

Sarah Edwards

Bachelor of Psychology (Honours)

**Smoking in People with Co-morbid Depression and Drug  
and Alcohol Use.**

Doctorate of Clinical and Health Psychology

School of Psychology

University of Newcastle

Submitted November 2011

## Acknowledgements

I would like to thank the staff at the Centre for Brain and Mental Health Research (CBMHR) for their ongoing professional and personal support over the years. In particular, I would like to express thanks to Frances Kay-Lambkin for her guidance and enthusiasm during my employment and studies. Lastly, I would like to thank my husband, parents and extended family for their continued support and encouragement whilst I completed this research.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

## Abstract

Smoking remains a major public health concern, with consequences not limited to individual health, but extended to communities and across nations. The largest single cause of mortality and disease in Australia that is preventable is tobacco smoking. Smoking has also been shown to be associated with a number of mental illnesses as well as increased drug and alcohol use. Treatment for individuals experiencing such comorbidities is limited, with people suffering from mental illness, and drug and/or alcohol addiction who smoke often being ineligible for treatment programs. The current study aimed to address this gap by exploring the relationship between smoking, depression and anxiety, as well as drug and alcohol use in more detail. Specifically, it was hypothesised that individuals with increased use of tobacco would evidence higher rates of depression and alcohol use. Furthermore, it was expected that those who are heavy smokers will have poorer outcomes on measures of depression and alcohol use than non-smokers. Lastly, it is expected that reductions in tobacco smoking will be observed from pre to post treatment and that these reductions will be moderated by treatment condition.

## *Methods*

Participants were those enrolled in the Depression and Alcohol Integrated and Single-focused Interventions project (DAISI, 1), and the Self Help for Alcohol/other drugs and Depression project (SHADE, 2), with the student having worked on both of the projects from baseline through to follow up. The total number of participants involved in the two studies was 447. They received one of a number of treatments including a brief intervention targeting depression; 10 sessions of CBT/MI targeting depression; 10sessions of CBT/MI targeting alcohol use; 10 sessions of CBT/MI targeting both

depression and alcohol use concurrently; 10 sessions of person centred therapy or 10 sessions of CBT/MI delivered via computer program.

### *Results*

The results suggest that tobacco use is associated with factors including anxiety, cannabis use, and lower functioning and quality of life, as well as gender. Heavy smokers did not report significantly higher levels of depression or alcohol use when compared to non-smokers. Smoking was not found to moderate treatment outcome. There was also no evidence to suggest that skills learned in therapy were generalised to smoking, with no changes in smoking behaviours being associated with time or treatment allocation.

### *Conclusions*

While the current study lends some support to previous research by affirming the relationship between tobacco smoking and mental illness as well as drug and alcohol use, it also suggests that tobacco use does not interfere with treatment for depression and alcohol use. Further research is required into this area with specific areas including gender differences as well as the generalisability of skills learned in therapy being important areas of future consideration.

### *Future Direction*

Future research should focus on exploring further the relationship between tobacco use and mental illness and drug and alcohol use. Specifically, the idea of the generalisability of skills learned in therapy being used for a secondary condition is extremely interesting and worthy of future research. Gender differences in regards to

tobacco use is also appealing to explore further with implications relating to the future development of interventions for smokers suffering comorbid mental health and drug and alcohol disorders.

## Table of Contents

Introduction.....	9
Mental health and smoking.....	11
Alcohol and other drug use and smoking.....	17
The importance of treating comorbidity.....	20
The way forward.....	24
The current study.....	27
Hypothesis.....	28
The role of the student in the DAISI and SHADE projects.....	29
Journal article: The impact of tobacco smoking on treatment for comorbid depression and alcohol misuse.....	30
Discussion.....	58
Tobacco use impacting on levels of depression, anxiety and drug and alcohol use....	58
Cigarette smoking and treatment outcome.....	65
Is tobacco use modified by treatment targeting depression and alcohol misuse.....	77
Summary and Conclusions.....	71
Strengths and weaknesses.....	71
Future directions.....	72
References.....	76
Appendix 1: SHADE Ethics Approval.....	82
Appendix 2: SHADE Initial Assessment.....	85
Appendix 3: SHADE Journal Article – Clinician-assisted computerised versus therapist-delivered treatment for depressive and addictive disorders: a randomised controlled trial.....	56

Appendix 4: DAISI Ethics Approval.....	87
Appendix 5: DAISI Initial Assessment.....	88
Appendix 6: DAISI Journal Article – Randomised controlled trial of cognitive-behavioural therapy for coexisting depression and alcohol problems: short-term outcome.....	89
Appendix 7: ‘Drug and Alcohol Review’ notes for authors.....	90
Appendix 8: Receipt of article submission from ‘Drug and Alcohol Review’ .....	91
Table 1: Characteristics of the study sample.....	55
Table 2: Levels of depression, alcohol consumption and other domains as a function of severity of tobacco consumption at baseline assessment.....	56
Figure 1: The interaction between depression over time and baseline consumption of cigarettes.....	57



The suggestion has been made by the World Health Organisation (WHO, 2008) that there are approximately 1,100 million people in the world who currently use tobacco on a regular basis. According to Grant, Hasin, Chou, Stinson, and Dawson (2004), the most common psychological disorder in America is nicotine dependence which affects approximately 12% of American adults, with the smoking rate in America being 19% (CDC, 2012).

Smoking is of major public health significance. Three million people per year during the 1990's died from a smoking related disease across the world (WHO, 2011).

Smoking has definitive and well publicized connections to ischemic heart disease, cerebrovascular disease and COPD, and has been linked to other illnesses including cancers of the mouth, kidney, stomach, bladder and cervix (ABS, 2006). It continues to be difficult to accurately estimate morbidity and mortality rates as a result of smoking due to the behaviour being a risk factor for so many diseases (ABS, 2006).

According to the Cancer Council (2011), the largest single cause of mortality and disease in Australia that is preventable is tobacco smoking. In Australia in 2004-05, 23% of adults were current smokers, approximately 3.5million people (ABS, 2006). The younger age groups of the nation are more likely to smoke with the highest rates of male smokers being in the 18-24 age group and the highest rates of female smokers being in the 25-34 age group. The statistics related to underage smoking and passive smoking are also important to acknowledge with 12.7% of males and 14.2% of females aged between 14-19 years being regular smokers in 2005. Passive smoking has been linked to ill health in unborn children, and bronchitis, pneumonia and sudden infant death syndrome in young children (AIHW, 2005). Smoking has also been

shown to be related to increased alcohol consumption, reduced exercise levels, and lower fruit and vegetable intake than in non-smokers (ABS, 2006). Furthermore, smoking is also associated with socioeconomic status (SES), with those from disadvantaged backgrounds being more likely to smoke, with additional links found between smoking and geographical region as well as country of birth.

A substantial amount of money is spent on smoking-related illness all around the world. The ABS (2006) reported that ten years ago, \$1094.4 million was attributed to health care costs related to tobacco in Australia, which included hospital, medical, pharmacological and nursing home costs. These costs were partly the result of 142,000 hospital admissions in relation to tobacco use which included ischaemic heart disease, cancer, chronic obstructive pulmonary disease, arteriosclerosis and stroke (ABS, 2006).

With such overwhelming statistics being presented regarding the impact of cigarette smoking, the issue of why 20% of the world's population continues to smoke is important to investigate (Tiffany, 2008). Although the prevalence of smoking has decreased in the past 50 years in Australia following increasing government taxes, funding for research, as well as advertisement campaigns showing the health impacts of smoking (The Cancer Council, 2010), a significant proportion of the Australian population continue to and initiate smoking. Between 1995 and 2004-5, the proportion of men who smoked in Australia decreased from 28% to 26% with the numbers of female smokers decreasing from 22% to 20% (ABS, 2006). However, the effects of tobacco smoking continue to result in psychological, social, political and economical disturbance (Tiffany, 2008).

Smoking in Australia has shown to be higher in a number of sub population groups; in particular Aboriginal and Torres Strait Islanders, prison inmates, and in individuals experiencing a mental illness or substance use disorder (Baker et al. 2006). The Australian Bureau of Statistics (2006) suggests that half of adults from Aboriginal and/or Torres Strait Islander backgrounds were regular smokers in 2004-5 compared to 23% of the general population. The National Comorbidity Survey carried out in the US identified a clear association between smoking and mental illness, with smokers experiencing mental health concerns being almost double the numbers of the general population (Araya, Gaete, Rojas, Fritsch & Lewis, 2007).

#### *Mental health and smoking*

According to the Australian Bureau of Statistics (ABS, 2006), in 2004 45% of Australians between the ages of 16-85 years reported having experienced an anxiety, mood or substance use disorder at some point in their life. The ABS suggests that anxiety disorders are more prevalent at 14% of the population in the 12 months prior to survey, with depressive disorders affecting approximately 6% of people between the ages of 16-85 years. Reported severity of the disorders ranged from mild (46%), moderate (33%), to severe (21%). The literature suggests that mental health disorders occur more frequently in those from lower socio economic status (SES), who are divorced, experience physical health conditions and/or substance use disorders, are generally disadvantaged and experience chronic stress (Jane-Llopis & Matytsina, 2006).

The relationship between smoking and a number of psychiatric disorders has been well established in the literature. Mood and anxiety disorders (Grant et al., 2004), as

well as psychotic disorders (Baker et al., 2006) each occur in higher numbers in people who smoke than the general population. McCaffery, Papandonatos, Stanton, Lloyd-Richardson, and Niaura (2008) suggest that initiation of smoking, current smoking as well as dependence on nicotine is associated with depression. Further to this, Chaiton and Zhang (2007) found that smoking prevalence in adolescents was related to depressive symptoms, however this effect was only noted in schools that had lower rates of smoking. Smokers have also been shown to experience more severe symptoms of depression, as well as increased rates of suicidal ideation and suicide (Wilhelm, Wedgwood, Niven, & Kay-Lambkin, 2006). In some studies involving smokers, history of a major depressive disorder has been double that seen in control groups representing the general population (Brown et al., 2001) and even up to two and a half times in one study (Wilhelm, Mitchell, Slade, Brownhill, & Andrews, 2003). Kessler et al. (1994) suggests that depression rates among smokers are as high as 61% compared to 17% in the general population. According to Beyond Blue (2010), one in five Australians will suffer from depression in their lifetime, and around one million Australian adults live with depression each year. Depression is also the leading cause of suicide making the experience of elevated risk for depression in cigarette smokers a serious concern.

The existence of a relationship between smoking and poorer mental health has been supported by two large population surveys conducted in Australia. Degenhardt and Hall (2001) found that of the 10, 641 adults surveyed, those who smoked regularly were significantly more likely than non smokers to experience increased rates of affective and anxiety disorders. The National Epidemiological Survey on Alcohol and related conditions (NESARC 2001-2002, Grant, Hasin, Chou, Stinson, & Dawson,

2004) conducted in the United States found that 7% of the total population suffered from a psychiatric condition and also smoked cigarettes, however they consumed 34% of the total amount of cigarettes smoked in the country (Jane-Llopis & Matytsina, 2006). As a result of this finding, the authors suggest that special attention should be paid to those people who smoke and suffer from comorbid mental health disorders in regards to future research.

Furthermore, Wilhelm, Wedgewood, Niven and Kay-Lambkin (2006) suggest that those individuals with a history of depression who quit smoking are more likely to develop further episodes of depression whilst abstaining. This may be limited to smokers with recurrent MDD (Hughes, 2007). Smokers with a history of depression also reportedly use tobacco at higher rates and are more dependent on tobacco than those without depression, with smokers responding to distress by restarting or increasing their tobacco use. The authors also propose that smokers who experience symptoms of depression are more likely to have a longer-lasting withdrawal experience with lower long term abstinence than their non depressed counterparts.

Whilst the relationship between smoking and depression is well researched, the proposed similar relationship between smoking and anxiety disorders has received less attention. Morissette, Tull, Gulliver, Kamholz and Zimering (2007) suggest that research regarding anxiety and smoking is inconsistent, however the idea that anxiety is related to initiation of smoking is proposed. Prevalence estimates in regards to smoking and anxiety disorders (including panic disorder [19-47%], post traumatic stress disorder [PTSD, 44-66%], social anxiety disorder [14-32%], generalised anxiety disorder [17-55%] and obsessive compulsive disorder [8-22%]) vary greatly

and are often compounded by other comorbidities (Morissette, et al, 2007). Baker-Morissette (2004) investigated the prevalence rates of smoking and comorbid anxiety in participants without alcohol or substance abuse or dependence and found significantly lower rates of smoking prevalence even in comparison to the general population at 15%. Further research is needed to clarify the extent of the relationship between anxiety disorders and smoking, particularly given the anecdotal reports of smokers that their tobacco use helps them cope in anxiety-provoking situations.

Baker et al. (2006) suggest that in psychiatric and drug and alcohol treatment settings, the use of tobacco is often viewed as a lesser evil and is ignored, even at times encouraged. The idea that a quit attempt would result in poorer mental health or drug and alcohol treatment outcomes exists, however research now suggests that between 46-80% of participants in drug treatment wish to quit smoking. Other studies suggest that making a quit attempt in alcohol treatment did not negatively impact on treatment outcome (Kahler et al, 2008).

Various theories have been suggested addressing the relationship between smoking and mental illness ranging from tobacco acting as an antidepressant, to substances in tobacco resulting in chemical changes in the brain actually inducing depression (Blalock, Robinson, Wetter, Schreindorfer, and Cinciripini, 2008). In one study Blalock et al found however that whilst there was no change in smokers' reported levels of positive affect and symptoms of depression, those who abstained from smoking for the three month trial period experienced an increase in positive affect and a decrease in depressive symptoms. The authors conclude that "quitting smoking may in fact help improve their [depressive] symptoms' (Blalock et al, 2008, p125). While

the small sample size, use of self reported measures and absence of a control group limit the generalisability of this study to the general population, the concept of trying to understand the relationship between smoking and mental illness, and how best to treat these conditions when they co-occur, is an important one to continue to explore.

There is a proposed gender difference in regards to smoking and mental health with a number of studies suggesting an increased association between mental health disorders including schizophrenia, and smoking among men (Reichler, Baker, Lewin & Carr, 2001), and depression and smoking in women (Massak & Graham, 2008), and adolescents (Mykletum, Overland, Aaro, Liabo & Stewart, 2008). Husky, Mazure, Paliwal and McKee (2008) suggest that negative affect is associated with smoking in women more so than men; and that women's expectations of smoking reducing negative affect is greater than men's. Further gender differences regarding smoking and depression include the idea that women are more likely to respond to stress or anxiety by smoking than their male counterparts (Husky, Mazure, Paliwal and McKee). Alati et al (2004) found a linear association between smoking and symptoms of depression and anxiety in males presenting to an Emergency Department in Australia, however the same relationship was not evident in the female sample. This study was limited with the sample over representing individuals of lower SES, who experienced higher incidence of mental health problems, and consumed greater amounts of alcohol, tobacco and illicit drugs in comparison to the general population.

The domain of gender differences in smoking and comorbid depression remains inconsistent with Araya and colleagues (2007) not finding any interactions between

smoking, mood and affective disorders and gender. Certainly, gender differences in comorbid populations is an area requiring ongoing exploration with implications for treatment of males and females being an important area of research.

Treatment for smoking cessation and comorbid depression is a growing area of research. It is now understood that excluding such individuals from research is ignoring an important sub group of people who may require something different from the standard treatment strategies for smoking cessation (Wilhelm et al, 2006).

The development of interventions for smoking cessation for individuals with alcohol dependence has paved the way for a more detailed investigation into the treatment for smoking and co-occurring depression (Patten, Drews, Myers, Martin, & Wolter, 2002). Interestingly, suggestions have been made that people with a psychiatric disorder who smoke are less likely to quit smoking than those without a psychiatric illness (Covey, 1998). Treatment techniques for this group include problem solving techniques, stress management, social support training as well as mood management (Wilhelm et al. 2006), however the literature focusing on this issue remains inconsistent (Piper et al. 2010). Whilst the connection between smoking and depression is undeniable, the characteristics of the depressive symptoms in smokers as opposed to non smokers, as well as outcomes to treatment have yet to be thoroughly investigated. However, Hall ( 2006) has researched outcomes between depressed and nodepressed smokers following a quit attempt.



### *Alcohol and other Drug use (AOD) and smoking*

The Global Burden of Disease project conducted by the World Health Organisation found that as a result of alcohol, tobacco and illicit drug use, the international disability adjusted years of life was 8.9% (Giesbrecht & Haydon, 2006). Alati et al (2004) suggest that 'harmful alcohol use and alcohol dependence are the most frequently experienced substance use disorders in Australia' (p463), with these disorders occurring three times more frequently than do illicit drug use disorders. Australia exists in the top 20 countries for increased alcohol use with the average individual in Australia consuming 9.3litres of pure alcohol per year (Shourie, Cinigrave, Proude & Haber, 2007). Non-smokers typically report lower alcohol consumption rates than do smokers, with 6.5% of non-smokers drinking an average of five or more drinks on at least one occasion per month compared to 20% of smokers (Kahler et al, 2008). In the United States, 15 million people meet the criteria for alcohol abuse, and with those in alcohol treatment, up to 85% of them also meet dependence criteria for tobacco (Abrams, et al, 2002). Various factors have been suggested that may moderate the effects and amounts of alcohol use in individuals such as depressed affect, personality, and social status (Aneshensel, & Huba, 1983).

Kahler and colleagues (2008) suggest that increased alcohol use has been shown to be related to less effective smoking cessation, and is a strong predictor of smoking relapse, whilst eventual tobacco abstinence has been associated with levels of alcohol use and particularly binge drinking at the beginning of smoking cessation treatment. The literature shows that esophageal cancer is 50% more likely to occur in men who drink and smoke heavily as opposed to men who only drink or smoke at high levels, while mouth and throat cancer is more than 300 times more likely in those who drink

heavily and smoke in comparison to those individuals who don't drink or smoke tobacco (Kalman, Kim, DiGirolamo, Smelson & Ziedonis, 2010). Clearly, the extent and impact of licit drug use in Australia is immense, which emphasises the need for ongoing research into effective outcomes of treatment for substance abuse.

Kahler et al (2008) investigated whether a brief alcohol use intervention, incorporated into a smoking cessation program was effective for smoking cessation outcomes. They found that the additional alcohol intervention was somewhat effective, in that it slightly reduced drinking levels, but had no impact on smoking outcomes. Other research has found very little association between alcohol use and smoking and nicotine dependence, again highlighting the need for more detailed research into the relationship between these behaviours and other factors (Cargill, Emmons, Kahler & Brown, 2001).

The biological connection between alcohol and tobacco use has been investigated with two studies showing genetic links influencing this particular comorbidity. For example, 'genetic factors appear to be particularly strong among smokers with a history of alcohol dependence' (Kalman, Kim, DiGirolamo, Smelson & Ziedonis, 2010, p13). Further studies suggest that nicotine reward and smoking behaviour are directly related to alcohol use, whilst smoking can act as a primer for alcohol consumption (Kalman, Kim, DiGirolamo, Smelson & Ziedonis).

Whilst depression has been shown to be more evident in people who smoke, alcohol and other drug use has also been suggested to occur at higher rates in smokers as opposed to non-smokers (Cargill, Emmons, Kahler, & Brown, 2001). Some suggest

that tobacco use among drug treatment populations is as high as 100%, with tobacco also showing a strong relationship with other substances such as cannabis, heroin and cocaine (Baker et al, 2006). Nicotine prevalence rates in methadone patients have been shown to range between 84 – 94%, with the rate of mortality for smokers who are opioid dependent being fourfold that of non-smoking opioid dependent patients (Dunn et al, 2010). The extent of the connection between tobacco use and alcohol dependence has been highlighted by Shelef, Diamond, Diamond, and Myers (2009) who suggest that over 80% of adolescents treated for substance use disorders in America also smoke tobacco. This is in comparison to approximately 25% in the general population (Dunn et al 2010). Nicotine dependence is also more severe in individuals who drink alcohol as opposed to those who are abstinent (Cooney, Litt, Cooney, Pilkey, & Steinberg, 2007). Hurt et al (1995) states that the tobacco used by patients who are dependent on alcohol leads to more deaths than the alcohol consumption itself. This further highlights the need for effective smoking cessation interventions within this specific population.

Evidence suggests that making a quit attempt whilst completing alcohol rehabilitation programs does not have a detrimental effect on treatment outcome (Prochaska et al, 2004). Furthermore, the proposal has been made that smoking cessation can actually limit the rate of alcohol relapse. The notion that alcohol treatment settings are a potential arena for smoking cessation programs has been put forward, however new ideas are needed in regards to treatment approaches for this population ( Kalman, Kim, DiGirolamo, Smelson & Ziedonis, 2010). Abrams et al. (2002) state that a more detailed understanding of the relationship between smoking, alcohol and comorbid conditions such as depression, may lead to improved outcomes in smoking cessation

programs. There are potential difficulties in examining this issue in real world settings. For example, in one study, only half of current smokers were identified by health care professionals for intervention, while less than one third of heavy drinkers were recognised, suggesting that the culture of the health care profession may be acting as a barrier in identifying those in need for interventions (Shourie, Conigrave, Proude & Haber, 2007). Kalman, Kim, DiGirolamo, Smelson and Ziedonis (2010) report that tobacco treatment within polysubstance use programs continues to be of a lesser priority. Attitudes of staff members, current treatment culture which includes 'smoke breaks' as well as limited knowledge regarding effective smoking cessation treatments adds to the issue of tobacco use being minimised. The suggestion is made that staff may be required to move from the precontemplation stage into the contemplation and action stages of targeting smoking cessation before substantial outcomes are seen in addiction treatment settings. In light of this, closer examination of smoking, alcohol use and depression in other settings, such as ongoing research programs, may be of particular value in further exploring these important issues.

### *The Importance of Treating Comorbidity*

It is clear that even though smoking causes severe illness and premature death, many Australians continue to use tobacco. Furthermore, those who do smoke are more likely to suffer from depression and substance use disorders. People who do experience comorbid disorders such as depression, alcohol and tobacco dependence also tend to experience other disadvantages in life such as limited access to appropriate treatment. There is a limited amount of research investigating the specific nature of the various comorbidities (alcohol, depression and smoking: Cargill, Emmons, Kahler & Brown, 2001; mental health, alcohol, drugs and tobacco: Jane-

Llopis & Matytsina, 2006) amounting to a modest understating of the interaction between these factors, as participants are usually excluded from research given their comorbid diagnosis.

Massak & Graham (2008) suggest that the link between smoking, alcohol use and depression may exist due to the vulnerabilities experienced by those who suffer from such comorbidities. One research project that has investigated this interaction found that those who smoked more than 10 cigarettes per day and drank to intoxication once per week were more likely to experience symptoms of depression (Hamalainen et al., 2001 cited in Massak & Graham, 2008). Massak and Graham investigated this relationship further predicting that alcohol may act as a confounding factor in the relationship between smoking and depression. Whilst this finding was not confirmed in their results, the authors suggest that further research is required to better understand the possible interactions between depression, smoking and alcohol use in individuals experiencing such comorbidities. Alati et al. (2004) extended this research to a population accessing the emergency department of a hospital, and found gender differences in the experienced interactions of alcohol and tobacco use and anxiety and depression. This draws attention to another area requiring further research with potential differences existing between male and female experiences of comorbid disorders and effective treatment modalities. Furthermore, the causal direction of this relationship is also important to investigate, with such knowledge having vast implications for the future development of treatment strategies.

The suggestion has been made that having a more detailed understanding of the relationship between smoking, alcohol use and depression may improve smoking

cessation programs among alcoholic smokers (Hitsman, et al., 2002). Hitsman and colleagues investigated the interaction between these factors and found that smokers were more likely to consider smoking cessation if they experienced low depressive symptoms and increased number of days since their last alcoholic drink. The authors propose that this may be the result of the generalisation of coping skills, with those individuals having a higher chance of considering quitting smoking than those with higher depressive symptoms and less days since last alcohol use. It is unknown however if coping skills mediated the interaction between motivation to quit smoking and alcohol abstinence due to the limited amount of data collected in this study.

Cargill, Emmons, Kahler and Brown (2001) did research the relationship between smoking, alcohol use and depression in hospitalised individuals in relation to their motivation to quit smoking. They confirmed the direct relationship between these factors, and also found that increased depressive symptoms and increased alcohol use may not decrease motivation levels to quit smoking. This highlights the current inconsistencies in the literature regarding smoking, alcohol use and depression. The fact that those individuals who experience comorbid disorders require and are open to receiving multi-facted treatment, despite the complexities of their presentations, is emphasised.

There is minimal research that investigates the comorbid occurrence of mental health disorders, behavioural disorders and substance use, with the need for a better understanding of risk factors, and predictors that characterise such relationships (Jane-Llopis, & Matytsina, 2006). Future research will allow identification of risk factors for such comorbidities experienced by a wide range of people around the world at

early stages. This may in turn reduce the possibility of developing additional disorders by targeting problems with appropriate methods whilst integrating various treatment methods for those who have developed comorbidities.

Given the limited understanding of the comorbidities of depression, alcohol and tobacco use, effective treatment for this subgroup remains a cloudy issue. Evidence based treatment for depression has been well documented (APA, 2000), as has treatment for substance use (APA, 1995), and smoking cessation (APA, 1996), with cognitive behaviour therapy being a treatment of choice for each of these conditions occurring in isolation. Whilst these disorders commonly co-occur, an effective treatment strategy addressing depression, substance use and smoking has yet to be uncovered. Wilhelm et al. (2006) suggests, a 'greater understanding of the characteristics of people who persist in smoking' (p.102) is needed, particularly given the significant proportion of global disease burden that is borne by depressive disorders, alcohol and tobacco use

Ouimette and colleagues (1999) state that pressures on mental health and drug and alcohol services are mounting regarding the provision of effective and short term treatment strategies. It is likely that further delay in providing effective and evidence based treatment for comorbid populations will not only impact the individual, but will continue to effect families, communities as well as at the national level in regards to health care costs.

### *The Way Forward*

Comorbidity research conducted with other co-occurring disorders has investigated the changes in a secondary disorder following treatment targeting a primary disorder, exploring the generalisability of the treatment modalities utilised. Shelef, Diamond, Diamond and Myers (2009) state that the interventions that are tailored at reducing substance use, for example, may be similar to those required of smoking cessation programs. Skills including ‘enhancing motivation, identifying triggers, learning refusal skills, and improving emotional coping skills’ are areas of common ground in the treatment of substance use disorders and tobacco use. Another component of successful treatment in the area of poly-substance use treatment includes addressing the idea of behavioural activation, with use of one substance influencing the use of another (eg. alcohol use and smoking). Shelef and colleagues also note that a sense of achievement in the reduction of one substance may have a carryover effect in the reduction in the use of a secondary substance. Shelef, Diamond, Diamond and Myers tested their theories researching the generalisability of substance use treatment on smoking in adolescents when smoking cessation was not specifically targeted. Whilst they did find that mild smokers reduced their cigarette consumption, this was not found in moderate and heavy smokers. This may be due to the treatment program for substance use addressing environmental and external sources of substance use, which may then only be relevant to less nicotine dependent smokers (mild) as opposed to moderate to heavy users with higher nicotine dependence. Furthermore, lifestyle changes of the mild group as a result of substance use treatment may also have impacted on their cigarette use, such as increased family contact and healthier choices in general. Nevertheless, this approach seems like an important one to explore, albeit that depression was not included in this study.



Burling, Burling and Latini (1991) found in a preliminary study that treatment for smoking had a small but positive effect on the inpatient treatment received by those with substance abuse. Following this research, the authors postulated that positive lifestyle changes, increasing self efficacy, and practicing relapse prevention strategies following smoking cessation treatment may positively impact substance abuse treatment. In a later study, Burling, Burling and Latini (2001) explored the effectiveness of a smoking intervention that incorporated relapse prevention strategies for drug and alcohol use. Surprisingly, the group that received the multi-focussed substance use approach had poorer outcomes than the control group in regards to smoking and drug and alcohol use. Possible reasons for this finding include the over use of the drug and alcohol component within the smoking cessation sessions which may have resulted in less skills being retained in comparison to the control group. Furthermore, it is possible that too many comparisons were made between tobacco and drugs and alcohol which may have resulted in decreases in individuals' ability to address both. Nevertheless, this research makes an important contribution to the literature by suggesting that careful consideration needs to be taken when working with such complex populations who experience comorbid disorders.

Cooney and colleagues (2007) tested the generalisability of treatment outcomes by investigating any changes in alcohol use following an intensive smoking cessation program. The results suggest that there was no negative impact of the smoking cessation program on alcohol use, however the authors themselves suggest that a more intensive smoking cessation program is required to better test this possible association.

Brown and colleagues (2001) looked into the effects of a cognitive behavioural therapy for depression program on smokers who experienced depression as compared to a standard smoking cessation treatment. Whilst not statistically significant, the authors identified a trend that suggested that smoking cessation treatment, which included a depression component, was more successful than a standard smoking cessation program which was evidenced through increased abstinence rates. This suggests that a multi-component treatment regime that addresses both smoking and depression may be as successful, if not more so, than a standalone smoking cessation program for comorbid participants.

These findings have been replicated in a study looking at smoking cessation in pregnant women suffering from depression (Cinciripini et al, 2010). This study included 257 pregnant women who smoked and suffered from depression. They received an intensive depression focused intervention or a control treatment focused on health and well being. Both treatments involved smoking cessation counselling. The findings of this research emphasise the effectiveness of targeting depression within a smoking cessation program with positive outcomes in relation to affect and abstinence for pregnant women with increased severity of depression. It must be noted that those women who had lower levels of depression fared better in the control health and well being focused treatment. Cinciripini and colleagues touch on the issues of the generalisability of treatment stating ‘that for certain individuals, interventions that reduce depressive symptoms may facilitate cessation’ (p. 52). It is important to note that such effective outcomes were only observed in women with severe depressive symptoms, with such implications not being applicable for those

experiencing mild symptomology. Again, further research confirming such interactions is needed, with later research possibly investigating the specific factors at play within these relationships.

### *Current study*

Despite a range of psychological and pharmacological treatments being available to treat depression or substance use or tobacco dependence occurring in isolation of each other, little evidence exists to suggest how well these treatment strategies generalise to people experiencing these conditions as they co-occur. This is also at odds with the recommendations made over a decade ago by Hall (1996) that urgent action was required to test the application of existing treatment programs to people with comorbid conditions. Experts suggest that the first important step in determining the optimal treatment approach for depression, substance use and tobacco comorbidity is to determine the efficacy of existing evidence-based treatments designed for people with single disorders (e.g. depression or alcohol use or tobacco use) among comorbid populations. This study has been designed to address the gap in the current literature regarding the utilisation of current treatment approaches for single disorders in a comorbid population.

It is also of interest to explore the relationship between different levels of smoking and subsequent experiences of mental health disorders. Alati et al (2004) suggests that if the association between smoking and mental health is at all similar to that between alcohol and mental health, then small amounts of smoking may be beneficial to individuals, or at least a harm reduction approach may be a more realistic and appropriate option for people with these complex comorbidities. Whilst some available literature suggests otherwise, more detailed examination is required.

The research group at the Centre for Brain and Mental Health Research (University of Newcastle) has devoted research efforts over the past decade to exploring the impact of psychological treatment for depression and alcohol/other drug use problems. Two lines of investigation have specifically been explored:

- (1) The comparative effectiveness of computer versus therapist delivered CBT, Self-Help for Alcohol/other drug use and Depression (SHADE); and
- (2) The comparative effectiveness of single focussed (depression or substance use) versus integrated (depression and substance use) CBT, the Depression and Alcohol Integrated versus Single-focussed Intervention (DAISI) trial.

These studies are of international significance as they represent the first large randomised controlled trials of CBT for comorbid depression and AOD use problems. These studies also present the opportunity to explore the prevalence of smoking amongst this important comorbid population, and examine the impact on smoking, if any, of CBT-focussed treatments for depression and alcohol/other drug use problems.

### *Hypothesis*

This project aims to provide further understanding into the relationship between smoking, depression and substance use disorders. More specifically, the effects of treatment for depression and substance use on tobacco use are being investigated.

Based on the literature discussed earlier, it is expected that heavy smokers within the DAISI and SHADE trials will report higher levels of depression and alcohol use than non-smokers at baseline.

It is also hypothesised that smoking moderates treatment outcomes for depression and alcohol use comorbidity. As such, we expect that those who are heavy smokers will have poorer outcomes on measures of depression and alcohol use than non-smokers.

Lastly, the idea of generalising treatment strategies will be examined. It is expected that reductions in tobacco smoking will be observed from pre to post treatment and that these reductions will be moderated by treatment condition.

### *The role of the student in SHADE and DAISI projects*

Since April 2008 I have been working on both SHADE and DAISI projects. This has involved contacting participants over the phone and scheduling appointments for the assessments, completing follow-up assessments as well as carrying out various administration tasks. I have also been involved in regularly updating the databases that hold the participants' personal information, calculating follow-up completion rates and coordinating other staff on the completion of assessments.

As a result of the work carried out by myself on both the SHADE and DAISI projects from baseline through to follow up, the analyses of the data that had been collected was considered appropriate for a thesis project. Following a presentation of the research idea to the methodological review panel, it was agreed that the current study and research questions were suitable for a Doctorate level qualification in clinical and health psychology.

The impact of tobacco smoking on treatment for comorbid depression and alcohol misuse.

**ABSTRACT**

**Introduction and Aims:** Tobacco use is a major public health concern, and is associated with a number of mental illnesses as well as increased alcohol/other drug (AOD). Research into treatment for individuals experiencing such comorbidities is limited. The current study aimed to address this gap.

**Design and Methods:** Participants (n=447) were those enrolled in the Depression and Alcohol Integrated and Single-focused Interventions project (1), and the Self Help for Alcohol/other drugs and Depression project (2), who reported current depression and hazardous alcohol use at entry to the study. Participants received: a brief (one session) intervention; one of 10-sessions of cognitive behavior therapy (CBT) targeting depression, alcohol or both depression and alcohol (therapist- or computer-delivered), or 10 sessions of a supportive therapy condition. Smoking cessation was not targeted in, nor a goal of, treatment.

**Results:** After controlling for socioeconomic variables, tobacco use was not associated with higher levels of depressive symptoms at baseline; however heavy smokers (30+ cigarettes per day) consumed significantly more alcohol at baseline than did non-smokers (13 standard drinks per day vs. 9 standard drinks per day).

Baseline smoking severity did not impact on depression or alcohol use outcomes over a 12-month period. In general, tobacco use did not change over the course of the study, however reductions in tobacco use between baseline and 3-month follow-up were significantly associated with reductions in depression and alcohol consumption over the same time period. CBT targeting depression and alcohol use concurrently did not have a significant impact on tobacco use, however the greatest reductions in cigarettes per day between baseline and 12-month follow-up were made by people

who received a computerized treatment targeting both depression and alcohol use concurrently.

Discussion and Conclusions: The study results suggest that tobacco use does not interfere with treatment for depression and alcohol use problems, and adds weight to the idea of considering specific treatment for tobacco use in the context of treatment for alcohol/other drug use.

Keywords: tobacco, depression, alcohol-related disorders, therapy

## INTRODUCTION

In the most recent survey into alcohol/other drug (AOD) use conducted by the Australian Institute of Health and Welfare (3), 19.4% of adults were current smokers, with 16.6% reporting regular daily tobacco smoking. Younger Australians are significantly more likely to smoke tobacco, with peak tobacco smoking occurring in the 20-29 years age group, and males for the most part reporting the highest rates of daily smoking across the lifespan (3). Smoking is also associated with socioeconomic status, with those from disadvantaged backgrounds being more likely to smoke, and additional links are found between smoking and geographical region as well as country of birth. People with mental health and AOD use problems are also among those groups reporting significantly higher rates of tobacco smoking than the general population (4).

### *Depression and smoking*

In particular, the association between depression and cigarette smoking is of concern. Aside from the increased cardiovascular risk associated with both depression and tobacco smoking, compared to non-smokers, regular smokers report more frequent and severe episodes of depression, and higher suicide ideation and rates of suicide (5). Smoking remains one of the strongest correlates of current Major Depressive Disorder (6). Rates and severity of nicotine dependence are higher amongst those with depression, and negative affect is the most commonly cited reason for unsuccessful smoking cessation attempts (5).

### *Alcohol and other drug use and smoking*

AOD use has also been suggested to occur at higher rates in smokers than non-smokers (7). Over one-fifth of current smokers in Australia report concurrent risky



consumption of alcohol, compared with 16% of ex-smokers and 8% of never smokers (8). There is some suggestion that tobacco smoking among AOD treatment populations is as high as 100%, with a strong relationship observed between tobacco smoking and other substance use such as cannabis, heroin and cocaine (4).

The extent of the connection between tobacco smoking and alcohol dependence is of particular note, with reports in the USA of over 80% of adolescents being treated for alcohol use disorders also smoking tobacco (9). This is in comparison to approximately 25% in the general US population who report tobacco smoking alone (10). Nicotine dependence is also more severe in individuals who drink alcohol as opposed to those who are abstinent (11), and smoking among people who are dependent on alcohol has been shown to be associated with deaths than alcohol consumption alone (12).

#### *Comorbid smoking, depression and alcohol misuse*

At present, there is only a modest understanding of the interaction between depression, alcohol and tobacco smoking, and even less on what an appropriate treatment for this particular type of comorbidity might comprise (13).

There are, however, potential difficulties in examining these issues in real world settings. For example, in psychiatric and AOD treatment settings, smoking tobacco is often viewed as a lesser evil and is ignored, perhaps at times encouraged (4), particularly in the context of poly-substance use treatment programs (14). Other concerns include the fear that a quit attempt might result in poorer mental health or AOD treatment outcomes. However, research now suggests that between 46-80% of

participants in drug treatment wish to quit smoking (15). Other studies suggest that making a quit attempt in alcohol treatment did not negatively impact on treatment outcome (16).

Given the limited understanding of the comorbidities of depression, alcohol and tobacco use, effective treatment for this subgroup remains a cloudy issue. Evidence based treatment for depression has been well documented (17), as has treatment for substance use (18), and smoking cessation (19), with cognitive behaviour therapy being a treatment of choice for each of these conditions occurring in isolation. Despite this, little evidence exists to suggest how well these treatment strategies generalise to people experiencing these conditions as they co-occur.

Comorbidity research conducted with other co-occurring disorders has investigated the changes in a secondary disorder following treatment targeting a primary disorder, exploring the generalisability of the treatment modalities utilised. For example, CBT and other treatment strategies such as enhancing motivation, identifying triggers, learning refusal skills, and improving emotional coping skills, are areas of common ground in the treatment of substance use disorders and tobacco use (9). A sense of achievement in the reduction of one substance may also have a carryover effect in the reduction in the use of a secondary substance (9). While promising, the ability of people with comorbidity to generalize skills learned in treatment to other behaviours and issues not targeted in that treatment program has not yet been tested (20, 21). The current study has been designed to address this gap.

### *The current study*

We have previously conducted two randomised controlled trials (1, 2) comparing brief (1-session advice and motivational interviewing, MI) and extended (10 sessions MI/cognitive behavior therapy, CBT) interventions for comorbid depression and AOD use problems; the first large-scale randomised controlled trials of CBT for comorbid depression and AOD use problems. These studies also present the opportunity to explore the prevalence of smoking amongst this important comorbid population, and examine the impact on smoking, if any, of CBT-focused treatments for depression and AOD use problems, and vice versa. The present paper reports findings from a combination of datasets from these studies for people who met study entry criteria for at least hazardous use of alcohol and moderate depressive symptomatology.

Specifically, it is hypothesized that:

- (a) At baseline, heavy smokers will report higher levels of depression and alcohol use than will non-smokers;
- (b) Heavy smokers will have poorer outcomes on measures of depression and alcohol use than non-smokers; and
- (c) Significant reductions in smoking tobacco will be observed from pre- to post-treatment and that these reductions will be moderated by treatment condition.

## **METHODS**

### *Participants*

Participants were those enrolled in the Depression and Alcohol Integrated and Single-focused Interventions project (DAISI, 1), and the Self Help for Alcohol/other drugs and Depression project (SHADE, 2), which commenced in 2006 and 2005 respectively. To be included in the current study, eligible participants were those with

current depressive symptoms ( $\geq 17$  on the Beck Depression Inventory II, BDI-II, 22) and concurrent use of alcohol in excess of recommended national guidelines in Australia at the time of the study (23), which equated to consumption above an average of four 10gm ethanol drinks per day for men, or two per day for women. Individuals who exhibited psychotic symptoms, those requiring medical detoxification, who had learning difficulties, were non-English speaking or who had organic brain disease at baseline were excluded. Participants could be using a range of other drugs, including tobacco, at entry to the study.

#### *Assessment Measures*

All assessment measures are widely used in mental health and AOD clinical and research settings, and were common to both the SHADE and DAISI projects and to all assessment timepoints. The assessments included:

- (a) Demographics and treatment history: including age, gender, employment and education status.
- (b) Temporal primacy of depression or alcohol use disorder (primacy): a timeline of depressive symptoms and alcohol consumption over the person's lifetime was completed to determine whether the person's first occurrence of symptoms of depression were prior or subsequent to the onset of regular alcohol use.
- (c) Structured Clinical Interview for DSM-IV, Research Version (SCID-RV, 24): provided a diagnostic, clinician-rated measure of depression and alcohol abuse and dependence.
- (d) BDI-II (22): a 21-item self-report questionnaire used to screen for the presence of depressive symptoms over the previous two-week period.
- (e) Opiate Treatment Index (OTI, 25): addresses the quantity and frequency of AOD use over the month prior to assessment, three of which are relevant to the current

study; alcohol, cannabis and cigarette use. For tobacco smoking, participants recalled their three most recent tobacco-smoking occasions, and estimated the number of cigarettes smoked on each of those occasions. A score was calculated based on these reports, summarizing the quantity and frequency of tobacco smoking for those use occasions falling in the same month prior to baseline. Each occasion of use equated to one day, and so the resultant score is essentially equivalent to cigarettes per day.

(f) Global Assessment of Functioning Scale (GAF, 26): provides an index of overall functioning incorporating the domains of psychological, social and occupational status.

(g) Brief Symptom Inventory (BSI, 27): is a self-report measure of psychopathology and general stress. The following domains of distress were included: somatisation, anxiety, and phobic anxiety.

### *Procedures*

Detailed description of the study procedures have been published for the SHADE (2) and DAISI (1) studies elsewhere. For both studies, following the provision of informed consent, eligible participants completed a baseline clinical interview with a Registered or Intern Psychologist, usually over two one-hour sessions, one week apart. All participants then received an initial session comprising advice and MI focused on depression and alcohol misuse, conducted face-to-face with a Registered or Intern Psychologist. At the conclusion of this session, participants were randomised into no further treatment (Brief Intervention (BI) condition), or conditions that ensued over the following 9 weeks. Regardless of treatment attendance, all participants were eligible for follow-up assessment, which occurred at 3-, 6-, and 12-

months post-baseline, and were conducted by a blind assessor independent from the treatment phase of the projects.

The DAISI project employed four psychological treatment programs of combination MI and CBT that were conducted face-to-face with trained Psychologists:

- (a) 1 60-minute integrated BI that addressed depression and alcohol use concurrently;
- (b) 10 60-minute sessions of MI/CBT that targeted alcohol use, including the BI as session 1 (Alc);
- (c) 10 60-minute sessions of MI/CBT that targeted depression, with the BI as session 1 (Dep); and
- (d) 10 60-minute sessions of MI/CBT that addressed depression and alcohol use concurrently, with the BI as session 1 (Int).

The SHADE project examined the efficacy of three psychological treatment conditions, delivered over a 10-week period, each with a 60-minute face-to-face BI as session 1. These treatments were:

- (a) 10 60-minute sessions of MI/CBT targeting depression and alcohol use concurrently, with the BI as session 1 and delivered face-to-face with a trained Psychologist (Int);
- (b) 10 60-minute sessions of MI/CBT targeting depression and alcohol use concurrently, with the face-to-face BI as session 1, and ensuing sessions delivered by the SHADE computer program with weekly 15-minutes compliance checking face-to-face with a therapist (SHADE); and

- (c) 10 60-minute sessions of Person Centred Therapy (PCT), with the BI as session 1, delivered face-to-face by a trained Psychologist, and limited to supportive counselling techniques with no MI/CBT strategies.

Across the SHADE and DAISI projects, the BI was identical in content and delivery mode, as was the 10-session integrated treatment program that used MI/CBT targeting both depression and alcohol use concurrently and was delivered face-to-face by a trained therapist.

The protocols for the SHADE and DAISI projects were approved by a suitably constituted Ethics Committee of the institution within which the work was undertaken and conformed to the provisions of the Declaration of Helsinki (as revised in Tokyo 2004).

### *Statistical Analysis*

Basic demographics were examined for the sample as a whole.

All participants received a categorisation according to the severity of their consumption of tobacco at baseline assessment. The categories were based on previous research (20, 21) and included: non-smoker (0 cigarettes per day, cpd), light (1-9 cpd), moderate (10-19 cpd) and heavy (20+ cpd). The relationship between this new smoking variable and basic demographics was examined using oneway Analysis of Variance (ANOVA) for continuous variables and chi square analysis for categorical variables. Relevant presenting symptoms (depression alcohol consumption, anxiety, cannabis use, general functioning) were also explored for

associations with smoking category using oneway ANOVA, with Bonferroni posthoc analysis used to determine the nature of any differences in these variables according to smoking category.

Hypothesis (a): that heavy smokers will have higher levels of depression and alcohol use than non-smokers

Analysis of CoVariance (ANCOVA) compared the newly created smoking variable with BDI-II and OTI (alcohol) scores at baseline, with all baseline variables examined above that showed a significant relationship with smoking entered in as covariates.

Hypothesis (b): that heavy smokers will have poorer outcomes on measures of depression and alcohol use than non-smokers.

Two repeated measures ANOVAs examined the impact of smoking category (non-smoker, light, moderate, heavy) on treatment outcomes over time (one for depression and one for alcohol use). No imputations for missing data were used, with participants providing data at each relevant timepoint included in the analysis.

Baseline, 3-, 6- and 12-month BDI-II and alcohol consumption scores were included in the model, and significant baseline variables as above were included as covariates in the analysis.

Hypothesis (c): that significant reductions in smoking tobacco will be observed from pre- to post-treatment and that these reductions will be moderated by treatment condition.



Paired sampled t tests examined changes in tobacco consumption, based on OTI tobacco scores, between baseline and 3-months, baseline and 6-months and baseline and 12-months.

The relationship between smoking and treatment outcome was assessed by creating change scores for the primary outcome variables (BDI-II and OTI alcohol scores) and OTI tobacco scores at three, six and twelve months relative to baseline. Positive scores on the change measures were indicative of decreases in tobacco, depression and alcohol use. Correlations were conducted between these variables to examine how changes in primary outcomes were associated with changes in smoking.

Repeated measures ANOVA examined changes in OTI tobacco scores over time (baseline, three, six and twelve months) as a function of treatment allocation (BI, Dep, Alc, Int, Comp, PCT) at each timepoint. No imputations for missing data were used, with participants providing data at each relevant timepoint included in the analysis. Baseline variables with a significant relationship to smoking were included as covariates.

## RESULTS

### *Demographics.*

Of the 447 participants in the current study at baseline, 340 (76%) completed the 3-month follow-up assessment, 342 (77%) the 6-month and 315 (70%) the 12-month follow-up assessment. Fifty eight percent (n=261) completed all three follow-up assessments. At baseline, 185 (41%) participants reported not smoking in the month prior to entry to the SHADE/DAISI studies, 63 (14%) were light smokers, 68 (15%)

were moderate smokers and 131 (29%) were heavy smokers of tobacco. The mean age of the sample was 43.94 years (range 18-73). Sample characteristics are displayed in Table 1.

---

Insert Table 1 about here

---

Significant associations were found between levels of smoking at baseline and age and education. Non-smokers were significantly older (age=47.13yrs) than were those who reported light (age=40.70,  $p<0.01$ ), moderate (age=40.32,  $p<0.01$ ) or heavy tobacco consumption (age=42.87,  $p<0.01$ ). Heavy smokers reported significantly less involvement in education compared to light smokers, having left secondary schooling at a younger age (age=15.93 vs. 16.63yrs respectively,  $p<0.01$ ). Non-smokers also left school at a significantly younger age than light smokers (age=16.09 vs. 16.63,  $p=0.03$ ). A significantly higher proportion of males than females were classified as heavy smokers (63% vs. 37%,  $\chi^2_3=9.247$ ,  $p=0.03$ ). A significantly higher proportion of participants with an Independent Depressive Disorder were non-smokers, relative to those with Substance-Induced Depression (73% vs. 27%,  $\chi^2_3=8.385$ ,  $p=0.04$ ). Unemployed participants were significantly more likely to be light-heavy smokers (n=29-71, 47-55%) than non-smokers (n=42, 23%,  $p<0.01$ ). Participants currently receiving government pensions were also significantly more likely to be light-heavy smokers (n=39-87, 63-66%) than non-smokers (n=74, 40%,  $\chi^2_3=27.24$ ,  $p<0.01$ ).

*Associations between tobacco smoking and relevant presenting symptoms.*

As can be seen in Table 2, there were significant Bonferroni corrected associations between severity of smoking and cannabis use, anxiety and general functioning.

---

Insert Table 2 about here

---

Light and heavy smokers reported significantly higher levels of cannabis use at baseline than non-smokers. Anxiety symptoms were significantly higher among moderate and heavy smokers compared to non-smokers. Non-smokers displayed significantly higher levels of general functioning than moderate-heavy smokers.

*Hypothesis (a): that heavy smokers will report higher depression and alcohol consumption at baseline.*

ANCOVA compared BDI-II scores with smoking category, using age, gender, education, employment, primacy, mental health treatment, baseline cannabis use, baseline anxiety and baseline functioning as covariates. The ANOVA was not statistically significant ( $F(3,204)=0.935$ ,  $p=0.425$ ). Significant covariates in the model were anxiety ( $p<0.01$ ) and functioning ( $p<0.01$ ).

The same ANCOVA model was used to examine the relationship between smoking category and alcohol consumption at baseline. The model was statistically significant ( $F(3,205)=3.900$ ,  $p=0.010$ ), with simple contrast results indicating heavy smokers consumed significantly more alcohol than did non-smokers ( $\underline{M}(\text{non-smokers})=9.104$  standard drinks per day,  $\underline{M}(\text{heavy smokers})=12.583$  standard drinks per day,  $p=0.011$ ). None of the covariates was significant in the model.

*Hypothesis (b): that smokers will have poorer outcomes on measures of depression and alcohol use than non-smokers.*

Repeated measures MANOVA, using the covariates of age, gender, education, employment, pension receipt, mental health treatment, baseline cannabis use, baseline anxiety and baseline functioning, examined depression outcomes over time according to smoking categorization at baseline. The MANOVA indicated a significant main effect of time on depression scores ( $F(3,182)=3.166, p=0.026$ ), with post-baseline depression scores at 3-, 6- and 12-months being 10.635, 11.656 and 12.083 BDI-II points respectively lower than baseline. However, the interaction between time, smoking status at baseline and depression was not statistically significant ( $F(9,184)=0.936, p=0.493$ ).

Using the same MANOVA model, there was no main effect of time on alcohol use ( $F(3,185)=1.470, p=0.224$ ), and no significant interaction between alcohol use over time and smoking status at baseline ( $F(9,187)=0.401, p=0.935$ ). The significant covariate in this model was education ( $F(3,185)=2.891, p=0.037$ ).

*Hypothesis (c): that significant reductions in smoking tobacco will be observed from pre- to post-treatment, and that these reductions will be moderated by treatment condition.*

Paired sample t tests revealed that no significant changes in tobacco use (OTI tobacco scores) occurred between baseline and 3-month follow-up ( $\underline{M}(\text{baseline})=10.559, \underline{M}(3\text{-months})=10.050, t=1.155, p=0.249, n=335$ ), baseline and 6-months ( $\underline{M}(\text{baseline})=10.731, \underline{M}(6\text{-months})=10.594, t=0.255, p=0.799, n=338$ ) and baseline

and 12-month ( $\underline{M}(\text{baseline})=10.926$ ,  $\underline{M}(\text{12-months})=10.846$ ,  $t=0.087$ ,  $p=0.931$ ,  $n=310$ ) follow-up assessments.

Pearson correlations indicated a significant positive association between changes in smoking and changes in depression ( $r=0.14$ ,  $p=0.01$ ) between baseline and 3-months post-baseline assessments. The same was true for changes in tobacco and changes in alcohol use over the same time period ( $r=0.15$ ,  $p<0.01$ ). No significant relationships between changes in these three variables were found over the longer term.

Repeated measures MANOVA, with the following covariates: age, gender, employment, education, pension receipt, mental health treatment, baseline cannabis use, baseline anxiety scores, and baseline functioning, examined changes in smoking between baseline, 3-, 6- and 12-month follow-up according to treatment allocation. The ANOVA indicated that the main effect of time on smoking was not statistically significant ( $F(3,151)=0.245$ ,  $p=0.865$ ). None of the covariates was statistically significant, and the interaction between smoking over time and treatment allocation was not statistically significant ( $F(15,153)=1.714$ ,  $p=0.135$ ).

Figure 1 displays the changes in tobacco use over time, according to treatment allocation, adjusted for the covariates in the model. Participants in the integrated therapist condition reported a slight reduction of 1.53 cpd between baseline and 12-month follow-up assessment, as did those in the alcohol condition (1.49 cpd). Those in the SHADE computer condition reported a 3.62 cpd reduction over the same time period. No change in OTI tobacco scores was found for those in the BI (+0.34 cpd)

and Dep (+0.54 cpd) conditions. Participants in the PCT condition reported a 1.16-cpd increase between baseline and 12-month follow-up assessments, with a peak increase observed at 6 months post-baseline (4.29 cpd).

---

Insert Figure 1 about here

---

## DISCUSSION

The aim of this study was to explore the impact of smoking tobacco on presenting symptoms and treatment outcomes for people enrolled in a trial of psychological treatment for comorbid depression and alcohol misuse. Contrary to prediction, after controlling for important socioeconomic factors relevant to smoking, heavy smokers did not report elevated levels of depression compared to non-smokers, however they did drink significantly more alcohol (13 versus 9 standard drinks per day). Smoking status at baseline did not affect depression or alcohol use outcomes over the course of the study, and tobacco use was not significantly reduced as a function of treatment for depression and alcohol misuse. These implications of these results are discussed in detail below.

*Hypothesis (a): that heavy smokers will have higher levels of depression and alcohol use at baseline than will non-smokers.*

We did not find an association between increased severity of depression or alcohol use at baseline and tobacco use severity. This may be due to the eligibility criteria of the study, with participants required to be experiencing at least moderate levels of depression and hazardous use of alcohol for the month prior to baseline, thus decreasing the variability of depression and alcohol use within the sample as a whole.

However, non-smokers generally reported lower levels anxiety, cannabis use and improved functioning compared to light, moderate and heavy smokers, and heavy smokers were significantly more likely to be unemployed, leave school at a younger age, and be receiving welfare payments. Light smokers reported significantly better levels of functioning and lower alcohol consumption than did moderate and heavy smokers, and generally lower anxiety, somewhat indicative of a dose-response relationship between the amount of tobacco smoked and increased severity of symptoms. This potentially illustrates the need for effective and evidence-based treatments options for smokers incorporating a wide range of intervention targets, and the potential harm reduction benefits of reduced tobacco smoking should this be a more realistic target.

As in the current study, previous studies have identified increased severity of smoking among males as compared to females (28). It has been suggested that the reward for smoking may be different between men and women, with women reporting more psychological rewards following smoking (e.g. relaxation) and men reporting more physiological rewards after smoking (29). Further, a range of socioeconomic variables, education, receiving welfare payments, and unemployment, were significantly associated with smoking severity at baseline. Smoking was heavier in those with substance-induced depression than for people with independent depressive disorders, as well as those engaged with mental health treatment services in the 12 months prior to baseline. These findings confirm the significance of smoking tobacco as not just a health, but also a social justice issue. There are also implications for the opportunistic delivery of smoking cessation interventions, particularly for people engaged with both substance use and mental health services.

*Hypothesis (b): that heavy smokers will have poorer outcomes on measures of depression and alcohol use than non-smokers.*

Contrary to prediction, although depressive symptomatology did significantly improve over the 12-month follow-up period, this was not moderated by baseline smoking levels. Similarly, alcohol use between baseline and 12-month follow-up was not significantly related to baseline smoking status. There is little existing literature examining the impact of smoking levels on mental health or substance use treatment outcomes. Research investigating the impact of varying degrees of alcohol use on smoking cessation programs revealed that moderate drinkers had poorer smoking cessation outcomes when compared to heavy drinkers (16). This was not the case in our study. Although our results were not in line with the study hypotheses, it is reassuring to observe that heavy tobacco use does not interfere with treatment outcomes for both depression and alcohol misuse. Our results did reveal, however, that reductions in tobacco use between baseline and three-month follow-up were significantly associated with reductions in depression and alcohol use over the same time period, suggesting that it is possible to make simultaneous changes on all three domains, at least in the short term. Future studies should seek to address this association, and identify mechanisms by which the short-term changes could be maintained for longer-term benefit in all three domains (depression, alcohol and smoking). Prolonged treatment may have been more successful in improving depression, alcohol and smoking, despite smoking not being specifically targeted in the treatment provided in the current study. Smoking may have been reduced further with additional targeted treatment and perhaps provision of nicotine replacement therapy.



*Hypothesis (c): that significant reductions in smoking tobacco will be observed from pre- to post-treatment and that these reductions will be moderated by treatment condition.*

It was anticipated that despite cigarette smoking not being directly targeted, the integrated approach to treatment taken in the current study might encourage generalization of skills to smoking behaviours, resulting in decreases in smoking. However, there was no reduction in smoking associated with treatment for depression or alcohol problems in the present study, indicating that tobacco use needs to be specifically targeted in treatment programs.

Whilst the impact of depression and alcohol use treatment on smoking behaviour has not been addressed in previous research, previous authors have reported that participants receiving treatment for smoking with skills that could be generalised to AOD use had poorer treatment outcomes compared to those who received the smoking cessation treatment alone (30). It was postulated that too much emphasis was given during treatment regarding the similarities of tobacco use and other substance abuse, which may have created undue pressure for the participants, who may have found these messages overwhelming. However, this was not the trend in our study. Although not statistically significant, participants receiving an integrated CBT/MI treatment for depression and alcohol use, with arguably the greatest potential for generalization of skills, reported greater reductions in tobacco use between baseline and 12-month follow-up than did participants in other single-focused, non-specific or brief treatments. Those allocated to SHADE computer treatment reported the greatest reduction in cigarettes consumed per day of all the treatment groups. We

have previously reported that the SHADE computer program was associated with significantly increased client initiative in therapy, with responsibility for learning and using treatment strategies based largely within the client (31). This may have also meant that the SHADE computer program had the largest potential for generalization of skills to other relevant areas of concern for the participant, including smoking tobacco. Other research has demonstrated that a substance use-focused treatment was effective in reducing tobacco use among adolescents (9). The authors suggested that this might be due to the targeting of external cues in the substance use treatment, which were easily generalized by participants to their smoking behaviours. This may also explain the finding in the current study, that participants receiving alcohol-focused treatment made reductions of a similar magnitude to the integrated therapist-delivered CBT/MI in relation to cigarettes per day. Importantly, some exposure to CBT/MI strategies, regardless of focus, is important in the context of tobacco use among people with depression and alcohol use problems, with participants in the PCT condition (non-directive supportive counseling, with no CBT/MI strategies offered) reporting increases in tobacco use over the study period.

### *Limitations*

A number of sample and methodological limitations are important to note. Given the sample was seeking treatment for depression and alcohol use problems, they may not represent the wider population with comorbid depression and alcohol use problems. The sample involved in this research was generally of Caucasian background and the findings may not be generalisable to other cultural groups. With regards to substance use, current usage may have been under-reported, and no biological verification was included to confirm smoking abstinence. We only measured smoking prospectively

from baseline, and not retrospectively. Hence, we do not know how recently the non-smokers in our sample had stopped smoking, or for how long current smoking levels had been maintained by participants. Given this study was a secondary data analysis of existing datasets that did not focus on tobacco use, key smoking outcome data was also not collected (e.g. quit attempts).

### *Future Directions*

Notwithstanding the above limitations, the present research is amongst the first to investigate the possible relationship between levels of tobacco smoking and the severity of symptoms experienced in a comorbid adult population presenting for treatment for depression and alcohol problems.

These results have important implications for the assessment and treatment of clients within Mental Health services, Drug and Alcohol facilities and the general health care system. To effectively treat individuals with tobacco use and other comorbid disorders, we need to have a detailed understanding of the influence smoking has on the person's psychological, biological and social existence. By understanding these associations, offering comprehensive assessments around these issues, and broadening the scope of mental health and AOD treatments to include functional improvement, perhaps in the form of vocational and other life skills training, we may be able to make significant inroads into these pressing health concerns.

The issue of the generalisability of skills learned in therapy to secondary problems remains an interesting area of discussion, and is particularly relevant to the comorbidity literature. The idea of developing treatments that target multiple conditions is also interesting to explore. The question of whether smoking is targeted

within treatments for mental health or AOD use disorders raises questions about individuals becoming overwhelmed during the interventions and compromising the effectiveness of the initial treatment focus. Alternatively, acting opportunistically to target smoking has its own difficulties, including the current barriers to identifying tobacco smoking as important in the context of other (possibly more immediate) health concerns. Furthermore, targeting functional improvement in individuals experiencing comorbidities in mental health and AOD use such as vocational skills and life skills training also warrants further investigation in regards to effectiveness.

Clearly we need to focus more on the area of smoking and comorbidity, given the huge public health impact of smoking on the global community. Tobacco smoking is the single most preventable cause of disease and death worldwide. Current hindrances to maintaining strong declines in smoking rates are in part related to the reach, effectiveness and adoption of smoking cessation support. Increasing the proportion of smokers attempting to quit, together with increasing the proportion using effective strategies on those quit attempts, will add downward pressure to smoking rates.

#### ACKNOWLEDGEMENTS

The DAISI project was funded by the National Health and Medical Research Council of Australia. The SHADE study was funded by the Alcohol Education and Rehabilitation Foundation.

#### REFERENCES

1. Baker AL, Kavanagh D, Kay-Lambkin F, Hunt S, Lewin TJ, Carr VJ, et al. Randomised controlled trial of CBT for co-existing depression and alcohol problems: Short-term outcome. *Addiction*. 2010;105 87-99.
2. Kay-Lambkin F, Baker A, Kelly B, Lewin TJ. Clinician-assisted computerised versus therapist-delivered treatment for depressive and

- addictive disorders: results of a randomised controlled trial. *Medical Journal of Australia*. 2011;195:S44-S50.
3. Baker AL, Lee NK, Claire M, Lewin TJ, Grant T, Pohlman S, et al. Brief cognitive behavioral interventions for regular amphetamine users: a step in the right direction. *Addiction*. 2005;100(3):367-78.
  4. Baker AL, Ivers R, Bowman J, Butler T, Kay-Lambkin F, Wye P, et al. Where there's smoke, there's fire: high prevalence of smoking among some sub-populations and recommendations for intervention. *Drug and Alcohol Review*. 2006;25(1):85-96.
  5. Wilhelm K, Wedgewood L, Niven H, Kay-Lambkin FJ. Smoking cessation and depression: Current knowledge and future directions. *Drug and Alcohol Review*. 2006;25(1):97-107.
  6. Wilhelm K, Mitchell P, Slade T, Brownhill S, Andrews G. Prevalence and correlates of DSM-IV major depression in an Australian national survey. *Journal of Affective Disorders*. 2003;75:155-62.
  7. Cargill B, Emmons K, Kahler C, Brown R. Relationship among alcohol use, depression, smoking behaviour, and motivation to quit smoking with hospitalised smokers. *Psychology of Addictive Behaviors*. 2001;15(3):272-5.
  8. ABS. Tobacco smoking in Australia: a snapshot 2004-05. Canberra: Australian Bureau of Statistics. Available at: <http://www.abs.gov.au> 2006.
  9. Shelef K, Diamond G, Diamond G, Myers M. Changes in tobacco use among adolescent smokers in substance abuse treatment. *Psychology of Addictive Behaviors*. 2009;23(2):355-61.
  10. Dunn K, Sigmon S, Reimann E, Badger G, Heil S, Higgins S. A contingency-management intervention to promote initial smoking cessation among opioid-maintained patients. *Experimental and Clinical Psychopharmacology*. 2010;18(1):37-50.
  11. Cooney N, Litt M, Cooney J, Pilkey D, Steinberg H, Oncken C. Concurrent brief versus intensive smoking intervention during alcohol dependence treatment. *Psychology of Addictive Behaviors*. 2007;21(4):570-5.
  12. Hitsman B, Abrams D, Shadel W, Niaura R, Borrelli B, Emmons K. Depressive symptoms and readiness to quit smoking among cigarette smokers in outpatient alcohol treatment. *Psychology of Addictive Behaviors*. 2002;16(3):264-8.
  13. Jane-Llopis E, Matytsina I. Mental health and alcohol, drugs and tobacco: a review of the comorbidity between mental disorders and the use of alcohol, tobacco and illicit drugs. *Drug and Alcohol Review*. 2006;25:515-36.
  14. Kalman D, Kim S, DiGirolamo G, Smelson D, Ziedoni D. Addressing tobacco use disorder in smokers in early remission from alcohol dependence: the case for integrating smoking cessation services in substance use disorder treatment programs. *Clinical Psychology Review*. 2010;30(12-24).
  15. Baker A, Richmond R, Haile M, Lewin TJ, Carr VJ, Taylor R, et al. A randomized controlled trial of a smoking cessation intervention among people with a psychotic disorder. *American Journal of Psychiatry*. 2006;163:1934-42.
  16. Kahler C, Metrik J, LaChance H, Ramsey S, Abrams D, Monti P. Addressing heavy drinking in smoking cessation treatment: A randomised clinical trial. *Journal of Consulting and Clinical Psychology*. 2008;76(5):852-62.

17. APA. Practice guideline for the treatment of patients with major depressive disorder (Revision). *American Journal of Psychiatry*. 2000;157(4 Suppl):1-45.
18. APA. Practice guideline for the treatment of patients with substance use disorders: Alcohol, cocaine, opioids. *American Journal of Psychiatry*. 1995;152(11 Supplement):1-59.
19. APA. Practice guidelines for the treatment of patients with nicotine dependence. *American Journal of Psychiatry*. 1996;153(10):S1-S31.
20. Shelef K, Diamond GS, Diamond GM, Myers M. Changes in tobacco use among adolescent smokers in substance use treatment. *Psychology of Addictive Behaviors*. 2009;23(2):355-61.
21. Alati R, Kinner S, Najman JM, Fowler G, Watt K, Green D. Gender differences in the relationships between alcohol, tobacco and mental health in patients attending an emergency department. *Alcohol & Alcoholism*. 2004;39(5):463-9.
22. Beck AT, Steer RA, Brown GK. *The Beck Depression Inventory, Second Edition: Manual*. San Antonio: The Psychological Corporation; 1996.
23. NHMRC. Australian guidelines to reduce health risks from drinking alcohol. Canberra: National Health and Medical Research Council of Australia ISBN Online: 1864963808 (available at <http://www.ag.gov.au/cca>), 2009.
24. First MB, Spitzer, R.L., Gibbon, M., & Williams, J.B.W. (2001). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition*. New York 2001.
25. Darke S, Hall W, Wodak A, Heather N, Ward J. Development and validation of a multi-dimensional instrument for assessing outcome of treatment among opiate users: the Opiate Treatment Index. *British Journal of Addiction*. 1992;87:733-42.
26. APA. Global assessment of functioning scale. *Diagnostic and Statistical Manual, Fourth Edition*. Washington: American Psychiatric Association; 1994.
27. Derogatis LR, Melisaratos N. The brief symptom inventory: An introductory report. *Psychological Medicine*. 1983;13:595-605.
28. Grant B, Hasin B, Chou P, Stinson F, Dawson D. Nicotine dependence and psychiatric disorders in the United States: results from the National Epidemiological Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*. 2004;61:1107-15.
29. Massak A, Graham K. Is the smoking-depression relationship confounded by alcohol consumption? An analysis by gender. *Nicotine and Tobacco Research*. 2008;10(7):1231-43.
30. Burling T, Burling A, Latini D. A controlled smoking cessation trial for substance dependent inpatients. *Journal of Consulting and Clinical Psychology*. 2001;69(2):295-304.
31. Kay-Lambkin F, Baker AL, Lewin TJ, Carr VJ. Acceptability of a clinician-assisted computerized psychological intervention for comorbid mental health and substance use problems: Treatment adherence data from a randomized controlled trial. *Journal of Medical Internet Research*. 2011;13(1):e11p1-ep.

Table 1: Characteristics of the study sample

	N	%
<b>Gender</b>		
Males	234	53
Females	213	47
<b>Marital Status</b>		
Single, never married	130	29
Divorced/Separated/Widowed	168	38
Married/Defacto	149	33
<b>Completed secondary school</b>	178	40
<b>Unemployed</b>	174	39
<b>Receiving Welfare</b>	243	54
<b>Primacy</b>		
Independent Depression	184	41
Alcohol-induced Depression	107	24
Unable to determine	156	35
<b>12-month Diagnosis</b>		
Major Depressive Disorder	276	62
Alcohol Dependence	361	81
<b>Treatment Allocation</b>		
Brief Intervention	70	16
Depression-focused	71	16
Alcohol-focused	68	15
Integrated-focused	133	29
SHADE	56	12
Person-centred Therapy	54	12

**Table 2:** Levels of depression, alcohol consumption and other domains as a function of severity of tobacco consumption at baseline assessment. Note: Non-smokers=0 cigarettes per day (cpd), Light=1-9 cpd, Moderate=10-19 cpd and Heavy=20+ cpd.

Severity of Smoking	N	Mean	SD <sup>1</sup>	Sig.
<b>BDI-II<sup>2</sup> depression</b>				
Non-smokers	185	30.48	8.83	n.s.
Light	63	32.38	8.49	
Moderate	67	32.78	9.64	
Heavy	130	32.02	8.74	
<b>OTI<sup>3</sup>-alcohol</b>				
Non-smokers	185	9.93	7.81	n.s.
Light	63	9.13	7.08	
Moderate	68	11.06	9.69	
Heavy	131	11.33	7.74	
<b>OTI<sup>3</sup>-Cannabis</b>				
Non-smokers	184	0.29	2.37	Non<Light, p<0.01
Light	62	3.14	9.78	
Moderate	67	2.14	5.23	Non<Heavy, p<0.01
Heavy	129	2.61	7.56	
<b>BSI<sup>4</sup> – somatisation</b>				
Non-smokers	154	1.00	0.82	Mod>Non, p<0.01 Heavy>Non, p<0.01
Light	57	1.28	0.84	
Moderate	59	1.42	0.82	
Heavy	108	1.49	0.75	
<b>BSI<sup>4</sup> - anxiety</b>				
Non-smokers	154	1.48	1.01	Mod>Non, p<0.05 Heavy>Non, p<0.01
Light	57	1.70	0.93	
Moderate	59	1.92	1.09	
Heavy	108	1.90	0.89	
<b>BSI<sup>4</sup> – phobic anxiety</b>				
	154	0.86	1.00	Mod>Non, p<0.01 Heavy>Non, p<0.01
Non-smokers	57	1.20	1.08	
Light	59	1.37	1.24	
Moderate	108	1.27	1.08	
Heavy				
<b>GAF<sup>5</sup> - functioning</b>				
Non-smokers	167	58.78	9.00	Non>Mod, p<0.01 Non>Heavy, p<0.01
Light	59	57.42	10.00	
Moderate	64	54.03	10.79	
Heavy	121	53.311	11.56	

<sup>1</sup> Standard Deviation

<sup>2</sup> Beck Depression Inventory II scores

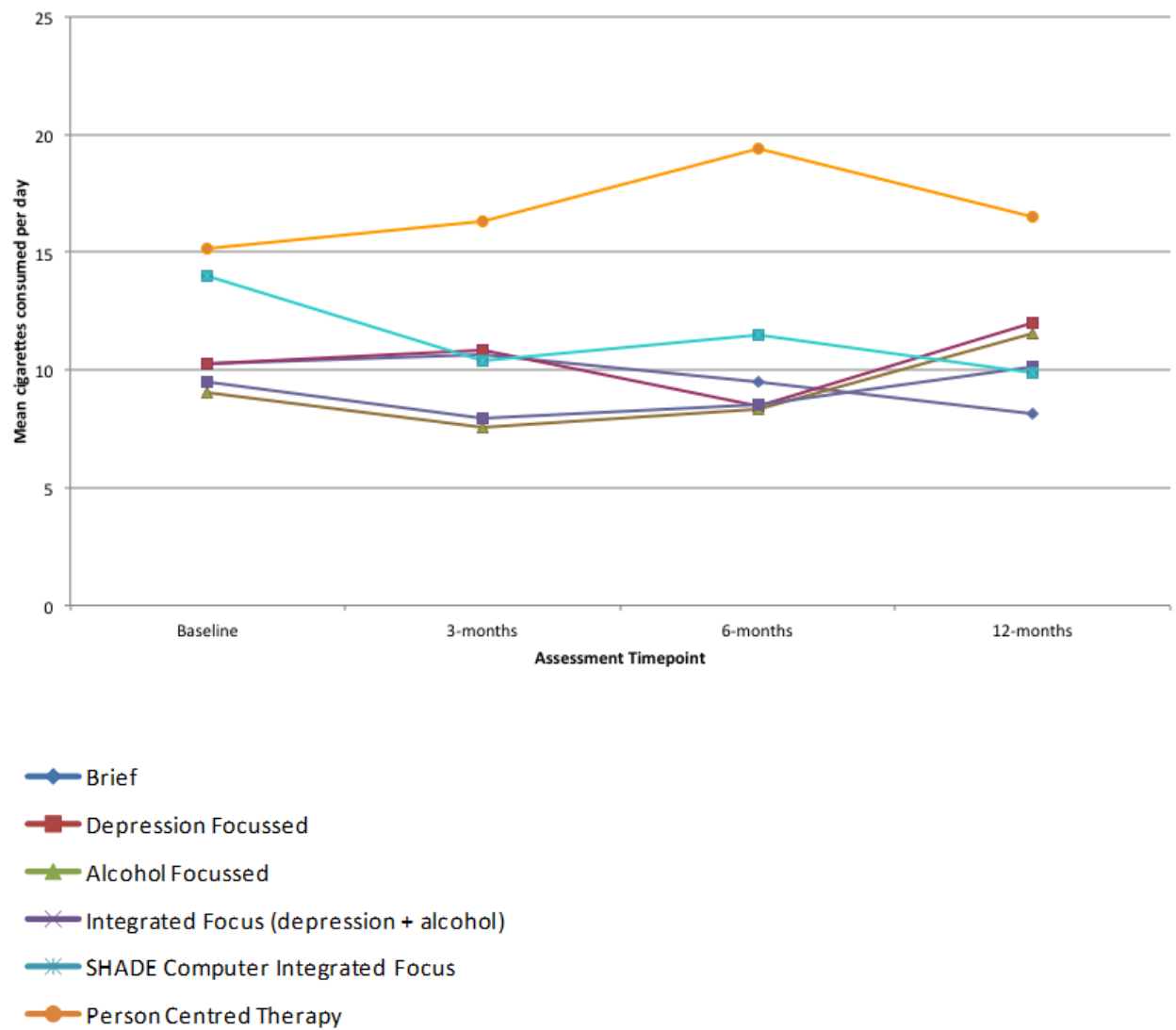
<sup>3</sup> Opiate Treatment Index Scores representing average use occasions per day

<sup>4</sup> Brief Symptom Inventory Scores

<sup>5</sup> Global Assessment of Functioning scores



**Figure 1:** The interaction between cigarettes consumed per day over time as a function of treatment allocation.



## Discussion

The present study sought to investigate the relationship between tobacco smoking, mental health disorders including depression and anxiety, as well as substance use in comorbid populations. It was hoped that by completing this research, a better understanding of the relationships between these factors may be gained and inform the more effective treatment of individuals experiencing such complex presentations. The identification of effective treatment modalities that address these disorders simultaneously will have effects not only at the individual level, but also within families, communities, nation's and worldwide.

Specifically, it was hypothesised that within our sample at baseline, those participants who had increased levels of smoking, would also report increased levels of depression and alcohol use. In addition, it was expected that those participants with increased levels of tobacco use would also have poorer treatment outcomes from those who were abstinent. Finally, it was anticipated that significant reductions in smoking would be observed following treatment with this being moderated by treatment condition. These hypotheses were not supported in the current study.

### *The association of tobacco use on levels of depression and alcohol use:*

Contrary to prediction, heavy smokers did not report higher levels of depression or alcohol use than non-smokers at baseline. However, use of tobacco was associated with increased levels of cannabis use, anxiety, and lower levels of functioning. This relationship was of a dose-response nature, with abstinent smokers generally reporting lower levels of anxiety, and improved functioning than smokers in the mild, moderate

and heavy range. Mild smokers reported significantly better levels of functioning and lower alcohol consumption than did moderate and heavy smokers, and were generally lower in anxiety. However, the relationship between tobacco consumption and cannabis use was not a linear one, with those abstinent on tobacco reporting the lowest cannabis use, followed by moderate, heavy and then mild smokers. This is perhaps indicative of the complex interaction between cannabis and tobacco use, and the difficulties in accurately measuring tobacco exposure amongst those also smoking cannabis. Tobacco is frequently mixed with cannabis to assist with burning (Cancer Council, 2010), and to mask the smell of cannabis, an adaptive practice for people who do not have a private place to smoke (AIHW, 2007). This may indirectly expose the cannabis user to nicotine, and it may not have occurred to our study participants to include this exposure in their self-report of tobacco consumption. Furthermore, in the context of cannabis use, any exposure to tobacco may be problematic. For example, in a large scale prospective study of adolescents in Victoria, tobacco smoking in adolescence, even as rare as one cigarette per month, was associated with weekly or greater cannabis use at age 24, with the strength of this relationship increasing with increasing severity of tobacco use (Ivers, 2004). Cannabis has also recently been put forward as a ‘gateway’ drug to tobacco use, having been identified as both a predictor of initiation to tobacco use and to later nicotine dependence in a sample of 1,943 young Australians aged 14-15 years (Rissel, McLellan & Bauman, 2000). Thus the importance of targeting both cannabis and tobacco use in treatment seems clear.

It is also interesting to note that the group reporting the lowest consumption of alcohol were those in the mild smoking group. In addition, heavy smokers did drink more than non-smokers however this did not reach significant levels. Perhaps the presence

of depression confounded these results. People who were abstinent from cigarettes reported similar levels of alcohol consumption to those who were classed as heavy smokers. Perhaps the presence of depression confounded these results. The relationship between depression and increased alcohol consumption has been well established in the literature (Conner, Piquart & Gamble, 2009), either with alcohol exacerbating existing depression or, more particularly, with alcohol being used to self-medicate problematic symptoms of depression. It may be at low levels of cigarette consumption, the stimulant effect of nicotine mitigates the relationship between depression and alcohol use, resulting in lower experience of depressive symptoms and thereby lower levels of alcohol use than for those completely abstinent on tobacco. However, this appears to be a small window for this effect, as any tobacco consumption above mild resulted in higher consumption of alcohol use. This issue is worthy of further investigation, but clearly highlights the importance of considering depression, alcohol and tobacco use in context when present in individuals seeking treatment.

The literature available in regards to the relationship between the severity of tobacco use and people's experience of mental illness and drug and alcohol use is limited. Research has found that adult participants who have increased alcohol use and have current depressed mood, also use more cigarettes per day than those who don't use alcohol heavily or experience current depression (Cargill, Emmons, Kahler & Brown, 2001), however this was not observed in the current study. The association between smoking and depressive symptoms has also been observed in adolescents (McCaffery, Papandonatos, Stanton, Lloyd-Richardson & Niaura, 2008).

This has important implications in regards to the assessment and treatment of clients within Mental Health services, Drug and Alcohol facilities and the general health care system. As suggested earlier, the identification of people with high levels of tobacco and alcohol use is limited in the current health care system and certainly requires an overhaul (Shourie, Conigrave, Proude & Haber, 2007). Through having a general understanding that those who suffer from increased depressive symptoms are more likely to use tobacco and alcohol excessively, a more thorough and effective assessment can be completed that takes into account other factors that may be influencing a person's mental health and social situation. With the current research lending some support to the association of increased anxiety symptoms with the use of larger amounts of tobacco, and cannabis, the need for effective and evidence based treatment for such comorbidities is emphasised.

Past research in the area suggests a 'dose response gradient between the severity of psychiatric symptoms and the number of cigarettes smoked daily' with smoking cessation having been found to be related to gains in mental health. (Araya, Gaete, Rojas, Fritsch & Lewis, 2007). The idea that increased depressive symptoms are experienced for smokers in comparison to non-smokers was not observed in this research and does not support past literature.

Given past findings regarding the dose response gradient between smoking and mental illness, it could be suggested that those experiencing mild symptoms of depression and anxiety who also smoke tobacco and drink alcohol may be targets for interventions to prevent not only deteriorating mental health, but also the possibility of substance abuse and dependence. Being able to identify such individuals and

address prevention, as well as treatment, may aid in the process of tackling such comorbidities. As discussed earlier, the impact of such comorbidities on individual functioning levels, as well as life expectancy and financial consequences in regards to health care costs is huge. To be able to effectively identify people at risk of developing such debilitating disorders and treat them accordingly, would have considerable implications.

Alati and colleagues (2004) found an association in their study between the experience of anxiety and tobacco use, however there was no evidence of a dose-response relationship, with anxiety levels not differing across light, moderate or heavy smokers. We did not find a statistically significant dose-response relationship between anxiety levels and severity of tobacco consumption (with the exception of abstinence from tobacco being associated with significantly lower anxiety), however self-reported anxiety levels did increase as severity of smoking increased. This finding implies that anxiety may be an important target for treatment amongst smokers of any level of severity.

It is important to note that the current study did not find associations between level of smoking and a number of demographic and diagnostic variables. In a similar result to the current study, Reichler, Baker, Lewin and Carr (2001) did not find any differences between smoking level and different diagnostic disorder groups in their sample. Like us, Reichler et al. (2001) did find age differences in level of smoking, however there were no differences between smoking levels and employment status. In the current study, participants without a current job, who were currently receiving welfare, and who left secondary schooling around one year earlier than their counterparts were

significantly less likely to report abstinence from smoking at entry to the study. Smokers in our study generally reported poorer levels of functioning, with those reporting abstinence also being rated as having significantly higher functioning than those with even mild levels of cigarette consumption. This emphasises the need to further research the possible links between smoking severity and other factors including mental health diagnosis, and sociodemographic disadvantage, and the importance of targeting functional improvement in treatment for smokers with comorbid depression and alcohol use problems, perhaps in the form of vocational and other life skills training, to correct this deficit. To effectively treat individuals with tobacco use and other comorbid disorders, we need to have a detailed understanding of the influence smoking has on the person's psychological, biological and social existence.

The significant finding in relation to gender and cigarette consumption supports results of previous research. A range of previous studies have identified increased severity of smoking among males as compared to females (Grant et al, 2004), whilst Alati and colleagues (2004) found that more females than males smoked in their sample, however males were more likely to report moderate to heavy smoking than their female counterparts. One study reported associations between a clinical diagnosis of depression and smoking for women across smoking severity, however only in mild and heavy categories for men (Massak & Graham, 2008). Other studies have found significant associations between gender, smoking status and major depression, with some evidence that the relationship is stronger in women (Husky, Mazure, Paliwal & McKee, 2008). Experts have interpreted these findings by suggesting that the reward for smoking may be different for men and women. Some

research indicates that women report more psychological rewards following smoking, feeling relaxed and comfortable, with men reporting more physiological rewards after smoking. These differences may impact on the number of cigarettes needed to achieve these desired effects (Massak & Graham, 2008). Although the majority of heavy smokers in the current study were identified as male, there were equal proportions of males and females distributed across the remaining smoking categories. The results of the current study support previous findings and adds to the suggestion that the use of tobacco by males and females may be for different purposes which has implications regarding the future development of smoking cessations programs.

The current study also found a significant association between primacy of depression over alcohol use with smoking. More specifically, participants who experienced substance-induced depression, as opposed to an independent depressive condition, were significantly more likely to report increased levels of tobacco use at baseline, and less likely to report abstinence. This potentially highlights the potency of relationship between use of alcohol/other drugs and tobacco, and points to a group of people who would benefit from a targeted smoking cessation intervention.

The present research did not find a relationship between the level of smoking, and diagnosis of Major Depressive Disorder, or adherence to medication. Similarly, Piper et al (2010) did not find any differences between level of smoking and current psychiatric diagnosis, however they suggested this may have been due to the exclusion of light smokers from their study. The current study improved on Piper et al. by including the full range of smokers from abstinent through to heavy, however the combination of current moderate-severe depression and concurrent problematic



alcohol use present in our sample may have diminished any potential additional impact of cigarette consumption on diagnosis and other related variables. Of note, however, is the significantly increased contact moderate had with mental health treatment services in the 12 months prior to the baseline assessment, along with the use of private psychologists significantly more often by those reporting mild tobacco use. Such treatment seeking and participation reported by mild-moderate smokers with depression and alcohol use problems presents an ideal and important opportunity for treatment providers in these settings to offer opportunistic smoking cessation interventions to prevent progression to heavier use.

#### *Cigarette smoking and treatment outcome*

Whilst it was hypothesised that baseline level of cigarette consumption would impact on depression outcomes following treatment for comorbid depression and alcohol misuse, this was not supported by the study results. Depression symptomatology did significantly improve over the 12-month follow-up period relative to baseline, however this was not moderated by baseline smoking levels. Although heavy smokers reported the smallest reduction in depressive symptoms at 12 months post-baseline (11-point reduction on the BDI-II, relative to a 14-point reduction for mild participants), this was not statistically significant. Similarly, alcohol use decreased significantly from baseline to 12-month follow-up, however this was not found to be significantly related to baseline smoking status.

The existence of past literature examining the impact of smoking levels on mental health or substance use treatment outcomes is minimal. A study exploring the changes in tobacco use of adolescents over time, following treatment for cannabis use,

supports the idea of differences between groups of smokers on treatment outcome (Shelef, Diamond, Diamond & Myers, 2010). Shelef et al. indicated that whilst moderate smokers maintained a consistent level of tobacco smoking during and post-treatment, heavy smokers significantly reduced their consumption (although it remained high), and mild smokers decreased their smoking over the course of treatment and at follow up. Whilst treatment in the current study focussed on alcohol use rather than cannabis, we did not observe any differences between smoking categories in alcohol use over time, suggesting a different relationship might exist between cannabis and tobacco comorbidity than for alcohol and tobacco comorbidity. This remains an important topic to explore. Certainly, developing the foundations of treatment for smokers depending on their level of consumption and drug of concern may prove an important assignment in changing the effectiveness of current smoking cessation programs.

Research has been conducted by Kahler and colleagues (2008) which investigated the impact of varying degrees of alcohol use on smoking cessation programs. Kahler et al. revealed that moderately-heavy drinkers had poorer treatment outcomes when compared to heavy drinkers in relation to smoking cessation. Furthermore, participants who were abstinent from smoking during different follow-up points were not significantly different in regards to alcohol use than those who were smoking, and no relationship between smoking and alcohol use levels was observed. This result in particular is similar to the findings of the current study in regards to smoking categories, and together these studies highlight the need for additional investigations into the influences of alcohol and tobacco use on each other.

*Is tobacco use modified by treatment targeting depression and alcohol misuse?*

At the univariate level, changes in depression and changes in alcohol use between baseline and 3-month follow-up were significantly associated with changes in tobacco consumption over the same period. However, this was not evident at any other baseline/follow-up comparison point (baseline – 6months, baseline – 12months), and was not moderated by modality or focus of treatment received in the study.

The expectation that CBT skills used in treatment for depression and alcohol misuse may be transferred to smoking cessation was somewhat supported in the current study. While some reductions in cigarette smoking were noted in the treatment groups including BI and the SHADE computer delivered treatment, increases in tobacco consumption were noted in depression-focused treatment as well as person-centred therapy. There was no change in smoking behaviours for participants involved in the alcohol-focused or integrated treatments. No changes in cigarette consumption were statistically significant as a function of time.

Whilst the impact of depression and alcohol use treatment on smoking behaviour has not been addressed in previous research, other literature has made some important contributions in regards to the idea of generalisability of treatments to non-targeted illnesses or behaviours. The idea has been put forward that ‘structured psychological approaches to smoking cessation adds to the benefits of antidepressants and nicotine replacement therapy, particularly for smokers with high nicotine dependence and repeated major depressive episodes’ (Wilhelm, Wedgewood, Niven & Kay-Lambkin, 2006), however little evidence exists to directly test this notion.

Burling, Burling and Latini (2001) initially explored the possibility of the generalisation of skills learned in therapy by inpatients receiving drug and alcohol treatment who also smoked tobacco. Interestingly, the authors found that participants receiving treatment for smoking with skills that could be generalised to drug and alcohol use had poorer treatment outcomes compared to those who received the smoking cessation treatment alone. The authors postulated that too much emphasis was given during treatment regarding the similarities of tobacco use and other substance abuse, which may have created undue pressure for the participants. It is important to note that the main aim of Burling, Burling and Latini's research was to explore this generalisation, with the current research not having the same precise focus. Nevertheless, it may be that our study provides some support to this previous research, albeit not at a statistically significant level. It may be argued that participants in the integrated treatment condition (which taught participants about the links between depression and alcohol use, and demonstrated how CBT skills could be generalised to both problem areas) had the greatest potential for generalisation of similar skills to the issue of smoking cessation. However, in our study, integrated participants reported little or no change in cigarettes per day (an increase of 0.17), with the other CBT treatment conditions (alcohol- or depression-focussed treatment) reporting around 1 cigarette per day increase over the course of the study. Brief intervention participants, and those allocated to SHADE computer treatment reported reductions in cigarettes consumed per day of 4.14 and 2.65 respectively, with these participants receiving the least 'live' therapist input (and potential pressure) over the treatment period. Our results perhaps suggest that some CBT (or pressure) is important, however, with the person-centred therapy group (who received the brief intervention plus nine sessions of nonspecific counselling) reporting the greatest

increase in cigarettes per day (5.07) of all the treatment conditions. Whilst the possibility of the generalising of therapy skills was not observed at a statistically significant level in this research, the findings certainly emphasise the need to explore the area in more detail.

The impact of a substance use-focused treatment on smoking behaviour in adolescents has also been investigated by Shelef, Diamond, Diamond and Myers (2009). Their findings suggest that some reductions in smoking were made across all levels of tobacco use even though tobacco smoking was not specifically targeted. The authors suggest that the higher reductions made by mild smokers may be related to the targeting of external cues in substance use treatment, given that their dependence on tobacco may be much less than that experienced by moderate to heavy smokers. It is important to note that the treatment received by participants involved in this study was in regards to cessation of cannabis use. Given the similarities of cannabis use to tobacco use in smoking behaviour, the results of this research may not be as generalisable to other substance use disorders. Nevertheless, reductions in cigarettes smoked per day following treatment that did not address tobacco smoking is an interesting topic of discussion, with further research needed to clarify what mechanisms are at play.

Cincirpini and colleagues (2010) explored the effects of a depression and smoking-based CBT treatment compared to a smoking alone treatment for depressed and pregnant smokers. They found that the depression and smoking-based CBT was more effective for women with higher depression rates in regards to abstinence, whilst women with lower levels of depression benefited from the control health and wellness

based treatment. The authors concluded that a combined treatment may be more effective for individuals suffering from comorbid conditions and that ‘interventions that reduce depressive symptoms may facilitate cessation’ (p52). This entertains the idea of treatment having an impact on a secondary comorbidity.

Conversely, a number of studies have been conducted where treatment as usual was compared to comorbidity-specific treatment programs. Baker and colleagues (2006) found modest treatment effects for participants who received a combined CBT/motivational interviewing treatment for substance use in people with psychotic disorders, as compared to a standard treatment as usual. Minimal differences in results were observed in an additional study that compared standard smoking cessation treatment for alcohol-using smokers compared with a brief alcohol intervention (Kahler et al, 2008). Significant differences in abstinence rates of smoking were only observed whilst treatment was being received, and diminished soon after. Furthermore, whilst rates of alcohol use reduced significantly following treatment, this was observed within both treatment groups. This implies that future research should not only focus on the development of effective treatments that specifically target comorbidities, but also entertain the possibility of developing treatments with multiple targets, and not rely on the transference of learned skills in addressing the secondary disorder.

### *Summary and Conclusions*

The current study explored the possible relationships between tobacco use, depression, anxiety and drug and alcohol use in an adult treatment seeking population. The results of this research suggest that there is no association between these factors. The expectation that the increasing severity of smoking would have an impact on treatment outcome for depression and alcohol misuse was not observed. Whilst both depression and alcohol levels decreased from baseline to follow up, this was not related to baseline smoking status. Finally, it was anticipated that whilst smoking was not targeted in the various treatment allocations presented to participants in the current study, that tobacco use would reduce as a result of the generalisation of skills learned in treatment. This was partially supported by the results. Although tobacco use did decrease for participants in a number of the different treatment allocations, this difference was not statistically significant with Bonferroni adjustment, and was not associated with time or treatment received.

### *Strengths and Weaknesses of the Current Study*

The present research is among the first to investigate the possible relationship between various levels of nicotine use and the severity of depressive symptoms experienced in a comorbid adult population presenting for treatment for depression and alcohol issues. The strengths of current study include the utilisation of data collected from two large randomised controlled trials of CBT for comorbid depression and alcohol use problems. Both trials also collected a broad range of data from each individual including demographic information, current mental health symptomology, recent drug and alcohol use, as well as a psychiatric service utilisation, and levels of general functioning. This allowed detailed assessment in regards to possible

confounding variables within the statistical analysis, and increased the scope of the results.

Whilst acknowledging the above strengths, a number of sample and methodological limitations are also important to note. It is possible that the sample utilised within this research may have been higher functioning than the general population experiencing comorbid depression and alcohol disorders. The fact that the sample maintained contact with researchers over the 12-month period suggests a certain level of commitment that may not exist in individuals who are not as high functioning. Added to this was the availability of \$20 reimbursement provided to participants following each follow-up time point. Whilst this level of compensation is unlikely to have had a major impact on participant's motives for involvement within the study, it is possible that the generalisability of the research may be slightly reduced as a result. Further, the sample involved in this research was generally of Caucasian persuasion and as such the findings may not be generalisable to other cultural groups. Additionally, the basis of the current research is self-report and it is possible that responses may not be completely accurate. Specifically, with regards to substance use, current usage may have been under-reported, and no biological verification was included to confirm smoking abstinence.

#### *Future Directions*

The current study has highlighted a number of different areas that require further research in the area of comorbidity in regards to mental health and drug and alcohol use. Initially, a better understanding is required of the relationship between smoking severity and mental health diagnosis, socioeconomic disadvantage as well as



comorbidities including drug and alcohol use. The results of the current study suggest that an association may exist between cannabis and tobacco use as apposed to alcohol and cannabis use. Whilst this relationship has been investigated to some extent (Swift, Coffey, Carlin, Degenhardt, & Patton, 2008), further probing is required in order to elaborate on the current understanding of the interaction between tobacco and cannabis use. This will also allow for a more focused intervention to be developed in the future that specifically targets the comorbid use of the two substances.

The issue of the generalisability of skills learned in therapy to secondary problems remains an interesting area of discussion. Whilst the current results did not prove to be statistically significant, further investigation is required to retest the potential interaction between treatment provided and outcomes of non primary issues. The prospective usefulness of significant results in this area is colossal with future treatment strategies and programs possibly effectively targeting a number of comorbid conditions in individuals who have not had access to such interventions in the past. As suggested earlier, the incidence of comorbidity in regards to mental health conditions, and drug and alcohol use is substantial (Jane-Llopis, & Matytsina, 2006), with effective treatments addressing such comorbidities being virtually nonexistent.

Whilst the notion of the generalisability of skills is important to continue to investigate, the idea of developing treatment modalities that target multiple conditions is also interesting to explore further. The question of whether smoking is targeted within treatments for mental health or substance use disorders raises questions about individuals becoming overwhelmed during the interventions and compromising the effectiveness of the initial treatment focus. Alternatively, acting opportunistically to target smoking has its own difficulties including the current barrier of the health

system in regards to identifying tobacco use as important to address in the context of other possibly more immediate health concerns. Furthermore, targeting functional improvement in individuals experiencing comorbidities in mental health and substance use such as vocational skills and life skills training also warrants further investigation in regards to effectiveness.

The results of this study also highlight the issue of gender being extremely relevant in the interaction between smoking, mental health and drug and alcohol use. The idea that the rewards for smoking differ between the sexes from physiological to psychological is a large gap in the knowledge of this area. This has huge implications in regards to developing effective and focused interventions for smoking cessation for individuals who experience comorbid conditions. The possibility that different interventions would need to be developed for each gender that focus on different aspects of smoking is an innovative proposal that requires further investigation. With a more detailed understanding of the interactions at play between smoking, mental health and substance use, treatment strategies can be developed that specifically address the interactions that exist.

Clearly we need to focus more on the area of smoking and comorbidity, given the huge public health impact of smoking on the global community. Tobacco smoking is the single most preventable cause of disease and death in Australia. Current hindrances to maintaining strong declines in smoking rates are in part related to the reach, effectiveness and adoption of smoking cessation support. Of the 50% of smokers who make a quit attempt each year most (64%-78%) do not use any cessation treatments. This is despite evidence that the use of strategies such as self-help materials, web-based support, telephone counselling, pharmacotherapies, health care

provider advice, or face-to-face support will significantly improve the likelihood of a smoker successfully quitting. Increasing the proportion of smokers attempting to quit, together with increasing the proportion using effective strategies on those quit attempts, will add downward pressure to smoking rates. This is especially important, given the combined contribution that depression, alcohol use and tobacco use has on the global burden of disease.

## References

- Alati, R., Kinner, S., Najman, J., Fowler, G., Watt, K., & Green, D. (2004). Gender differences in the relationships between alcohol, tobacco and mental health patients attending an emergency department. *Alcohol and Alcoholism*, 39 (5), 463-469.
- Aneshensel, C., & Huba, G. (1983). Depression, alcohol use and smoking over one year: a four wave longitudinal causal model. *Journal of Abnormal Psychology*, 92 (2), 134-150.
- Araya, R., Gaete, J., Rojas, G., Fritsch, R., & Lewis, G. (2007). Smoking and common mental disorders: a population-based survey in Santiago, Chile. *Social Psychiatry and Psychiatric Epidemiology*, 42 (11), 874-880.
- Australian Bureau of Statistics (2006). *Tobacco smoking in Australia: a snapshot 2004-05*. Retrieved from [www.abs.gov.au](http://www.abs.gov.au) on 8 June 2010.
- Australian Institute of Health and Welfare (2007). *Australian's smoking less but still drinking*. Retrieved from [www.aihw.gov.au](http://www.aihw.gov.au) on June 22, 2010.
- Australian Psychological Association (APA, 1995). Practice guideline for the treatment of patients with substance use disorders: Alcohol, cocaine, opioids. *American Journal of Psychiatry* 152(11 Supplement): p. 1-59.
- Australian Psychological Association (APA, 1996). Practice guidelines for the treatment of patients with nicotine dependence. *American Journal of Psychiatry* 153(10): p. S1-S31.
- Australian Psychological Association (APA, 2000). Practice guideline for the treatment of patients with major depressive disorder (Revision). *American Journal of Psychiatry*. 157(4 Suppl): p. 1-45.
- Baker, A., Bucci, S., Lewin, T., Kay-Lambkin, F., Constable, P., & Carr, V. (2006). Cognitive-behavioural therapy for substance use disorders in people with psychotic disorders. *British Journal of Psychiatry*, 188, 439-448.
- Baker, A., Ivers, R., Bowman, J., Butler, T., Kay-Lambkin, F., Wye, P. et al. (2006) Where there's smoke, there's fire: high prevalence of smoking among some sub-populations and recommendations for intervention. *Drug and Alcohol Review*, 25, 85-96.
- Baker, A., Richmond, R., Haile, M., Lewin, T., Carr, V., Taylor, R. et al. (2006). A randomised controlled trial of smoking cessation intervention among people with a psychotic disorder. *American Journal of Psychiatry*, 163, 1934-42.
- Baker-Morissette, S., Gulliver, S., Wiegel, M., & Barlow, D. (2004). Prevalence of Smoking in Anxiety Disorders Uncomplicated by Comorbid Alcohol or Substance Abuse. *Journal of Psychopathology and Behavioural Assessment*, 26(2), 107-112.

Beck, A., Steer, R., & Brown, G. (1996). *The Beck Depression Inventory, Second Edition: Manual*. The Psychological Corporation, San Antonio.

Beyond Blue (2010). *What is Depression?* Retrieved on June 12, 2010 from [www.beyondblue.org.au](http://www.beyondblue.org.au)

Blalock, J., Robinson, J., Wetter, D., Schreindorfer, L., Cinciripini, P. (2008). Nicotine withdrawal in smokers with current depressive disorders undergoing intensive smoking cessation treatment. *Psychology of Addictive Behaviours*, 22(1), 122-128.

Brown, R., Kahler, C., Niaura, R., Abrams, D., Sales, S., Ramsey, S. et al. (2001). Cognitive-behavioural treatment for depression in smoking cessation. *Journal of Consulting and Clinical Psychology*, 69 (3), 471-480.

Burling, T., Marshall, G., & Seidner, A. (1991). Smoking cessation for substance abuse inpatients. *Journal of Substance Abuse*, 3, 269-276.

Burling, T., Burling, A., & Latini, D. (2001). A controlled smoking cessation trial for substance dependent inpatients. *Journal of Consulting and Clinical Psychology*, 69 (2), 295-304.

Cancer Council NSW. (2010). Smoking in Australia - statistics. Retrieved on October 12, 2010 from: <http://www.cancercouncil.com.au/editorial>

Cancer Council NSW (2010). Tobacco in Australia: facts and issues, a comprehensive online resource. Retrieved on September 12, 2011 from [www.tobaccoinaustralia.org.au](http://www.tobaccoinaustralia.org.au)

Cancer Council NSW. (2011). Smoking and Cancer. Retrieved on March 15, 2011 from: <http://www.cancercouncil.com.au/editorial>

Cargill, B., Emmons, K., Kahler, C., & Brown, R. (2001). Relationship among alcohol use, depression, smoking behaviour, and motivation to quit smoking with hospitalised smokers. *Psychology of Addictive Behaviours*, 15 (3), 272-275.

Centers for Disease Control and Prevention (2012). Retrieved on May 5, 2012 from [www.cdc.gov](http://www.cdc.gov).

Chaiton, M., & Zhang, B. (2007). Environment modifies the association between depression symptoms and smoking among adolescents. *Psychology of Addictive Behaviours*, 21 (3), 420-424.

Cinciripini, P., Blalock, J., Minnix, J., Robinson, J., Brown, V., Lam, C. et al. (2010). Effects of an intensive depression-focused intervention for smoking cessation in pregnancy. *Journal of Consulting and Clinical Psychology*, 78 (1), 44-54.

- Conner, K., Piquart, M., Gamble, S. (2009). Meta-analysis of depression and substance use among individuals with alcohol use disorders. *Journal of Substance Abuse Treatment*, 37(2):127-37.
- Cooney, N., Litt, M., Cooney, J., Pilkey, D., Steinberg, H., & Oncken, C. (2007). Concurrent brief versus intensive smoking intervention during alcohol dependence treatment. *Psychology of Addictive Behaviours*, 21 (4), 570-575.
- Covey, L., Glassman, A., & Stetner, F. (1998). Cigarette Smoking and Major Depression. *Journal of Addictive Diseases*, 17(1):35-46.
- Darke, S., Hall, W., Wodak, A., Heather, N., & Ward, J. (1992). Development and validation of a multi-dimensional instrument for assessing outcome of treatment among opiate users: the Opiate Treatment Index. *British Journal of Addiction*, 87, 733-42.
- Degenhardt, L., Hall, W., & Lynskey, M. (2001). *Alcohol, cannabis and tobacco use and the mental health of Australians: A comparative analysis of their associations with other drug use, affective and anxiety*. Sydney: National Drug and Alcohol Research Centre, Technical Report No. 103.
- Derogatis, L., & Melisaratos, N. (1983). The brief symptom inventory: An Introductory report. *Psychological Medicine*, 13, 595-605.
- Dunn, K., Sigmon, S., Reimann, E., Badger, G., Heil, S., & Higgins, S. (2010). A contingency-management intervention to promote initial smoking cessation among opioid-maintained patients. *Experimental and Clinical Psychopharmacology*, 18 (1), 37-50.
- First, M., Spitzer, R., Gibbon, M., & Williams, J. (2001). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition*. New York.
- Giesbrecht, N. & Haydon, E. (2006). Community-based interventions and alcohol, tobacco and other drugs: foci, outcomes and implications. *Drug and Alcohol Review*, 25, 633-646.
- Grant, B., Hasin, B., Chou, P., Stinson, F., & Dawson, D. (2004). Nicotine dependence and psychiatric disorders in the United States: results from the National Epidemiological Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, 61, 1107-1115.
- Hall, S., Munoz, R., Reus, V., Sees, K., Duncan, C., & Humfleet, G. (1996). Mood management and nicotine gum in smoking treatment: A therapeutic contact and placebo-controlled study. *Journal of Consulting and Clinical Psychology*, 64:1003-9.
- Hall, S., Tsoh, J., Prochaska, J., Eisendrath, S., Rossi, J., Redding, C., Rosen, A., Meisner, M., Humfleet, G., & Gorecki, J. (2006). Treatment for Cigarette Smoking Among Depressed Mental Health Outpatients: A Randomized Clinical Trial. *American Journal of Public Health*, 96 (10), 1808-1814.

- Hitsman, B., Abrams, D., Shadel, W., Niaura, R., Borrelli, B., Emmons, K. et al. (2002). Depressive symptoms and readiness to quit smoking among cigarette smokers in outpatient alcohol treatment. *Psychology of Addictive Behaviours*, 16 (3), 264-268.
- Hughes, J. (2007). Depression during tobacco abstinence. *Nicotine Tobacco Research*, 9 (4), 443-446.
- Hurt, R., Dale, L., Offord, K., Croghan, I et al. (1995). Nicotine patch therapy for smoking cessation in recovering alcoholics. *Addiction*, 90 (11), 1541-1546.
- Husky, M., Mazure, C., Paliwal, P., & McKee, S. (2008). Gender differences in the comorbidity of smoking behaviour and major depression. *Drug and Alcohol Dependence*, 93, 176-179.
- Ivers, R. (2004). An evidence based approach to tobacco interventions for Aboriginal people. *Drug and Alcohol Review*, 23, 5-9.
- Jane-Llopis, E., & Matytsina, I. (2006). Mental health and alcohol, drugs and tobacco: a review of the comorbidity between mental disorders and the use of alcohol, tobacco and illicit drugs. *Drug and Alcohol Review*, 25, 515-536.
- Kahler, C., Metrik, J., LaChance, H., Ramsey, S., Abrams, D., Monti, P. et al. (2008). Addressing heavy drinking in smoking cessation treatment: A randomised clinical trial. *Journal of Consulting and Clinical Psychology*, 76 (5), 852-862.
- Kalman, D., Kim, S., DiGirolamo, G., Smelson, D. & Ziedoni, D. (2010). Addressing tobacco use disorder in smokers in early remission from alcohol dependence: the case for integrating smoking cessation services in substance use disorder treatment programs. *Clinical Psychology Review*, 30, 12-24.
- Kessler, R et al. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. *Archives of General Psychiatry*, 151, 8-19.
- Massak, A., & Graham, K. (2007). Is the smoking-depression relationship confounded by alcohol consumption? An analysis by gender. *Nicotine and Tobacco Research*, 10 (7), 1231-1243.
- McCaffery, J., Papandonatos, G., Stanton, C., Lloyd-Richardson, E., & Niaura, R. (2008). Depressive symptoms and cigarette smoking in twins from the national longitudinal study of adolescent health. *Health Psychology*, 27 (3), S207-S215.
- McLaren, J., & Mattick, R. (2007). *Cannabis in Australia: Use, supply, harms and responses*. Drug Strategy Branch, Commonwealth Department of Health and Ageing.
- Morissette, S., Tull, M., Gulliver, S., Kamholz, B., & Zimering, R. (2007). Anxiety, anxiety disorders, tobacco use, and nicotine: a critical review of interrelationships. *Psychological Bulletin*, 133 (2), 245-272.

- Mykletun, A., Overland, S., Aaro, L., Liabo, H., & Stewart, R. (2008). Smoking in relation to anxiety and depression: evidence from a large population survey: The HUNT study. *European Psychiatry*, 23, 77-84.
- NHMRC. (2009). *Australian Guidelines to Reduce Health Risks from Drinking Alcohol*. Canberra: National Health and Medical Council of Australia.
- Ouimette, P. C., Gima, K., Moos, R. H., & Finney, J. W. (1999). A comparative evaluation of substance abuse treatment IV. The effect of comorbid psychiatric diagnoses on amount of treatment, continuing care, and 1-year outcomes. *Alcoholism: Clinical & Experimental Research*, 23(3), 552-557.
- Patten, C., Drews, A., Myers, M., Martin, J., & Wolter, T. (2002). Effect of depressive symptoms on smoking abstinence and treatment adherence among smokers with a history of alcohol dependence. *Psychology of Addictive Behaviours*, 16 (2), 135-142.
- Patton, G., Coffey, C., Carlin, J., Sawyer, S., & Lynskey, M. (2005). Reverse gateways? Frequent cannabis use as a predictor of tobacco initiation and nicotine dependence. *Addiction*, 100:1518-25.
- Piper, M., Smith, S., Schlam, T., Fleming, M., Bittrich, A., & Brown, J. (2010). Psychiatric disorders in smokers seeking treatment for tobacco dependence: relations with tobacco dependence and cessation. *Journal of Consulting and Clinical Psychology*, 78 (1), 13-23.
- Prochaska, J., Delucchi, K., & Hall, S. (2004). A meta-analysis of smoking cessation interventions with individuals in substance abuse treatment or recovery. *Journal of Consulting and Clinical Psychology*, 72 (6), 1144-1156.
- Ream, G., Benoit, E., Johnson, B., Dunlap, E. (2008). Smoking tobacco along with marijuana increases symptoms of cannabis dependence. *Drug and Alcohol Dependence*;95(3):199-208.
- Reichler, H., Baker, A., Lewin, T., & Carr, V. (2001). Smoking among in-patients with drug-related problems in an Australian psychiatric hospital. *Drug and Alcohol Review*, 20, 231-237.
- Rissel, C., McLellan, L., & Bauman, A. (2000). Factors associated with delayed tobacco uptake among Vietnamese and Arabic youth in Sydney, NSW. *Health Promotion Journal Australia*, 24, 22-28.
- Shelef, K., Diamond, G., Diamond, G., & Myers, M. (2009). Changes in tobacco use among adolescent smokers in substance abuse treatment. *Psychology of Addictive Behaviours*, 23 (2), 355-361.
- Shourie, S., Conigrave, K., Proude, E., & Haber, P. (2007). Detection of an intervention for excessive alcohol and tobacco use among adult hospital in-patients. *Drug and Alcohol Review*, 26, 127-133.



- Swendsen, J., Conway, K., Degenhardt, L., Glantz, M., Jin, R., Merikangas, K., Sampson, N., Kessler, R. (2010). Mental disorders as risk factors for substance use, abuse and dependence: Results from the 10-year follow-up of the National Comorbidity Survey. *Addiction* 105(6), 1117-1128
- Swift, W., Coffey, C., Carlin, J., Degenhardt, L., & Patton, G. (2008). Adolescent cannabis users at 24 years: Trajectories to regular weekly use and dependence in young adulthood. *Addiction*, 103(8):1361-70.
- Tiffany, S. (2008). Modern science and tobacco research. *Health Psychology*, 27 (3), S187-S188.
- Wilhelm, K., Mitchell, P., Slade, T., Brwonhill, S., Andrews, G. (2003). Prevalence and correlates of DSM-IV major depression in an Australian national survey. *Journal of Affective Disorders*, 75, 155-162.
- Wilhelm, K., Wedgwood, L., Niven, H., & Kay-Lambkin, F. (2006). Smoking cessation and depression: current knowledge and future directions. *Drug and Alcohol Review*, 25, 97-107.
- World Health Organisation (2008). *WHO Report on the global tobacco epidemic, 2008*. Geneva: Author.

## Appendix 1: SHADE Ethics Approval

Hunter New England Human Research Ethics Committee  
(Locked Bag No 1)  
(New Lambton NSW 2305)  
Telephone (02) 49214 950 Facsimile (02) 49214 818  
Email: hnehrec@hnehealth.nsw.gov.au  
Nicole.gerrand@hnehealth.nsw.gov.au  
Michelle.lane@hnehealth.nsw.gov.au  
[http://www.hnehealth.nsw.gov.au/Human\\_Research\\_Ethics](http://www.hnehealth.nsw.gov.au/Human_Research_Ethics)

6 May 2008

Professor A Baker  
Centre for Mental Health Studies  
James Fletcher Hospital

Dear Dr Baker,

**Re: Computer-based cognitive behaviour therapy for alcohol and other drug use and coexisting depression in a rural and urban area (03/12/10/3.17).**

Thank you for submitting a request for an amendment to the above project. This amendment was reviewed by the Chair of the Hunter New England Human Research Ethics Committee under the provisions of expedited review. This Human Research Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2007)* (National Statement) and the *CPMPIICH Note for Guidance on Good Clinical Practice*.

I am pleased to advise that the Hunter New England Human Research Ethics Committee has granted ethical approval for the following amendment request:

- ☐ For the addition of Student Researcher Sarah Edwards to the research protocol; and
- ☐ Letter of Introduction of New Student Researcher (dated 5 May 2008).

For the protocol: **Computer-based cognitive behaviour therapy for alcohol and other drug use and coexisting depression in a rural and urban area**

Approval from the Hunter New England Human Research Ethics Committee for the above protocol is given for a maximum of 3 years from the date of the approval letter of your initial application, after which a renewal application will be required if the protocol has not been completed. The above protocol is approved until January 2008.

The *National Statement on Ethical Conduct in Human Research (2007)* which the Committee is obliged to adhere to, include the requirement that the committee monitors the research protocols it has approved. In order for the Committee to fulfil this function, it requires:

- ☐ a report of the progress of the above protocol be submitted at 12 monthly Intervals. Your review date is January 2008. A proforma for the annual report will be sent two weeks prior to the due date.
- ☐ A final report be submitted at the completion of the above protocol, that is after data analysis has been completed and a final report compiled. A proforma for the final report will be sent two weeks prior to the due date.

Hunter New England Human Research Ethics Committee  
(Locked Bag No 1)  
(New Lambton NSW 2305)  
Telephone (02) 49214 950 Facsimile (02) 49214 818

All variations or amendments to this protocol, including amendments to the Information Sheet and Consent Form must be forwarded to and approved by the Hunter New England Human Research Ethics Committee prior to their implementation.

- The Principal Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including:

- any serious or unexpected adverse events

- Adverse events, however minor, must be recorded as observed by the Investigator or as volunteered by a participant in this protocol. Full details will be documented, whether or not the Investigator or his deputies considers the event to be related to the trial substance or procedure.

- Serious adverse events that occur during the study or within six months of completion of the trial at your site should be reported to the Professional Officer of the Hunter New England Human Research Ethics Committee as soon as possible and at the latest within 72 hours.

- Copies of serious adverse event reports from other sites should be sent to the Hunter New England Human Research Ethics Committee for review as soon as possible after being received.

- Serious adverse events are defined as:

- Causing death, life threatening or serious disability.

- Cause or prolong hospitalisation.

- Overdoses, cancers, congenital abnormalities whether judged to be caused by the investigational agent or new procedure or not.

- unforeseen events that might affect continued ethical acceptability of the project.

- If for some reason the above protocol does not commence (for example it does not receive funding); is suspended or discontinued, please inform Dr Nicole Gerrand, the Professional Officer of the Hunter New England Human Research Ethics Committee as soon as possible.

The Hunter New England Human Research Ethics Committee also has delegated authority to approve the commencement of this research on behalf of the Hunter New England Area Health Service. This research may therefore commence.

Should you have any queries about your project please contact Dr Nicole Gerrand as per her contact details at the bottom of the page. The Hunter New England Human Research Ethics Committee Terms of Reference, Standard Operating Procedures, membership and standard forms are available from the Hunter New England Area Health Service website:

Internet address: [http://www.hnehealth.nsw.gov.au/Human\\_Research\\_Ethics](http://www.hnehealth.nsw.gov.au/Human_Research_Ethics)

Please quote **03/12/10/3.17** in all correspondence.

**Hunter New England Human Research Ethics Committee**  
(Locked Bag No 1)  
(New Lambton NSW 2305)  
Telephone (02) 49214 950 Facsimile (02) 49214 818  
Email: hnehrec@hnehealth.nsw.gov.au  
Nicole.gerrand@hnehealth.nsw.gov.au  
Michelle.lane@hnehealth.nsw.gov.au  
[http://www.hnehealth.nsw.gov.au/Human\\_Research\\_Ethics](http://www.hnehealth.nsw.gov.au/Human_Research_Ethics)

The Hunter New England Human Research Ethics Committee wishes you every success in your research.

Yours faithfully,

For: Dr M Parsons  
Chair  
Hunter New England Human Research Ethics Committee

## **Appendix 2: SHADE Initial Assessment**

For information about the content of the assessments, please contact Frances Kay-Lambkin ([f.kaylambkin@unsw.edu.au](mailto:f.kaylambkin@unsw.edu.au)).

**Appendix 3:** SHADE Journal Article – Clinician-assisted computerised versus therapist-delivered treatment for depressive and addictive disorders: a randomised controlled trial.

For information about this appendix, please contact  
Frances Kay-Lambkin ([f.kaylambkin@unsw.edu.au](mailto:f.kaylambkin@unsw.edu.au)).

#### **Appendix 4:** DAISI Ethics approval letter

For information about this appendix, please contact  
Frances Kay-Lambkin ([f.kaylambkin@unsw.edu.au](mailto:f.kaylambkin@unsw.edu.au)).

## **Appendix 5: DAISI Initial assessment**

For information about the content of the assessments, please contact Frances Kay-Lambkin ([f.kaylambkin@unsw.edu.au](mailto:f.kaylambkin@unsw.edu.au)).



**Appendix 6:** DAISI Journal Article – Randomised controlled trial of cognitive-behavioural therapy for coexisting depression and alcohol problems: short-term outcome.

For information about this appendix, please contact  
Frances Kay-Lambkin ([f.kaylambkin@unsw.edu.au](mailto:f.kaylambkin@unsw.edu.au)).

## **Appendix 7:** ‘Drug and Alcohol Review’ notes for authors

For information about this appendix, please contact  
Frances Kay-Lambkin ([f.kaylambkin@unsw.edu.au](mailto:f.kaylambkin@unsw.edu.au)).

**Appendix 8:** Proof of submission of article to ‘Drug and Alcohol Review’.

For information about this appendix, please contact  
Frances Kay-Lambkin (f.kaylambkin@unsw.edu.au).  
31-Oct-2011