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Summary and Keywords

Worldwide, tobacco use is a leading cause of morbidity and mortality. However, the health effects of smoking are reversible, making smoking cessation an important target for public health policy. Tobacco control is a field of public health science dedicated to reducing tobacco use and, thereby, to reducing cigarette-related morbidity and mortality. For tobacco control to be effective, it is necessary for policy makers to understand the personal and interpersonal factors which encourage people to smoke, factors which motivate smokers to quit (e.g., health, social pressure, cost), and the personal and population-level methods that are most effective at encouraging and prolonging attempts to quit. Research has identified that social norms, mental health, and individual personality factors are most associated with smoking uptake, so interventions which reduce social smoking (e.g., smoking bans, plain packaging) would be most effective at preventing uptake. Conversely, the use of cigarettes is maintained by nicotine addiction and attempts to quit are often motivated by health concerns, social pressure and the cost of tobacco products. As such, interventions that address physiological and behavioral addiction inherent in tobacco product use (e.g., nicotine replacement therapy combined with counselling), that create social pressure to stop (e.g., mass media campaigns), or that increase the cost of tobacco products are most likely to be effective at encouraging attempts to quit.

Keywords: smoking, cessation, addiction, intervention, population control

Psychological Aspects of Tobacco Control

Tobacco products come in many forms, including cigarettes, cigars, roll-your-own tobacco, pipe tobacco, snuff, chewing tobacco, and hookah (European Union, 2014). In high-income countries, cigarettes are the most commonly used tobacco products, so much of the research into tobacco control focuses on cigarettes. As such, they are also the focus of this article.

As of 2015, 1.1 billion (15%) adults world-wide smoked (World Health Organisation, 2016), most of whom live in low- and middle-income countries. However, tobacco products are also a concern for high-income counties, with 9.6 million adult smokers reported in the United Kingdom alone (Health & Social Care Information Centre, 2015). Cigarette smoke contains more than 4,600 chemicals, 60 of which are known carcinogens (WHO, 2004), and it is accountable for an estimated 30–40% of deaths among the middle-aged population. Life-long smoking reduces life expectancy by at least ten years (Doll, Peto, Boreham, & Sutherland, 2005). Smoking is also the primary cause of preventable illness world-wide (Samet, 2013). It is related to increases in the risk of lung cancer, respiratory disease, and heart disease, as well as an increased risk of stomach ulcers, other cancers (throat, mouth, bladder, kidney, stomach, pancreas), type 2 diabetes, cataracts, erectile dysfunction, arthritis, and stroke (US Department of Health and Human Services, 2004). Smoking is also related to an increase in the onset and severity of mental disorders (Cuijpers, Smit, ten Have, & de Graaf, 2007). As such, smoking also causes loss in quality of life. Moreover, the health and quality-of-life costs of smoking extend to passive smokers, that is, those affected by environmental tobacco smoke who themselves do not smoke. Non-smokers living with smokers have a 15% increased risk of smoking-related diseases compared with` those living in smoke-free homes (Hill, Blakely, Kawachi, & Woodward, 2004).

However, many of the health effects of smoking are reversible, once an individual stops smoking (West & Shiffman, 2016). Roughly 90% of smoking-related mortality can be avoided if smokers stop smoking before middle age (Peto et al., 2000), and stopping smoking at any age is beneficial to health. Reducing smoking prevalence therefore can be described as "the single most important preventable public health problem of modern society" (Shahab & Fidler, 2012). Tobacco control aims to address this problem.

Tobacco control is a field of public health science that aims to decrease tobacco use and, thereby, to reduce tobacco-related morbidity and mortality (Friend & Levy, 2002). Tobacco control involves preventing individuals from taking up smoking and encouraging smokers to quit and to maintain their ex-smoker status. To effectively control tobacco, it is necessary for policy makers to understand why people begin smoking, what motivates them to quit, and what methods are most effective at encouraging and prolonging attempts to quit. In this way, psychological research is imperative for developing an appropriate response to tobacco use. Psychological factors relevant to tobacco control, along with the interventions currently in place to curb cigarette use, are described in this article.

Smoking Uptake and Maintenance

Understanding why individuals take up and continue smoking is important to tobacco control. It allows researchers and policy makers to reduce the number of new adults who begin smoking and develop interventions which can effectively increase smokers' quit-rates. Furthermore, the factors that cause smokers to take up smoking are likely to be the same factors that make quitting difficult, and so the underlying features of tobacco use need to be understood.

Smoking uptake most commonly occurs in adolescence, although the age of onset has increased over time (ONS, 2016). Tobacco uptake in adolescents is related to several risk factors including age, sex, socioeconomic status, and smoking prevalence among peer groups and family members (Leonardi-Bee, Jere, & Britton, 2011). The maintenance of smoking behaviors is generally thought to be related to physiological addiction to nicotine.

Nicotine

Nicotine is a stimulant drug found in tobacco. When cigarette smoke is inhaled, nicotine-saturated tar droplets enter the lungs, from where nicotine is quickly absorbed into the blood stream and transported to the brain (Benowitz, 2010). As nicotine's chemical signature is similar to that of the neurotransmitter acetylcholine—a chemical used by the brain to trigger the production of, amongst other things, dopamine (Lagrue & Cormier, 2001)—when nicotine reaches the brain, it activates the acetylcholine receptors. This causes the release of dopamine, which is experienced by the smoker as relaxation, calmness, and alertness (Lagrue & Cormier, 2001).

Nicotine is an addictive substance. Addiction, or "drug dependence" is "a biological need for a drug, developed because of physiological adaptation to the drug in the system" (West & Shiffman, 2016). In the case of smoking, over time the body begins to depend less on acetylcholine to activate the acetylcholine receptors that leads to dopamine release, and the body then relies on nicotine instead (Rademacher et al., 2016). When the nicotine is withdrawn, the brain can no longer produce enough dopamine by itself. This creates nicotine withdrawal symptoms that can include irritability, anxiety, difficulty concentrating, restlessness, sleep disturbances, decreased heart rate, and increased appetite or weight gain (Brown et al., 2013). These symptoms typically last two to four weeks and vary in intensity depending upon the strength of the nicotine addiction (Schlam & Baker, 2013).

After quitting, the brain adapts to the lack of nicotine and reverts to the production and use of endogenous acetylcholine to activate receptors, so the physiological addiction to nicotine is erased (Rademacher et al., 2016). However, ex-smokers sometimes begin

smoking again even after they are no longer physiologically dependent on nicotine. This is because addiction also involves a level of learned dependence, developed through positive and negative reinforcement, also called operant conditioning (West & Shiffman, 2016). As inhaling nicotine triggers the release of dopamine, which causes a short-lived pleasant sensation. Therefore the smoker learns to associate cigarette smoking with feelings of relaxation and pleasure (positive reinforcement) and further cigarette use is encouraged (Picciotto & Mineur, 2014). In fact, dopamine specifically functions as a "global reward signal" (Schultz, 2015) to associate a stimulus or behavior with reward. Over time, repetition of the behavior (i.e., smoking) is therefore encouraged and becomes engrained. Conversely, abstinence from cigarettes causes unpleasant symptoms that are alleviated by the reuptake of smoking, so the smoker feels compelled to smoke to avoid punishment (negative reinforcement) (Picciotto & Mineur, 2014). In this way, cigarette smoking becomes a learned coping mechanism, which smokers fall back on in stressful situations (Pinto de Jesus et al., 2016), and the smoking behavior is enforced through behavioral dependence. When faced with stressful situations after quitting, it is therefore likely that a smoker will use cigarettes to alleviate stress.

While smoking is an addiction, in first-time smokers inhalation of cigarette smoke is generally an unpleasant experience which can result in coughing, sore throat, nausea, and dizziness (West & Shiffman, 2016). It can take several weeks for the body to adapt to the smoke and to begin to feel the rewarding, reinforcing effects of nicotine. As such, beyond the physiological response it takes external factors to become a smoker (West & Shiffman, 2016). One such factor is social pressure.

Social Norms

According to social learning theory (Bandura, 1977), behaviors are learned through the observation and modeling of others—such as family or friends. The likelihood of behavioral modeling occurring is greater the more contact the individual has with a person, and the more intimate their relationship is. As such, younger children are likely to imitate their parents, while older adolescents may be more likely to imitate close friends or sexual partners (Kobus, 2003). Behavioral modeling has been observed in relation to smoking initiation (Scalici & Schulz, 2014).

Overwhelmingly, exposure to cigarette smoking by family and friends is related to smoking initiation and the development of tobacco addiction (Kobus, 2003). A systematic review estimated that in England and Wales, around 17,000 young people take up smoking each year as a consequence of exposure to household smoking, with the likelihood increasing the more family members smoked (Leonardi-Bee et al., 2011). However, there are likely many mechanisms through which adolescents come to initiate smoking other than imitation alone. For example, parental smoking habits may affect smoking uptake by normalizing smoking as a behavior (Scalici & Schulz, 2014) and by giving children access to cigarettes (intentionally or not) from an early age. Parents who

smoke are also less likely to view smoking as a negative behavior in their children, so their children could feel free to experiment with cigarettes and would be less likely to be encouraged to quit (Kobus, 2003).

Parents are also likely to have a role in shaping intention to use tobacco before the onset of smoking behavior. A parent's attitude toward smoking (e.g., permissive/intolerant) affects how a child values smoking as a behavior from an early age (Öztürk, Kahraman, & Bektas, 2013). Early attitudes toward tobacco can then translate into adolescent friend selection, such that adolescents choose friends with similar behaviors and values (e.g. smoking/non-smoking) (Kobus, 2003) and are therefore more (or less) likely to alter their smoking behavior to fit in with their social group.

Many adolescents in communities where smoking is prevalent report experiencing an internal, normative, pressure to smoke (Kobus, 2003), such that they perceive smoking to be a desirable behavior and therefore take up smoking in an effort to fit in. For example, smoking uptake has been found to be higher in students who move to schools with higher smoking prevalence (Molyneux et al., 2004). Similarly, non-smokers who affiliate with smokers are more likely to transition to tobacco use than those who do not, and they tend to adapt to the smoking behaviors (cigarettes smoked per day, puff frequency) of their current social group (Kobus, 2003). Smoking rates are also influenced by social norms; women are still less likely to smoke than men, and smoking is more prevalent in lower socioeconomic groups (Hiscock, Bauld, Amos, Fidler, & Munafò, 2012), which suggests a level of social normalization in smoking behavior. Nevertheless, it is difficult to say for sure whether this effect is a result of internalized social pressure, increased access to cigarettes, and/or permissive smoking attitudes within the social group.

Mental Health and Personal Predisposition

Mental Health

While smoking rates in many high-income countries are decreasing in the general population, smoking rates have stagnated in adults with common mental disorders (Center for Disease Control and Prevention, 2012). For example, the most common mental disorders in the United Kingdom are anxiety and depression (Office of National Statistics, 2007) and, within these, smoking rates are reported at 37% and 36% respectively (McManus, Meltzer, & Campion, 2010), compared with 19% in the general population (West & Brown, 2016).

Several factors may account for this difference in smoking prevalence. Adults with mental health issues report self-medicating with tobacco to manage psychological distress (Rowley, Lawn, & Coveney, 2015), as well as a greater feeling of reward from nicotine intake (Allan, 2013), and they are consequently unwilling to quit. Many also experience stronger addiction to nicotine (Royal College of Physicians & Royal College of Psychiatrists, 2013), more severe withdrawal symptoms (Weinberger, Desal, & McKee,

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2010), and higher rates of relapse after attempting to quit than the general smoking population (Lukowski, Morris, Young, & Tinkelman, 2015). This may contribute to lower quit success rates and therefore higher overall prevalence. Alternatively, some researchers argue that this increase in smoking rates is related to the higher rates of mental illness in adults of low socioeconomic status (Lê Cook et al., 2014) and that, consequently, this difference in prevalence rates reflects sociological differences in the prevalence, availability, and perceived acceptability of smoking.

Tobacco use has also been found to increase the risk of mental disorders developing (Cuijpers et al., 2007), so it is likely that this relationship is bidirectional in nature, and/or related to common causal factors such as substance use and personal characteristics.

Substance Use

Illicit drug users are another sub-population in which the prevalence of smoking has traditionally been high (Fraser, Gartner, & Hall, 2014). One explanation for this is through the Gateway Hypothesis. This depicts a developmental process of substance use whereby users start with "soft," "gateway drugs" (e.g., alcohol, tobacco) that are easily accessible and lead to "hard" drug use (e.g., cocaine, heroin) through an increasingly permissive attitude to drug use and reliance on substance abuse as a coping mechanism (Kandel & Kandel, 2014). Alcohol use has similarly been identified as a gateway to smoking uptake (Kirby & Barry, 2012) and may, furthermore, inhibit smokers' attempts to quit by lowering inhibition and acting as a "trigger" for smoking behaviour thus cementing the relationship between smoking and substance use.

However, there are alternative explanations for this relationship. First, "soft" substances may simply be more accessible (Degenhardt et al., 2010), so they are likely to be explored first by individuals with a propensity for substance use. Additionally, in communities and social groups where "soft" substances are accessible and acceptable, it is likely that attitudes are also lenient toward "hard" substances (known as "common liability"), so the opportunity for progression is available (Fraser et al., 2014).

Personality Factors

It is also possible that adolescents who take up smoking may have irreverent attitudes toward substance use as a whole; especially as many begin before the legal smoking age. For example, smoking uptake has been related to a risk-taking predisposition (Degenhardt et al., 2010) as well as sensation seeking, depressive, and delinquent behaviours (Kirby & Barry, 2012). It is possible therefore that smoking uptake may also be influenced by personality, but it is just as likely that both smoking and personality are influenced by environment such that adolescents in a high-stress environment (e.g., high violent-crime rates) with low social engagement are likely to seek out rapid coping mechanisms such as smoking and destructive behavior (Uphoff, Pickett, Cabieses, Small, & Wright, 2013).

Smoking Cessation

Even with the presence of social pressure, predisposition, and addiction, the majority of current smokers (including those with mental health issues) report that they would like to quit smoking (Rafful, García-Rodríguez, Wang, Martínez-Ortega, & Blanco, 2013). Of those that do, the most common reasons for quitting are health, social pressure, and monetary cost (Tulloch, Pipe, Clyde, Reid, & Els, 2015).

Health

Health is the most commonly reported motivator for quitting smoking. It can motivate attempts to quit through several health-related concerns, including (a) concern over one's present health risk (e.g., in relation to current symptoms), (b) concern over one's future health risk (e.g., a desire to improve one's health), and (c) illness or death of a family member or friend due to smoking (McCaul et al., 2006; Gallus et al., 2013). As such, health is reported more often as a motivator with increasing age, and in smokers who consume more cigarettes per day (Schlam & Baker, 2013; Gallus et al., 2013). Indeed, smokers who report being ready to quit smoking are often more aware of the health risks of smoking, more concerned about the effect of smoking on their own health, and more likely to have a smoking-related medical condition than the general smoking population (Schlam & Baker, 2013).

So why is health such a strong motivator for quit behavior? According to the Health Belief Model (Rosenstock, 1974), individuals engage in health-related behaviors when their perceived susceptibility to illness, the perceived severity of said illness, and the benefits of the health behavior outweigh the perceived barriers. Similar assumptions are made in the Protection Motivation Theory in relation to responses to fear appeals (Rogers, 1975). In this instance, it seems likely that smokers are responding to a perceived increase in vulnerability to sickness (McCaul et al., 2006). While the actual risk of smoking-related morbidities has not changed, the presence of symptoms causes the smoker to re-assess their personal level of risk. Should this level rise above the perceived difficulty of quitting then it motivates a change in behavior (e.g., to quit smoking). In cases of severe illness, such as cancer, the severity of the risk, and the benefits of quitting are likely to be even more salient. Similarly, the presence of ill health in a close family member or friend who smokes makes the possibility of illness appear to be more salient and motivates concern over the smoker's own health.

Given that concerns about health promote smoking cessation, the dissemination of knowledge regarding the harmful effects of smoking may be an important motivator for attempts to quit (Gallus et al., 2013). Health professionals, for example, are well placed to quantify the personal health risks of smoking to individuals, and to deliver smoking

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cessation advice at a time when smokers may therefore be strongly motivated to quit (Schlam & Baker, 2013).

Social Pressure and Social Norms

As in smoking uptake, social pressure affects the likelihood of an individual attempting to quit smoking. Social pressure is, in fact, the second most prevalent reason given for quitting smoking. This mainly relates to family pressure, but encouragement from friends, stigma, and conscientiousness regarding the effects of second-hand smoke have also been identified as motivating factors (Gallus et al., 2013).

The opinion of partners and family strongly influences a smoker's motivation to quit, as well as the likelihood of maintaining a successful attempt to quit (Caponnetto & Polosa, 2008). An important factor which contributes to this difference is the level of social support available for quitters. Quitting smoking is a difficult process which requires individuals to address a physiological addiction, as well as their own habitual behaviors. Social support is an important coping resource, which aids in the development of health-related behaviors by boosting feelings of confidence and create a buffer to psychological distress, as well as providing physical support (Diemert, Bondy, Brown, & Manske, 2012). In other words, a sympathetic social group can provide smokers with both emotional and instrumental support with their attempt to quit (Burns, Rothman, Fu, Lindgren, & Joseph, 2014). On the other hand, a family member who is critical of a smoker, either in relation to their smoking habit or attempt to quit, is likely to create more stress for the smoker who is then more likely to fall back on cigarettes as a coping mechanism (Walker & Loprinzi, 2014).

While difficult to distinguish from quit support, the presence of smoking as behavior with the smoker's social group is also likely to affect their motivation to quit. Smokers have been found to be less likely to quit smoking when other smokers are present in their household or social group (Walker & Loprinzi, 2014) and are more likely to remain abstinent when their partner also quits smoking (Caponnetto & Polosa, 2008). This could reflect the difficulty of quitting when smoking "cues," such as cigarettes, cigarette packets, and cigarette smoke are present in the immediate environment (Schlam & Baker, 2013). Alternatively, these differences in cessation rates could reflect the perceived acceptability of smoking in the social circle. As highlighted in the Theory of Planned Behavior (Ajzen, 1985), subjective norms influence an individual's intention to alter their behavior. Should smoking be perceived negatively within a social group, the behavior will become less valued by the smoker themselves and cessation intention will become more likely (Walker & Loprinzi, 2014). Alternatively, should smoking be a valued behavior, then smokers will experience less motivation to quit and intention will remain low. As smoking is increasingly becoming a stigmatized activity, smokers are more likely to experience

negative feelings about their smoking status (Tombor, Shahab, Brown, & West, 2013) and social pressure is likely to become a stronger cue to quit.

Cost of Smoking

The economic cost of smoking is less often reported as a motivator, and it does vary depending on the income and taxation rates present in the country under examination (Gallus et al., 2013). At the simplest level, the more expensive tobacco substances become, the fewer tobacco products smokers can afford to buy and the more comparative wealth they stand to gain by quitting (Sindelar & O'Malley, 2014). Therefore, increases in tobacco product pricing may encourage attempts to quit, or at least to reduce nicotine intake. However, this predominantly affects younger, lower-income smokers (Jha & Peto, 2014), who have been reported to be two to three times more responsive to price changes than older adult smokers (Chaloupka, Yurekli, & Fong, 2012).

The cost of nicotine replacement therapies may also come into this decision. If the cost of quitting becomes higher than that of smoking, the motivation to quit is likely to be low (Jardin et al., 2014). Alternatively, should a financial incentive be related to quitting, more smokers may be motivated to quit. For example small payments, or "quit to win" schemes do appear to improve smoking cessation rates (Sindelar & O'Malley, 2014), although their efficacy is difficult to monitor at a population level.

Individual-Level Interventions

Regardless of motivation to quit, many smokers still do not initiate an attempt to quit, or they relapse soon after starting (Smit, Hoving, Schelleman-Offermans, West, & de Vries, 2014). Fewer than 5% of unaided attempts to quit last 12 months or longer (West, May, West, Croghan, & McEwan, 2013). As such, stop-smoking aids that can maintain abstinence are crucial to tobacco control.

Generally, the most effective stop-smoking aids can be divided into two groups: pharmacological and behavioral support (Schlam & Baker, 2013). Pharmacotherapy assists in reducing cravings and reducing the symptoms of nicotine withdrawal. Behavioral support can focus on (a) increasing a smoker's motivation to quit, (b) reducing nicotine intake and/or (c) aiding in the attempt to quit itself. Both approaches are considered to be effective; in terms of cost-effectiveness and in preserving population health (West, McNeill, & Raw, 2000) but are most effective when offered together (Michie, Hyder, Walia, & West, 2011) as recommended by most healthcare guidelines (Cahill, Stevens, Perera, & Lancaster, 2013).

Pharmacological Support

Prescription Medications

The most common prescription-only medications prescribed to aid in smoking cessation are bupropion and varenicline. Varenicline is a chemical which binds with and activates nicotine receptors in brain, thus mimicking the effects of nicotine on the body (Chirila, Ghita, & Fulga, 2015), albeit more weakly. It not only controls the effects of nicotine withdrawal but also "tricks" the brain into believing that nicotine has been absorbed, thus reducing cigarette cravings. In addition, nicotine absorbed through smoking will find the receptors blocked, so will have no further effect. As such, the association between smoking and pleasure will be weakened. However, varenicline can frequently cause side effects like insomnia, headaches, nausea, and increased appetite (Beard, Shahab, Cummings, Michie, & West, 2016) and is therefore only available on prescription in the United Kingdom. Varenicline is currently considered to be the most effective pharmacological support for smoking abstinence (Mills, Wu, Spurden, Ebbert, & Wilson, 2009), with smokers being reported as three times as likely to quit with varenicline compared with placebo treatment (Cahill et al., 2013).

Bupropion increases the release of dopamine in the body, thus reducing its physiological reliance on nicotine and producing a behavioral reward similar to smoking (Beard et al., 2016). Therefore, it increases the likelihood of a successful attempt to quit by removing the body's need for nicotine, both to function and as a reward mechanism. As it prevents a crash in dopamine levels following nicotine withdrawal, it also moderates the unpleasant symptoms associated with quitting (Chirila et al., 2015). As a nicotinic antagonist, it prevents nicotine from binding with receptors in the brain (Carroll et al., 2014). Like the effects of varenicline, this results in a lowered pleasure response to smoking and therefore reduces positive reinforcement, which can make it easier for smokers to motivate themselves to quit. Compared with a placebo treatment, bupropion can double the likelihood of a successful attempt to quit (Wu, Wilson, Dimoulas, & Mills, 2006), but its use has been related to an increased risk of epileptic seizures, which caused the Food and Drug Administration to recommend it to be withdrawn from the market, followed by a return to the market at a lower recommended dosage.

Nicotine Replacement Therapy

Nicotine replacement therapy (NRTs) comprises any medication that releases nicotine into the bloodstream without the use of smoking products. In the United Kingdom and other countries, it can be obtained over the counter or via prescription and is available in many forms (nicotine patch, gum, inhaler, nasal and mouth spray, film and lozenge). NRTs work by temporarily replacing cigarettes as a mode of nicotine intake, thus reducing the urge to smoke and lessening nicotine withdrawal symptoms (Stead et al., 2012). Therefore, they are useful for reducing tobacco dependence at the beginning of an attempt to quit, for preventing lapses in cessation, and for enabling long-term abstinence. They can be especially useful in long-term smokers with severe tobacco dependence who are

otherwise at heightened risk of withdrawal symptoms and relapse (West et al., 2000). Furthermore, NRTs can be used as tools to reduce smoking rates, rather than quit outright, which increases the likelihood of attempting (and succeeding at) future attempts to quit (Schlam & Baker, 2013). As such, they are part of the "harm reduction" paradigm for limiting the health effects of cigarette smoke in smokers who do not wish to quit (Beard et al., 2011).

As NRTs are (in many countries) available without prescription, they are easy for smokers to attain. They also require little time commitment or external aid to be used effectively, which makes them a convenient quitting tool. It is unsurprising, therefore, that they are the most commonly reported stop smoking aid amongst smokers attempting to quit (reported by 30–40% of quit attempters) (West & Brown, 2016). The use of these products has been found to increase the likelihood of an attempt to quit among adherent smokers trying to quit by 50–70% compared to attempting to quit without any support (Stead et al., 2012).

Adherence is the primary limitation of NRTs as a stop-smoking aid. Data from the International Tobacco Control (ITC) Four-Country Survey, for example, showed that 71.4% of smokers discontinue NRTs prematurely—before the time advised by their doctors (Balmford, Borland, Hammond, & Cummings, 2011). As with any medication, the use of NRTs requires a level of self-management and motivation that may not always be present in smokers. Indeed, NRTs cannot improve smokers' motivation to quit, although they can alleviate the symptoms that were perceived as barriers to quitting, thus improving self-efficacy. Furthermore, as NRT replaces the source of nicotine, rather than eliminating the addiction, early cessation of NRT use can still result in withdrawal symptoms, and is related to an increased rate of relapse (Balmford et al., 2011).

E-Cigarettes

The poor adherence apparent in NRT is at least partially mitigated by the newest form of non-combustible nicotine delivery devices: e-cigarettes. As well as a source of nicotine, e-cigarettes offer smokers a similar sensory experience to cigarette smoking: the nicotine is inhaled in a similar way, and vapor is exhaled (Brown, Beard, Kotz, Michie, & West, 2014). This may fulfill the habitual behaviors associated with smoking and therefore alleviate some of the issues of adherence by replacing cigarettes as a coping mechanism.

E-cigarettes are increasing rapidly in popularity among smokers, with prevalence of use increasing from approximately 3% in 2011 to 36% in 2016 in the U.K. population (West & Brown, 2016). E-cigarettes appear to aid in smoking cessation (Bullen et al., 2013; Caponnetto et al., 2014), with some studies reporting higher rates of smoking cessation in e-cigarette users compared to smokers using NRTs (Brown et al., 2014). While the health effects of e-cigarettes have yet to be conclusively determined, it appears that the toxic effects are far lower than from smoking cigarettes (McNeill et al., 2015). E-cigarettes are therefore likely a useful intervention for nicotine addiction (West, Shahab, & Brown, 2016).

Behavioral Support

Behavioral support can take the form of advice, discussion, encouragement, and activities designed to help attempts to quit to succeed. Behavioral support is an extremely diverse field, with 94 separate methods of behavioral support being identified (Michie, Churchill, & West, 2011). While behavioral interventions do not directly treat nicotine addiction, they do aid in reducing the habitual response of smoking, in developing nonsmoking behaviors, and in coping with the stress of quitting. Essentially, behavioral interventions can be considered to have four main aims: (a) to increase motivation to quit, (b) to promote methods of quitting, (c) to improve the smoker's ability to quit (e.g., through self-regulation), and (d) to increase their adherence to interventions (Michie et al., 2011). This can include a wide variety of individual components and approaches: advising on stress reduction and avoidance of high-risk situations; the development of effective coping strategies; initiating action planning; explaining how medication works; and tackling concerns regarding medication use.

Smoking abstinence rates have been estimated to be 2.3 times higher among smokers attending behavioral support interventions, compared with control groups (Shahab & Fidler, 2012). These interventions can be individual, group-based or electronic (e.g., telephone counselling) in design, and all have been shown to increase smoking abstinence rates (Hartmann-Boyce, Stead, Cahill, & Lancaster, 2014). Behavioral support commonly involves multiple sessions laid out over a long period of time, with longer, more intensive interventions showing the greatest improvements in smoking cessation (Schlam & Baker, 2013). This does, however, mean that behavioral support requires a high level of motivation and time from the smoker, which may not always be available and may explain why few smokers attend face-to-face smoking-cessation sessions (Schlam & Baker, 2013).

The research into behavioral support is limited in the efficacy of specific components of support. It is extremely rare to find interventions that do not use overlapping therapies and approaches. It is therefore almost impossible, given the large number of components involved in any behavioral intervention, to identify which specific modules are effective as tobacco control measures (Michie et al., 2011). Consequently, it is difficult to determine which components could be removed to develop shorter and more accessible interventions.

Very Brief Advice

Short interventions can be effective smoking cessation aids (Stead & Lancaster, 2012) and may be more accessible to a greater number of smokers. For instance, Very Brief Advice (VBA) on smoking has been effective in triggering attempts to quit in smokers while requiring a minimal time investment. VBA interventions are behavioral' counselling interventions that general practitioners and allied health professionals are encouraged to provide to patients who smoke. They typically involve five minutes or less in which the general practitioner asks the patient whether they use tobacco, advises them to quit smoking, and offers NRTs and/or referral to other quit aids if the patient is willing to quit (West et al., 2000). This is also known as the 'Five A's' (i.e., ask, advise, assess, assist, and arrange) (Stead & Lancaster, 2012). VBA interventions have been related to a 40%–60% increase in smoking cessation attempts (Aveyard, Begh, Parsons, & West, 2012), presumably because they act as a "trigger" event for quitting, coupled with a definitive offer of support. While VBA interventions may not appear to be useful for improving quit success, with only 1–3% of smokers receiving this advice going on to quit for at least six months (Schlam & Baker, 2013), they offer a means of engaging a large population, and in actual numbers, they are likely to impact a large number of smokers.

However, general practitioners also appear unwilling to give VBA, with only about 30% of smokers reporting that they receive advice to quit annually (Aveyard et al., 2012). This unwillingness generally stems from a lack of time to bring up smoking with a patient as well as feelings that the patient will not respond positively to uninvited advice (Schlam & Baker, 2013). Therefore, while healthcare providers are important agents for encouraging attempts to quit and providing access to quit aids at a time when health concerns may motivate smokers to quit, VBA may still not be greatly utilized as a form of tobacco control.

Population-Level Interventions

Despite the range of stop-smoking aids available, roughly half of all smokers attempting to quit do so unaided (Williams, Beebe, & Neas, 2015). As such, population-level tobacco control is also indispensable. At a population level, tobacco can be controlled more broadly by reducing the population's access to tobacco products, the prevalence of smoking within social situations, and the appeal of tobacco products to potential smokers (U.K. Department of Health, 2011). Population-level control predominantly occurs through taxation, smoking bans, and restricted cigarette advertisement.

Taxation

The simplest form of population-level tobacco control comes in the form of taxes on tobacco products. This method relies on the fact that the more expensive tobacco substances are, the fewer smokers can afford to buy them. Population studies from high-income countries repeatedly report that cigarette sales decline following an increase in tax, with a 10% increase in tax being related to a 3–5% reduction in cigarette consumption (Centers for Disease Control and Prevention, 2012). Furthermore, increasing the cost of cigarettes has been found to help prevent young adults from becoming regular smokers (Jha & Peto, 2014) and to trigger attempts to quit (whether successful or not) within current smokers (Chaloupka et al., 2012; Choi & Goyle, 2013).

However, taxation does not address the addiction inherent in smoking. It assumes that cigarette consumerism is based on logical decision making rather than physiological dependence. When nicotine addiction is taken into account, it is not surprising that taxation induces cessation in smokers who report lower cigarette consumption and is less useful against seasoned smokers (Choi & Goyle, 2013). Furthermore, smokers with mental health issues sometimes choose to spend money on cigarettes instead of essentials, such as food, because they perceive nicotine as more indispensable to their quality of life (Snyder, McDevitt, & Painter, 2008). Other studies have found that while cigarette consumption may decrease with taxation, nicotine inhalation does not: smokers simply smoke fewer cigarette more intensively, or they switch to cheaper products (West & Shiffman, 2016). In the United Kingdom and the United States, for example, it is estimated that smokers receive an average of one milligram of nicotine per cigarette, but they can obtain as much as six times this amount by puffing more frequently and deeply (West & Shiffman, 2016). As such, tobacco taxation does have limitations to its impact on population health.

Smoking Bans

Smoking bans (e.g., the ban of smoking in indoor areas) reduce the health detriments of second-hand smoke (Callinan, Clarke, Doherty, & Kelleher, 2010) and are therefore effective at reducing smoking-related morbidity and mortality. For example, reductions in hospital admissions due to cardiac events have been recorded following smoking bans in several countries (Meyers, Neuberger, & He, 2009). Smoking restrictions are also, unsurprisingly, related to reduced daily nicotine consumption among smokers (Borland, Chapman, Owen, & Hill, 1990). This reduction is directly related to nicotine intake, such that heavier smokers report larger reductions in consumption (Borland et al., 1990). Furthermore, smoking bans have the additional benefit of reducing the pervasiveness of smoking in a social context; and therefore the likelihood of uptake due to imitation or social pressure (Odermatt & Stutzer, 2015; Mathur, Stigler, Erickson, Perry, & Forster, 2014). As such, it is unsurprising that these bans have been taken up by an increasing number of countries, including the United Kingdom, and are increasingly including outside areas, too (Kennedy, Zummach, Filsinger, & Leatherdale, 2014)

The limitation of this approach is that there is no consistent evidence that smoking bans reduce overall smoking prevalence (Callinan et al., 2010). While there have also been concerns that smokers would smoke more in their homes to off-set the loss of cigarette time, thus exposing their families to more second-hand smoke, this assertion has not been found (Mons et al., 2013).

Advertising Restrictions

In the United Kingdom, restrictions have been in place for tobacco-related advertising since 2003. Previously, these restrictions resulted in cigarette packaging becoming the most prominent medium for marketing (Song, Brown, & Glantz, 2014), and thus also a prominent medium for tobacco control. Including health warnings on packaging, for example, has been found to emphasize the health risks of smoking and reduces the attractiveness of smoking to young adult smokers, with larger and more graphic warnings resulting in stronger cessation effects (Hoek, Wong, Gendall, Louviere, & Cong, 2011; Hammond, White, Anderson, Arnott, & Dockrell, 2013). Similarly, mass media campaigns highlighting the health effects of smoking have been found to promote smoking cessation at a population level (Durkin, Brennan, & Wakefield, 2012).

Tobacco companies are conscious that their consumers are aware of, and concerned about, the health risks of smoking (Hammond & Parkinson, 2009), and have developed "healthier" products to appease their consumer's fears. For example, in the 1950s they offered "filter" cigarettes, which claimed to prevent harmful chemicals and tar from escaping the cigarette, thus giving smokers an apparently healthier alternative to quitting altogether (Hammond & Parkinson, 2009; Mutti et al., 2011). Smokers appear to rate packages depicting filters as having fewer health risks than those without (Cummings, Hyland, Bansal, & Giovino, 2004; Hammond & Parkinson, 2009), despite the fact that scientific trials have found that this is not the case (Schulz, Gerber, & Groneberg, 2016).

Research into cigarette marketing has also identified that the use of adjectives and colors affect consumer's beliefs about the harmfulness of cigarettes brands. For example, brands labeled as "smooth" are considered to be less harmful and to deliver less tar (Hammond, Daniel, & White, 2013; Hammond & Parkinson, 2009) while the colors used on cigarette packs affect the perceived quality of the cigarettes—including health risks, tar content, and ease of quitting (Hammond, Dockrell, Arnott, Lee, & McNeill, 2009). Cigarettes packaged in lighter, feminine colors (e.g., purple, white, light yellow) are perceived by consumers as less harmful than regular brands (Doxey & Hammond, 2011). Research into the effects of color have shown that these lighter colors convey freshness, femininity, purity, and cleanliness (Doxey & Hammond, 2011), which may undermine the message of health warning labels.

Moreover, the colors and patterns used on cigarette packs relate to the image that smokers are attempting to portray (Moodie, Mackintosh, Hastings, & Ford, 2011); especially as cigarette packages have a high degree of social visibility during use (Doxey & Hammond, 2011). When packaging is replaced with plain colors (e.g., brown), smokers report feeling more embarrassed and less accepted by their social group (Moodie et al., 2011). Indeed, removing color and brand descriptors from packaging has been related to more negative perceptions of smoking, decreased cigarette purchasing and consumption rates, and an increased desire to quit in current smokers, when compared to normal packaging (Gallopel-Morvan, Beguinot, Eker, Martinet, & Hammond, 2011).

Brighter, bolder colors are also more appealing to children and adolescents and increase the odds of purchase when compared to darker colors (Hammond et al., 2013; Hammond, 2010). When color, branded fonts, and imagery are removed from cigarette packs, adolescents perceive smoking as less positive; they have more negative expectations regarding the taste of cigarettes and report lower likelihoods of starting smoking (Germain, Wakefield, & Durkin, 2010; Gallopel-Morvan et al., 2011). The same pattern of results has also been documented for current smokers, for example, in terms of the appeal and taste of cigarettes (Hammond et al., 2013).

Therefore, the effect of tobacco control targeting cigarette packaging is two-fold: it reduces smoking rates in current smokers, and it reduces the appeal of smoking to young potential smokers. This evidence has led to suggestions that "plain packaging"—standardized brown packaging, letter size, and font—should be used on all cigarette packages. Plain packaging has been implemented in Australia with positive effect (Australian Government Department of Health, 2016) and is due to be fully implemented in the United Kingdom in 2017 and other European Countries are following suit. Whether this will aid in reducing smoking rates, or whether smokers will simply move to alternative covers, such as cigarette cases (Wakefield et al., 2015; Zacher et al., 2014) remains to be seen.

Conclusions

Through psychological research, the effects of tobacco addiction have been understood, as well as the social and individual-level factors that impact smoking uptake, maintenance, and cessation. This research has resulted in the development of tobacco control interventions and policies which have a proven impact on reducing tobacco use. Thanks to these measures, smoking prevalence has reached a record low level in many high-income countries (CDC, 2016). Given the continuing burden of tobacco use worldwide (current predictions estimate that the death toll from tobacco will reach 7.5 million a year by 2020 [WHO, 2011]) more still needs to be done, especially in lower-income countries, where tobacco use rates remain very high (Wang, Jin, Lu, & Ferketich, 2016). However, the combination of investing in interventions that prevent uptake and support tobacco use

cessation at the individual level (e.g., pharmacotherapy and behavioral support) and continuing to pursue population-level policies (e.g., taxation, bans), means that there is hope that the effects of tobacco on global health can be controlled and that this most deadly of public health problems will eventually be eradicated altogether.

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