco industry consumer research on socially acceptable cigarettes. *Tobacco Control*, *14*(5), e3-e3.
Lugo, A., Asciutto, R., Pacifici, R., Colombo, P., La Vecchia, C., & Gallus, S. (2015). Smoking in Italy 2013-2014, with a focus on the young. *Tumori Journal*, *101*(5), 529-534.
Lundbäck, B., Lindberg, A., Lindström, M., Rönmark, E., Jonsson, A. C., Jönsson, E., et al. (2003). Not 15 but 50% of smokers develop COPD? Report from the Obstructive Lung Disease in Northern Sweden studies. *Respiratory medicine*, *97*(2), 115-122.
MacDonald, A. W., & Chafee, M. V. (2006). Translational and developmental perspective on N-methyl-D-aspartate synaptic deficits in schizophrenia. *Development and Psychopathology*, *18*(3), 853-876.
Majeed, B. A., Weaver, S. R., Gregory, K. R., Whitney, C. F., Slovic, P., Pechacek, T. F., et al. (2017). Changing perceptions of harm of e-cigarettes among US adults, 2012–2015. *American journal of preventive medicine*, *52*(3), 331-338.
Mann-Wrobel, M. C., Bennett, M. E., Weiner, E. E., Buchanan, R. W., & Ball, M. P. (2011). Smoking history and motivation to quit in smokers with schizophrenia in a smoking cessation program. *Schizophrenia research*, *126*(1-3), 277-283.
Manzella F., Maloney, S. E., & Taylor, G. T. (2015). Smoking in schizophrenic patients: A critique of the self-medication hypothesis. *World J Psychiatry*, *5* (1), 35–46.
Manzoli, L., Flacco, M. E., Ferrante, M., La Vecchia, C., Siliquini, R., Ricciardi, W. (2017). Cohort study of electronic cigarette use: effectiveness and safety at 24 months. *Tobacco control*, *26*(3), 284-292.
McCloughen, A. (2003). The association between schizophrenia and cigarette smoking: a review of the literature and implications for mental health nursing practice. *International journal of mental health nursing*, *12*(2), 119-129.
McChargue, D. E., Gulliver, S. B., & Hitsman, B. (2002). Would smokers with schizophrenia benefit from a more flexible approach to smoking treatment? *Addiction*, *97*(7), 785-793.
McEvoy, J. P., Johnson, J., Perkins, D., Lieberman, J. A., Hamer, R. M., Keefe, R. S. (2006). Insight in first-episode psychosis. Psychological medicine, 36(10), 1385-1393.
McEwen, A. (2014). Standard Treatment Programme: A Guide to Behavioural Support for Smoking Cessation. National Centre for Smoking Cessation and Training. (2 nded.).
McEwan A, McRobbie H. (2016). Electronic cigarettes: a briefing for stop smoking services.
McRobbie, H., Bullen, C., Hartmann-Boyce, J., Hajek, P. (2014). Electronic cigarettes for smoking cessation and reduction (Review). *The Cochrane database of systematic reviews*, *12*, 17.
McRobbie, H., Phillips, A., Goniewicz, M. L., Smith, K. M., Knight-West, O., Przulj, D., et al. (2015). Effects of switching to electronic cigarettes with and without concurrent smoking on exposure to nicotine, carbon monoxide, and acrolein. *Cancer Prevention Research*, *8*(9), 873-878.
Mendrek, A., Bourque, J., Dubé, A., Lakis, N., & Champagne, J. (2012). Emotion processing in women with schizophrenia is menstrual cycle phase and affective valence dependent: an FMRI study. *ISRN psychiatry*, *2012*, 656274
Meurk, C., Ford, P., Sharma, R., Fitzgerald, L., & Gartner, C. (2016). Views and preferences for nicotine products as an alternative to smoking: A focus group study of people living with mental disorders. *International journal of environmental research and public health*, *13*(11), 1166.
Mexal, S., Berger, R., Logel, J., Ross, R. G., Freedman, R., & Leonard, S. (2010). Differential regulation of α7 nicotinic receptor gene (CHRNA7) expression in schizophrenic smokers. *Journal of molecular neuroscience*, *40*(1-2), 185-195.
Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., et al. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of behavioral medicine*, *46*(1), 81-95.
Miller, B. J., Wang, A., Wong, J., Paletta, N., & Buckley, P. F. (2017). E-cigarette use in schizophrenia: prevalence and attitudes. *Annals of Clinical Psychiatry*, *29*(1), 4-10.
Mitchell, A. J., Vancampfort, D., De Hert, M., & Stubbs, B. (2015). Do people with mental illness receive adequate smoking cessation advice? A systematic review and meta-analysis. *General hospital psychiatry*, *37*(1), 14-23.
Moerer-Urdahl, T., & Creswell, J. W. (2004). Using transcendental phenomenology to explore the "ripple effect" in a leadership mentoring program. *International Journal of Qualitative Methods*, *3*(2), 1-28.
Moheimani, R. S., Bhetraratana, M., Yin, F., Peters, K. M., Gornbein, J., Araujo, J. A., et al. (2017). Increased cardiac

sympathetic activity and oxidative stress in habitual electronic cigarette users: implications for cardiovascular risk. *JAMA cardiology*, *2*(3), 278-284.

Mooney, M. E., &Sofuoglu, M. (2006). Bupropion for the treatment of nicotine withdrawal and craving. *Expert Review ofNeurotherapeutics*, *6*(7), 965-81.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage.

Myles, N., Newall, H. D., Curtis, J., Nielssen, O., Shiers, D., & Large, M. (2012). Tobacco use before, at, and after first-episode psychosis: a systematic meta-analysis. *The Journal of clinical psychiatry*, *73*(4), 468–475.

National Institute of Mental Health (2016). Schizophrenia. Retrieved from https://www.nimh.nih.gov/health/topics/schizophrenia/index.shtml (Accessed May 27, 2019).

National Institute for Health and Care Excellence. (2011). Public health guidance scope: Tobacco: Harm-reduction approaches to smoking. London.

National Institute for Health and Care Excellence. (2013). Public Health Guideline 45Tobacco: Harm-reduction approaches to smoking. London.

Nuechterlein, K. H., Green, M. F., Kern, R. S., Baade, L. E., Barch, D. M., Cohen, J. D., et al. (2008). The MATRICS Consensus Cognitive Battery, part 1: test selection, reliability, and validity. *American Journal of Psychiatry*, *165*(2), 203-213.

Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things.* New York: Basic Books.

Novelli, M., Lopes Cardozo, M. T., & Smith, A. (2017). The 4Rs framework: Analyzing education's contribution to sustainable peacebuilding with social justice in conflict-affected contexts.

Novick, D., Haro, J. M., Suarez, D., Vieta, E., &Naber, D. (2009). Recovery in the outpatient setting: 36-month results from the Schizophrenia Outpatients Health Outcomes (SOHO) study. *Schizophrenia Research*, *108*, 223-230.

Nutt, D. J., Phillips, L. D., Balfour, D., Curran, H. V., Dockrell, M., Foulds, J., et al. (2016). E-cigarettes are less harmful than smoking. *Lancet*, *387*(10024), 1160-1162.

O'Brien, B., Knight-West, O., Walker, N., Parag, V., & Bullen, C. (2015). E-cigarettes versus NRT for smoking reduction or cessation in people with mental illness: secondary analysis of data from the ASCEND trial. *Tobacco induced diseases*, *13*(1), 5.

Ohtani, T., Levitt, J. J., Nestor, P. G., Kawashima, T., Asami, T., Shenton, M. E., et al. (2014). Prefrontal cortex volume deficit in schizophrenia: a new look using 3 T MRI with manual parcellation. *Schizophrenia research*, *152*(1), 184-190.

Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature mortality among adults with schizophrenia in the United States. *JAMA psychiatry*, *72*(12), 1172-1181.

Osborn, D.P., Levy, G., Nazareth, I., Petersen, I., Islam, A., King, M.B**.** (2007). Relative risk of cardiovascular and cancer mortality in people with severe mental illness from the United Kingdom's General Practice Rsearch Database. *Arch Gen Psychiatry*, *64*(2), 242-9.

OSSFAD. (2008). Osservatorio Droga Alcol e Fumo. Linee guida cliniche per promuovere la cessazione dell'abitudine al fumo.

OSSFAD. (2012). Osservatorio Droga Alcol e Fumo. Rapporto annuale sul fumo.

OSSFAD. (2016). Osservatorio Droga Alcol e Fumo. Rapporto annuale sul fumo.

OSSFAD. (2018). Osservatorio Droga Alcol e Fumo. Rapporto annuale sul fumo.

Osuna, E., Pérez-Carrión, A., Pérez-Cárceles, M. D., & Machado, F. (2018). Perceptions of health professionals about the quality of communication and deliberation with the patient and its impact on the health decision making process. *Journal of public health research*, *7*(3).

Owen, M. J., Sawa, A., & Mortensen, P.B. (2016). Schizophrenia. *Lancet*, *388*, 86-97.

Padgett, D. K. (2008). *Qualitative methods in social work research* (Vol. 36). Sage Publications.

Pankow, J. F., Kim, K., McWhirter, K. J., Luo, W., Escobedo, J. O., Strongin, R. M., et al. (2017). Benzene formation in electronic cigarettes. *PLoS ONE*, *12*(3).

Parikh, V., Kutlu, M. G., & Gould, T. J. (2016). nAChRdysfunctionas a common substrate for schizophrenia and comorbid nicotine addiction: Current trends and perspectives. *Schizophrenia research*, *171*(1-3), 1-15.

Partti, K., Vasankari, T., Kanervisto, M., Perälä, J. (2015). Lung function and respiratory diseases in people with psychosis: Population-based study. *The British Journal of Psychiatry. 207(1),* 37-45.

Patton MQ. (200). Qualitative research and evaluation methods. 3rd Sage Publications; Thousand Oaks, CA.

Pawlikowska, T., Zhang, W., Griffiths, F., van Dalen, J., & van der Vleuten, C. (2012). Verbal and non-verbal behavior of doctors and patients in primary care consultations–How this relates to patient enablement. *Patient education and counseling*, *86*(1), 70-76.

Peckham, E., Brabyn, S., Cook, L., Tew, G., &Gilbody, S. (2017). Smoking cessation in severe mentalill health: whatworks? anupdatedsystematic review and meta-analysis. *BMC psychiatry*, *17*(1), 252.

Pearson, J, L., Hitchman, S.C., Brose, L.S., Bauld, L., Glasser, A.M, Villanti, A.C et al. (2018). Recommended core items to assess e-cigarette use in population-based surveys. *Tobacco Control 27,* 341-346.

Pepper, J. K., Emery, S. L., Ribisl, K. M., Rini, C. M., & Brewer, N. T. (2015). How risky is it to use e-cigarettes? Smokers' beliefs about their health risks from using novel and traditional tobacco products. *Journal of behavioral medicine, 38(2),* 318–326.

Perez Mata, M., Ahmed-Kristensen, S., Brockhoff, P. B., & Yanagisawa, H. (2017). Investigating the influence of product perception and geometric features. *Research in Engineering Design, 28*(3), 357–379.

Perfetti, T. A., & Rodgman, A. (2013). *The chemical components of tobacco and tobacco smoke*. New York: NY CRC press

Polosa, R., Morjaria, J. B., Caponnetto, P., Campagna, D., Russo, C., Alamo, A., et al. (2014a). Effectiveness and tolerability of electronic cigarette in real-life: a 24-month prospective observational study. *Internal and emergency medicine, 9*(5), 537-546.

Polosa, R., Morjaria, J., Caponnetto, P., Caruso, M., Strano, S., Battaglia, E., et al. (2014b). Effect of smoking abstinence and reduction in asthmaticsmokers switching to electronic cigarettes: Evidence for harm reversal. *International journal of environmental research and public health*, *11*(5), 4965-4977.

Polosa, R., Morjaria, J. B., Caponnetto, P., Caruso, M., Campagna, D., Amaradio, M. D., et al. (2016a). Persisting long term benefits of smoking abstinence and reduction in asthmatic smokers who have switched to electronic cigarettes. *Discovery medicine*, *21*(114), 99-108.

Polosa, R., Morjaria, J. B., Caponnetto, P., Prosperini, U., Russo, C., Pennisi, A., et al. (2016b). Evidence for harm reduction in

COPD smokerswho switch to electronic cigarettes. *Respiratory research*, *17*(1), 166.

Polosa, R., Cibella, F., Caponnetto, P., Maglia, M., Prosperini, U., Russo, C., et al. (2017). Health impact of E-cigarettes: a prospective 3.5-year study of regular daily users who have never smoked. *Scientific reports*, *7*(1), 13825.

Potvin, S., Bourque, J., Durand, M., Lipp, O., Lalonde, P., Stip, E., … Mendrek, A. (2013). The neural correlates of mental rotation abilities in cannabis-abusing patients with schizophrenia: an FMRI study. *Schizophrenia research and treatment,* 543842.

Poulsen, L. H., Osler, M., Roberts, C., Due, P., Damsgaard, M. T., & Holstein, B. E. (2002). Exposure to teachers smoking and adolescent smoking behaviour: analysis of cross-sectional data from Denmark. *Tobacco control, 11(3),* 246–251.

Pratt, S. I., Sargent, J., Daniels, L., Santos, M. M., & Brunette, M. (2016). Appeal of electronic cigarettes in smokers with serious mental illness. *Addictive behaviors, 59*, 30-34.

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, *51,* 390-395.

Prochaska, J. J. (2011). Smoking and mental illness-breaking the link. *New England Journal of Medicine*, *365* (3), 196-198.

Pulvers, K., Emami, A. S., Nollen, N. L., Romero, D. R., Strong, D. R., Benowitz, N. L., at al. (2016). Tobacco consumption and toxicant exposure of cigarette smokers using electronic cigarettes. *Nicotine and Tobacco Research*, *20*(2), 206-214.

Purcell, S. M., Moran, J. L., Fromer, M., Ruderfer, D., Solovieff, N., & Roussos, P., et al. (2014). A polygenic burden of rare disruptive mutations in schizophrenia. *Nature*, *506* (7487), 185-90.

Rabin, R., & Charro, F. D. (2001). EQ-SD: a measure of health status from the EuroQol Group. *Annals of medicine*, *33*(5), 337-343.

Radding B (2015). Pax Juul: the iPhone of e-cigs? *Mens Fit* 2015

Rae, J., Pettey D., Aubry, T., Stol, J. (2015) Factors Affecting Smoking Cessation Efforts of People with Severe Mental Illness: A Qualitative Study. *Journal of Dual* Diagnosis, *11*(1), 42-49.

Randolph, C., Tierney, M. C., Mohr, E., & Chase, T. N. (1998). The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): preliminary clinical validity. *Journal of clinical and experimental neuropsychology*, *20*(3), 310-319.

Rass, O., Pacek, L. R., Johnson, P. S., & Johnson, M. W. (2015). Characterizing use patterns and perceptions of relative harm in dual users of electronic and tobacco cigarettes. *Experimental and clinical psychopharmacology, 23(6),* 494–503.

Ratschen, E., Britton, J., Doody, G. A., Leonardi-Bee, J., & McNeill, A. (2009). Tobacco dependence, treatment and smoke-free policies: a survey of mental health professionals' knowledge and attitudes. *General hospital psychiatry*, *31*(6), 576-582.

Rees, V. W., Kreslake, J. M., Wayne, G. F., O'Connor, R. J., Cummings, K. M., & Connolly, G. N. (2012). Role of cigarette sensory cues in modifying puffing topography. *Drug and alcohol dependence, 124*(1-2), 1–10.

Richardson, G., & Manca, A. (2004). Calculation of quality adjusted life years in the published literature: a review of methodology and transparency. *Health economics*, *13*(12), 1203-1210.

Riley, B. P., Makoff, A., Mogudi-Carter, M., Jenkins, T., Williamson, R., Collier, D., et al. (2000). Haplotype transmission disequilibrium and evidence for linkage of the CHRNA7 gene region to schizophrenia in Southern African Bantu families. *American journal of medical genetics*, *96* (2), 196-201.

Richtel, M. A. T. T. (2014). Selling a poison by the barrel: liquid nicotine for e-cigarettes. *New York Times*, *23*.

Roberts, E., Eden Evins, A., McNeill, A., & Robson, D. (2016). Efficacy and tolerability of pharmacotherapy for smoking cessation in adults with seriousmentalillness: a systematic review and network meta-analysis. *Addiction*, *111*(4), 599-612.

Robson, D., & Potts, J. (2014). Smoking cessation and mental health: A briefing for front-line staff.

Robson, D. & McEwen, A. (2018) Smoking cessation and smokefree policies: Good practice for mental health services. *National Centre for Smoking Cessation and Training (NCSCT).*

Royal College of Physicians, Royal College of Psychiatrists. Smoking and mental health. London, RCP, 2013.

Royal College of Physicians, Royal College of Psychiatrists. The prescribing of varenicline and vaping (electronic cigarettes) to patients with severe mental illness. London, RCP, 2016.

Russo, C., Cibella, F., Caponnetto, P., Campagna, D., Maglia, M., Frazzetto, E et al. (2016). Evaluation of post cessation weight gain in a 1-year Randomized Smoking Cessationn Trial of Electronic Cigarettes. *Scientific reports*, *6*, 18763.

Russell, M. A. H. (1974). Realisticgoals for smoking and health: A case for safer smoking. *The Lancet*. 1, 254-258

Sacco, K. A., Termine, A., Seyal, A., Dudas, M. M., Vessicchio, J. C., Krishnan-Sarin, S., et al. (2005). Effects of cigarette smoking on spatial working memory and attentional deficits in schizophrenia: involvement of nicotinic receptor mechanisms. *Archives of general psychiatry*, *62*(6), 649-659.

Saha, S., Chant, D., & McGrath, J. (2007). A systematic review of mortality in schizophrenia: is the differential mortality gap worsening over time? *Archives of general psychiatry*, *64*, 1123-1131.

Šagud, M., Mihaljević-Peleš, A., Mück-Šeler, D., Pivac, N., Vuksan-Ćusa, B., Brataljenović, T., et al. (2009). Smoking and schizophrenia. *PsychiatriaDanubina*, *21*(3), 371-375.

Sanford, Z., Goebel, M. D., & Lynne, J. (2014). E-cigarettes: an up to date review and discussion of the controversy. *West Virginia Medical Journal, 110*(4), 10-5.

Schneider, C. E., White, T., Hass, J., Geisler, D., Wallace, S. R., Roessner, V., et al. (2014). Smoking status as a potential confounder in the study of brain structure in schizophrenia. *Journal of psychiatric research, 50, 84-91.*

Schifferstein, H. N. J., & Zwartkruis-Pelgrim, E. P. H. (2008). Consumer-product attachment: Measurement and design implications. *International Journal of Design, 2*(3), 1-14.

Shahab, L., Goniewicz, M. L., Blount, B. C., Brown, J., McNeill, A., Alwis, K. U., et al. (2017). Nicotine, carcinogen, and toxin exposure in long-term e-cigarette and nicotine replacement therapy users: a cross-sectional study. *Annals of internal medicine*, *166*(6), 390-400.

Sharma, R., Wigginton, B., Meurk, C., Ford, P., & Gartner, C. E. (2017a). Motivations and limitations associated with lapin among people with mental illness: A qualitative analysis of Reddit discussions. *International journal of environmental research and public health*, *14* (1), 7.

Sharma, R., Gartner, C. E., Castle, D. J., & Mendelsohn, C. P. (2017b). Should ween courage smokers with severe mental illness to switch to electronic cigarettes? *Australian & New Zealand Journal of Psychiatry*, *51*(7), 663-664.

Siegel, R. L., Jacobs, E. J., Newton, C. C., Feskanich, D., Freedman, N. D., Prentice, R. L., et al. (2015). Deaths due to cigarette smoking for 12 smoking-relatedcancers in the United States. *JAMA internal medicine*, *175*(9), 1574-1576.

Siru, R., Hulse, G. K., & Tait, R. J. (2009). Assessing motivation to quit smoking in people with mental illness: a review. *Addiction*, *104*(5), 719-733.

Sleight, V. J. (2016). A brief history of the electronic cigarette. *J Lung PulmRespir Res.* 3(5), 1-2.

Smith, P. H., Mazure, C. M., & McKee, S. A. (2014). Smoking and mental illness in the US population. *Tobacco control*, *23* (e2), e147-e153.

Smith, R. C., Warner-Cohen, J., Matute, M. (2005). Effects of nicotine nasal spray on cognitive function in schizophrenia. *Neuropsychopharmacology*. *31,* 637–643.

Sokal, J., Messias, E., Dickerson, F.B., Kreyenbuhl, J., Brown, C., Goldberg, R.W., et al., (2004). Comorbidity of medical illnesses among adults with serious mental illness who are receiving community psychiatric services. *J. Nerv. Ment. Dis. 192*(6), 421–427.

Spindle, T. R., Hiler, M. M., Breland, A. B., Karaoghlanian, N. V., Shihadeh, A. L., & Eissenberg, T. (2016). The influence of a mouthpiece-based topography measurement device on electronic cigarette user's plasma nicotine concentration, heart rate, and subjective effects under directed and ad libitum use conditions. *Nicotine & Tobacco Research*, *19*(4), 469-476.

Spring, B., Pingitore, R., & McChargue, D. E. (2003). Reward value of cigarette smoking for comparably heavy smoking schizophrenic, depressed, and nonpatientsmokers. *American Journal of Psychiatry*, *160*, 316-322.

Song, F., Raftery, J., Aveyard, P., Hyde, C., Barton, P., & Woolacott, N. (2002). Cost-effectiveness of pharmacological interventions for smoking cessation: a literature review and a decision analytic analysis. *Medical Decision Making*, *22*(1), 26-37.

Stead, L. F., Perera, R., Bullen, C., Mant, D., Hartmann-Boyce, J., Cahill, K., et al. (2012) Nicotine replacement therapy for smoking cessation. *The Cochrane Database of Systematic Reviews*, CD000146.

St. Helen, G. S., Dempsey, D. A., Havel, C. M., Jacob III, P., & Benowitz, N. L. (2017). Impact of e-liquid flavors on nicotine intake and pharmacology of e-cigarettes. *178*, 391-398.

Steinberg, M. B., Zimmermann, M. H., Delnevo, C. D., Lewis, M. J., Shukla, P., Coups, E. J., & Foulds, J. (2014). E-cigarette versus nicotine inhaler: comparing the perceptions and experiences of inhaled nicotine devices. *Journal of general internal medicine*, *29*(11), 1444-1450.

Stephens, W. E. (2018). Comparing the cancer potencies of emissions from vapourised nicotine products including e-cigarettes with those of tobacco smoke. *Tobacco control*, *27*(1), 10.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research.* Thousand Oaks: Sage.

Streck, J. M., Bergeria, C. L., Parker, M. A., Davis, D. R., DeSarno, M., Sigmon, S. C., Higgins, S. T. (2018). Response to reduced nicotine content cigarettes among smokers with chronic health conditions. *Preventive medicine reports, 12,* 321–329.

Stringhini, S., Carmeli, C., Jokela, M., Avendaño, M., Muennig, P., Guida, F., et al. (2017). Socioeconomic status and the 25× 25 risk factors as determinants of premature mortality: a multicohort study and meta-analysis of 17 million men and women. *The Lancet*, *389* (10075), 1229-1237.

Strongin R. M. (2019). E-Cigarette Chemistry and Analytical Detection. Annual review of analytical chemistry (Palo Alto, Calif.), 12(1), 23–39.

Suzuki, T., Remington, G., Mulsant, B. H., Uchida, H., Rajji, T. K., Graff-Guerrero, A., et al. (2012). Defining treatment-resistantschizophrenia and response to antipsychotics: a review and recommendation. *Psychiatry research*, *197*, 1-6.

Szołtysek-Bołdys, I., Sobczak, A., Zielińska-Danch, W., Bartoń, A., Koszowski, B., &Kośmider, L. (2014). Influence of inhaled nicotine source on arterialstiffness. *Przegladlekarski*, *71*(11), 572-575.

Tajima-Pozo, K., de Castro Oller, M. J., Lewczuk, A., & Montañes-Rada, F. (2015). Understanding the direct and indirectcosts of patients with schizophrenia. *F1000 Research*, *4*, 182.

Tan, A. S., & Bigman, C. A. (2014). E-cigarette awareness and perceived harmfulness: prevalence and associations with smoking-cessation outcomes. *American journal of preventive medicine, 47*(2), 141–149.

Taylor, G., McNeill, A. &Girling, A. (2014). Change in mentalhealthafter smoking cessation: systematicreview and meta-analysis. *BMJ,* (vol. 348).

Tidey, J. W., Rohsenow, D. J., Kaplan, G. B., & Swift, R. M. (2005). Cigarette smoking to pography in smokers with schizophrenia and matched non-psychiatric controls. *Drug and Alcohol Dependence*,80 (2), 259-265.

Timothy, H.R., Walker, D.M., Mullen, D., Johnson, T.J., Ford, E.W. (2017). Trends in E-Cigarette Awareness and Perceived Harmfulness in the U.S. *American Journal of Preventive Medicine, 52*(3) 339-346.

Tobacco Atlas. The Tobacco Atlas. 5th ed. Atlanta, GA: American Cancer Society; 2015. Available at: http://www.tobaccoatlas.org/. (Accessed June 18, 2018).

Trainor, K., Leavey, G. (2017). Barriers and facilitators to smoking cessation among people with severe mental illness: a critical appraisal of qualitative studies. *Nicotine Tob Res, 19*(1),14–23.

Tran, E., Rouillon, F., Loze, J., Casadebaig, F., Philippe, A., Vitry, F. and Limosin, F. (2009), Cancer mortality in patients with schizophrenia. *Cancer*, 115: 3555-3562.

Tramacere, I., Gallus, S., Fernandez, E., Zuccaro, P., Colombo, P., & La Vecchia, C. (2009). Medium-term effects of the Italian smoke-free legislation: findings from four annual population-based surveys. *Journal of Epidemiology & Community Health, 63* (7), 559-562.

Truth Initiative. *What is JUUL?* Washington, DC: Truth Initiative, 2018. (Accessed June 13, 2018).

Tsoi, D. T., Porwal, M., & Webster, A. C. (2013). Interventions for smoking cessation and reduction in individuals with schizophrenia. *The Cochrane Database of Systematic Reviews*, *2.*

Tsuda, Y., Saruwatari, J., Yasui-Furukori, N. (2014). Meta-analysis: the effects of smoking on the disposition of two commonly used antipsychotic agents, olanzapine and clozapine. *BMJ Open, 4*:e004216.

Twyman, L., Bonevski, B., Paul, C., Bryant, J (2014). Perceived barriers to smoking cessation in selected vulnerable groups: A systematic review of the qualitative and quantitative literature. *BMJ Open, 4*(12).

Ulin, P. R., Robinson, E. T. & Tolley, E. E. (2004). Qualitative methods in public health: a field guide for applied research, Wiley. com.

US Department of Health and Human Services: Atlanta, GA: Centers for Disease Control and Prevention, (2004) The health consequences of smoking: a report of the surgeon general. Office of the Surgeon General (US), Office on Smoking and Health (US).

Ussher, M., Kakar, G., Hajek, P., West, R. (2016) Dependence and motivation to stop smoking as predictors of success of a quit attempt among smokers seeking help to quit. *Addict. Behav*, 53, 175–180.

Van Erp, T. G. M., Preda, A., Nguyen, D., Faziola, L., Turner, J., Bustillo, J., et al. (2014). Converting positive and negative symptom scores between PANSS and SAPS/SANS. *Schizophrenia research*, *152*(1), 289-294.

Vansickel, A. R., Cobb, C. O., Weaver, M. F., & Eissenberg, T. E. (2010). A clinicallaboratory model for evaluating the acute effects of electronic "cigarettes": nicotine delivery profile and cardiovascular and subjective effects. *CancerEpidemiology and Biomarkers & Prevention, 19*(8), 1945-1953.

Viegi, G., Pedreschi, M., Baldacci, S., Chiaffi, L., Pistelli, F., Modena, P., et al. (1999). Prevalence rates of respiratory symptoms and diseases in general population samples of North and Central Italy. *The International Journal of Tuberculosis and Lung Disease*, *3*(11), 1034-1042.

Volk, D. W., Austin, M. C., Pierri, J. N., Sampson, A. R., & Lewis, D. A. (2000). Decreased glutamic acid decarboxylase67 messenger RNA expression in a subset of prefrontal cortical γ-aminobutyric acid neurons in subjects with schizophrenia. *Archives of general psychiatry*, *57* (3), 237-245.

Walker, E. F., Grimes, K. E., Davis, D. M., & Adina, J. (1993). Child hood precursors of schizophrenia: facial expressions of emotion. *The American Journal of Psychiatry*, *150*, 1654-1660.

Walker, E. F., Savoie, T., & Davis, D. (1994). Neuromotor precursors of schizophrenia. *Schizophrenia bulletin*, *20*(3), 441-451.

Walker, E., Kestler, L., Bollini, A., & Hochman, K. (2004). Schizophrenia: etiology and course. *Annual Review Psychology*, *55*, 401-430.

Walker, E., & Tessner, K. (2008). Schizophrenia. *Perspectives on Psychological Science*, *3*(1), 30–37.

Wang, Y-Y., Wang, S., Zheng, W., Zhong, B-L., Ng, C.H., Ungvarie, G.S., Wang, C-X., Li, X-H., Xiang, Y-T. (2019) Cognitive functions in smoking and non-smoking patients with schizophrenia: A systematic review and meta-analysis of comparative studies. *Psychiatry Research,* 272, 155-163.

Wagener, T. L., Siegel, M., & Borrelli, B. (2012). Electronic cigarettes: achieving a balanced perspective. *Addiction*, *107*(9), 1545-1548.

Wailoo, A., Davis, S., & Tosh, J. (2010). The Incorporation of Health Benefits in Cost Utility Analysis Using the EQ-5D: A Report by the Decision Support Unit. *Sheffield: School of Health and Related Research, University of Sheffield*.

Watt, N. F. (1974). *Childhood and adolescent roots of schizophrenia.* In D. Ricks, A. Thomas & M. Roll (Eds.), Life history research in psychopathology (Vol. 3). Minneapolis: University of Minnesota Press

Wedzicha, J. A., & Donaldson, G. C. (2003). Exacerbations of chronic obstructive pulmonary disease. *Respiratory care*, *48* (12), 1204-1215.

Warner K. E. & Burns D. M. (2003). Hardening and the hard-core smoker: concepts, evidence, and implications. *Nicotine and Tobacco Res*, *5*, 37-48.

Weiner, E., Buchholtz, A., Coffay, A., Liu, F., McMahon, R. P., Buchanan, R. W., et al. (2011). Varenicline for smoking cessation in people with schizophrenia: a double-blind randomized pilot study. *Schizophrenia research*, *129*(1), 94-95.

West, R., McEwen, A., Bolling, K., & Owen, L. (2001). Smoking cessation and smoking patterns in the general population: a 1-year follow-up. *Addiction*, *96*(6), 891-902.

West, R., & Jarvis, M. (2005). Tobacco smoking and mental disorder. *Italian Journal of Psychiatry and Behavioural Science*, *15,* 10-17.

West, R., Hajek, P., Stead, L., & Stapleton, J. (2005). Outcome criteria in smoking cessation trials: proposal for a common standard. *Addiction*, *100*(3), 299-303.

West, R. (2009). The multiple facets of cigarette addiction and what they mean for encouraging and helping smokers to stop. *COPD: Journal of Chronic Obstructive Pulmonary Disease*, *6* (4), 277-283.

Wiium, N., Breivik, K., &Wold, B. (2006). The relationship between smoker role models and intentions to smoke among adolescents. *Journal of Youth and Adolescence, 35(4),* 549-560.

White, A.R., Rampes, H., Liu, J.P., Stead, L.F., Campbell, J. (2014). Acupuncture and related interventions for smoking cessation. *Cochrane Database of Systematic Reviews*, Issue 1.

Williams, J. M., Gandhi, K. K., Lu, S. E., Kumar, S., Shen, J., Foulds, J., et al. (2010a). Higher nicotine levels in schizophrenia compared with controls after smoking a single cigarette. *Nicotine & tobacco research*, *12* (8), 855-859.

Williams, J. M., Steinberg, M. L., Zimmermann, M. H., Gandhi, K. K., Stipelman, B., Budsock, P. D., et al. (2010b). Comparison of two intensities of tobacco dependence counseling in schizophrenia and schizoaffective disorder. *Journal of substance abuse treatment*, *38*(4), 384-393.

Williams, J. M., Gandhi, K. K., Lu, S. E., Kumar, S., Steinberg, M. L., Cottler, B., & Benowitz, N. L. (2011). Shorter interpuff interval is associated with higher nicotine intake in smokers with schizophrenia. *Drug and alcohol dependence*, *118*(2-3), 313–319.

Winterbourne, S. (2012). *Preventing future physicalmorbidity and premature mortality in firs- episode psychosis patients: an economic evaluation of smoking cessation interventions.* London, UK: MSc Thesis.

Witkiewitz, K., &Marlatt, G. A. (2004). Relapse prevention for alcohol and drug problems: that was Zen, this is Tao. *American Psychologist*, *59* (4), 224.

Woodberry, K. A., Giuliano, A. J., & Seidman, L. J. (2008). Premorbid IQ in schizophrenia: a meta-analytic review. *American Journal of Psychiatry*, *165*, 579-587.

World Health Organization, Cabral de Mello, M., Bornemann, T. H., Levav, I., Leff, J., Patel, V., & Saraceno, B. (2001). *Mental health: Call for Action by World Health Ministers*. *World Health Organization*. Retrieved from http://www.who.int/entity /mental_health/media/en/249.pdf. (Accessed May 27, 2018).

World Health Organization (WHO) (2003): *WHO Framework Convention on TobaccoControl*. Geneva: *WHO Press*.

World Health Organization (WHO) (2008). World Health Statistics 2008. www.who.int/whosis/whostat/ 2008/en. (Accessed April 1, 2018).

World Health Organization, (WHO) 2010). The International Classification of Diseases (ICD-10) Classification of Mental and Behavioural Disorders.

World Health Organization (WHO) (2012). WHO global report: Mortality attributable to tobacco.2012:392. http://whqlibdoc.Who.Int/publications/2012/9789241564434_eng.Pdf. (Accessed January 1, 2016).

World Health Organization (WHO) (2017). *World No Tobacco Day 2017: Beating tobacco for health, prosperity, the environment and national development.* http://www.who.int/mediacentre/news/releases/2017/no-tobacco-day/en/. (Accessed 25, November 2017).

World Health Organization (WHO) (2018). WHO global report: Mortality attributable to tobacco. 2012:392. http://www.who.int/gho/database/en/. (Accessed Febrary 11, 2018).

Yann, S. & Marina, R. (2008). Genetics of nicotinic acetylcholine

receptors: Relevance to nicotine addiction. *Biochemical Pharmacology,75,* 323–333.

Yan, X. S., & D'Ruiz, C. (2015). Effects of using electronic cigarettes on nicotine delivery and cardiovascular function in comparison with regular cigarettes. *Regulatory Toxicology and Pharmacology*, *71*(1), 24-34.

York, L.N. (1997). *A phenomenological investigation of cigarette smoking in persons with severe and persistent mental illness*. Doctoral dissertation, Saint Louis University, St Louis.

Zemann A. (2011) Smoke chemistry. In: Bernhard D, ed. Cigarette Smoke Toxicity. Weinheim: Wiley-VCH Verlag & Co. KGaA; pp. 55–64.

Zenzes, M. T. (2000). Smoking and reproduction: gene damage to human gametes and embryos. *Human Reproduction Update*, *6* (2), 122-131

Zhang, X. Y., Chen, D. C., Xiu, M. H., Haile, C. N., He, S. C., Luo, X., et al. (2013). Cigarette smoking, psychopathology and cognitive function in first-episodedrug-naivepatients with schizophrenia: a case-control study. *Psychological medicine*, *43* (8), 1651-1660.

Zhou, X., Nonnemaker, J., Sherrill, B., Gilsenan, A. W., Coste, F., & West, R. (2009). Attempts to quit smoking and relapse: factors associated with success or failure from the ATTEMPT cohort study. *Addictivebehaviors*, *34*(4), 365-373.

Zhu, S. H., Sun, J. Y., Bonnevie, E., Cummins, S. E., Gamst, A., Yin, L., & Lee, M. (2014). Fourhundred and sixty brands of e-cigarettes and counting: implications for product regulation. *Tobacco control*, *23*(3), 3-9.

Zhu, S. H., Zhuang, Y. L., Wong, S., Cummins, S. E., &Tedeschi, G. J. (2017). E-cigarette use and associated changes in population smoking cessation: evidence from US current population surveys. *The BMJ, 358*, j3262.

Ziedonis, D. M., Kosten, T. R., Glazer, W. M., & Frances, R. J. (1994). Nicotine dependence and schizophrenia. *Hospital & Community Psychiatry, 45*(3), 204-206.

Ziedonis, D. M., & George, T. P. (1997). Schizophrenia and nicotine use: report of a pilot smoking cessation program and review of neurobiological and clinical issues. *Schizophrenia Bulletin*, *23* (2), 247-254.

Ziedonis, D., Hitsman, B., Beckham, J. C., Zvolensky, M., Adler, L. E., Audrain-McGovern, J., et al. (2008). Tobacco use and cessation in psychiatric disorders: National Institute of Mental Health report. *Nicotine and tobacco research, 10*(12), 1691–1715.