The Influence of Attachment Phenomena on Alcohol and Tobacco Use

by

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Abstract

Alcohol and tobacco use are leading causes of preventable death. Studying novel determinants of substance use may inform prevention and cessation. Attachment insecurity (attachment avoidance and attachment anxiety) describes interactions between adults and their attachment figures, which may influence substance use. This thesis assessed how attachment may be relevant in understanding and addressing substance use.

Study 1, a cross-sectional survey study of 348 adult primary care patients, tested hypothesized associations between childhood adversity, attachment insecurity and substance use; if attachment insecurity could mediate between childhood adversity and substance use; and hypothesized sex differences in these associations. In Study 2, 38 smokers participated in experiments designed to assess the influence of cigarette cues and an attachment figure photo on craving and affect.

In Study 1, 61% of participants reported childhood adversity, 11% reported harmful drinking and 20% reported current smoking. Attachment anxiety was associated with harmful drinking in
Attachment anxiety was a statistical mediator between childhood adversity and harmful drinking (95% CI 0.09 to 0.30). Sex did not moderate the relationship between attachment anxiety and hazardous drinking in this mediation model. In women, attachment anxiety was associated with both childhood adversity (p=.002) and current smoking (p=.04), and was a statistical mediator between childhood adversity and smoking (95% CI 0.003 to 0.236). In Study 2, 56% of participants reported decreased craving after seeing an attachment figure photo (Neutral photo = 50.9 (SD 29.8), Attachment figure photo = 38.2 (SD 31.6), t(35)= -2.661, p=0.01). Cigarette cues (d=.50) and the attachment figure photo (d=.42) had similar effect sizes. Cigarette cue reactivity and attachment figure smoking status did not influence responses to photo exposures.

Attachment anxiety was associated with alcohol and tobacco use, and may mediate between childhood adversity and substance use. Viewing an attachment figure photo decreased craving in smokers, with an effect that is comparable to the increase caused by cigarette cues. These studies indicate that attachment phenomena may play a role in substance use. Childhood adversity, attachment anxiety, and the presence of an attachment figure are factors to consider in the design of prevention and cessation strategies.
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Dr. Robert Maunder, thank you for your supervision. You have taught me that an orchid, under certain conditions, can also be a sunflower.

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Contributions

Chapter 1: Introduction & Chapter 2: Research Aims and hypotheses
Contribution statement and acknowledgements: The content of these chapters was conceived, drafted, and revised by me. Robert Maunder provided comments and suggested revisions.

Chapter 3: Childhood adversity and alcohol consumption: the mediating role of attachment insecurity & Chapter 4: Sex differences in the relationships between childhood adversity, attachment insecurity and current smoking


Contribution statement and acknowledgements: My roles in this study included the following: 1) conceiving and designing the study, 2) recruiting participants, 3) implementing surveys, 4) designing and managing the database, 5) statistical analyses, 6) writing the manuscript, 7) submitting and revising the manuscript for publication, and 8) communicating results through conference presentations. I thus played a primary role in every aspect of this study.

Robert Maunder supervised all aspects of my involvement in this study, and made contributions to the study design, data interpretation, and writing the manuscript. All authors provided critical revision of the manuscript for important intellectual content. We thank the participants who made this study possible, Yves Talbot, Cleo Haber and the Granovsky Gluskin Family Medicine Center at Mount Sinai Hospital for their support with the study. In addition, we would like to acknowledge Souraya Sidani for her statistical guidance.
Chapter 5: A Photo Of An Attachment Figure Decreases Craving in Smokers

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Robert Maunder supervised all aspects of my involvement in this study, and made contributions to the study design, data interpretation, and writing the manuscript. All authors provided critical revision of the manuscript for important intellectual content. We thank the participants who made this study possible. In addition, we would like to acknowledge Souraya Sidani for her statistical guidance.

Chapter 6: General discussion and Chapter 7: Conclusions and Implications

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<td>AAI</td>
<td>Adult Attachment Interview</td>
</tr>
<tr>
<td>ACE</td>
<td>Adverse Childhood Experiences</td>
</tr>
<tr>
<td>AF</td>
<td>Attachment Figure</td>
</tr>
<tr>
<td>AUDIT</td>
<td>Alcohol Use Disorder Identification Test</td>
</tr>
<tr>
<td>CAMH</td>
<td>Centre for Addiction and Mental Health</td>
</tr>
<tr>
<td>DSM</td>
<td>The Diagnostic and Statistical Manual of Mental Disorders</td>
</tr>
<tr>
<td>ECR</td>
<td>Experiences in Close Relationships</td>
</tr>
<tr>
<td>FTND</td>
<td>Fagerström Test of Nicotine Dependence</td>
</tr>
<tr>
<td>ICD</td>
<td>The International Statistical Classification of Diseases and Related Health Problems</td>
</tr>
<tr>
<td>Non-AF</td>
<td>Non-Attachment Figure</td>
</tr>
<tr>
<td>RQ</td>
<td>Relationship Questionnaire</td>
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<td>SD</td>
<td>Standard Deviation</td>
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<td>TLFB</td>
<td>Timeline Follow Back</td>
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Chapter 1
Introduction

1 Overview

1.1 Substance Use
Alcohol, tobacco and other psychoactive substances are commonly used in Canada and internationally. Substance abuse refers to the harmful or hazardous use of these psychoactive substances (World Health Organization, 2016). This thesis focuses on alcohol and tobacco use, which are leading causes of preventable disease and mortality (Mokdad, Marks, Stroup, & Gerberding, 2005; Rehm et al., 2006a). In 2015 in the United States, the prevalence of smoking in men was 16.7% and women was 13.6% (Jamal et al., 2016). In 2014 in the United States, about 16.3 million adults were diagnosed with an Alcohol Use Disorder. This included 10.6 million men (9.2 percent of men in this age group) and 5.7 million women (4.6 percent of women in this age group) (Substance Abuse and Mental Health Services Administration SAMHSA, 2016b).

Substance abuse has many consequences, which include health, social, and economic costs. With respect to health, substance abuse contributes to diseases including heart disease (Ronksley, Brien, Turner, Mukamal, & Ghali, 2011) and cancer (World Health Organization, 2014), and ultimately to death (Mokdad et al., 2005). The social consequences of alcohol consumption include problems in the work place, with education, and with family and social relations. In addition, alcohol use is linked to violence (including domestic violence), accidents, suicide, and criminality (Rehm, Giesbrecht, Popova, Patra, & Adlaf, 2006b). Furthermore, substance abuse has economic costs. In 2002, health care costs associated with drug use totaled $8.8 billion dollars in the Canada. Other economic costs include loss of productivity ($24.3 billion), law enforcement costs ($5.4 billion), as well as research and prevention ($147 million) (Rehm et al., 2006a).
1.1.1 Determinants of Alcohol and Tobacco Use

People use substances for various reasons. Some determinants overlap between alcohol consumption and tobacco use. These include the desirability of the psychoactive effects of the substance, peer pressure, genetics, parental influences, modeling one’s behavior on others, relief of stress, attitudes and beliefs, social rewards, socioeconomic status, the effect of marketing, laws, and public policy (Ducci & Goldman, 2008; Galea & Vlahov, 2002; Killen & Fortmann, 1997; Spooner & Hetherington, 2004; R. West, 2009). Some determinants are more specific to the particular substance. For example, alcohol use is socially accepted and promoted in some cultures (Kuntsche, Knibbe, Gmel, & Engels, 2006). As another example, tobacco is sometimes smoked to control weight (Aubin, Berlin, Smadja, & West, 2009).

This thesis looks beyond these factors, to focus on the influence of childhood adversity and attachment phenomena. Childhood adversity has been well studied as a determinant of substance use (Afifi et al., 2014; Felitti et al., 1998). However, experiences of childhood adversity cannot be changed after the fact, so identifying this risk factor does not directly lead to cessation strategies. Our goal was to identify a consequence of childhood adversity that would suggest new strategies for cessation, either because it is more amenable to change or because it would allow treatment to be personalized. We investigated attachment phenomena, which are not as well studied and understood in the context of substance use.

1.1.2 Measures of substance use

Advances in the understanding of substance use and abuse rely on studying substance use from many perspectives, including its epidemiology, longitudinal course, and treatment outcomes. Different studies examine substance related issues from varying perspectives and may use various instruments to assess substance use. Substance use is complex and requires a collection of tools to portray a more complete picture. A selection of these tools will be described below.

One aspect of alcohol use concerns the amount that people drink and their patterns of consumption. Sobell developed The Alcohol Timeline Followback (TLFB) as a method to estimate daily alcohol use (Sobell & Sobell, 1995; Sobell, Toneatto, & Sobell, 1994). This tool is a calendar-based form, which provides a detailed description of an individual’s alcohol use. People provide retrospective estimates of their daily drinking by reporting the number of standard alcohol drinks consumed each day over a specified period of time. The tool may cover
up to twelve months of alcohol use. The TLFB method was originally developed as a research tool to study people with alcohol abuse, but it has been adapted for use in clinical settings and has been extended to measure drug and cigarette use (Sobell et al., 1994; Sobell & Sobell, 1995). The TLFB has been extensively evaluated with a wide range of clinical and nonclinical populations (Sobell & Sobell, 1995) and was chosen by the American Psychiatric Association as having met criteria for inclusion in their Handbook of Psychiatric Measures (American Psychiatric Association, 2000).

The TLFB tool can produce a number of variables that provide detailed and varied information about a person’s alcohol use. The pattern, variability, and level of alcohol use can be summarized using variables such as percentage of days drinking at different levels or the pattern of weekend/weekday drinking. This tool is usually utilized when alcohol use is variable or when somewhat precise approximations of alcohol use are needed.

Two advantages of using the TLFB are its ease of use and low cost. The amount of time needed to administer the TLFB depends on the assessment interval. For a period of ninety days, the survey takes approximately ten to fifteen minutes to complete whereas a twelve month period survey may take thirty minutes to complete. Administration of the TLFB is flexible. It can be self-administered or administered in person, by phone, mail, or computer (Sobell, Brown, Leo, & Sobell, 1996). Finally, the TLFB has very good psychometric characteristics with a variety of drinker groups (Sobell & Sobell, 1995). Several studies have examined the validity of the TLFB method with alcohol abusers. The number of drinks assessed by the TLFB has been confirmed with collaterals' reports of peoples' drinking (Maisto, Sobell, & Sobell, 1985; Maisto, Sobell, Cooper, & Sobell, 1979).

There are circumstances where the TLFB would not be recommended. In instances where time is limited or less precise estimations of substance use would suffice, then the TLFB may be too time consuming. Further, it would not be recommended for use of mailed-out questionnaires due to the high burden on respondents, which may result in increased attrition rates (Cunningham, Ansara, Wild, & Toneatto, 1999; Roy, Dum, Sobell, & Sobell, 2008).

Another aspect of alcohol use that requires measurement is the occurrence of addiction and problems that result from drinking. The CAGE questionnaire was developed in the 1970s as a short interviewer-administered test to identify alcohol problems (Ewing, 1984). The CAGE
contains four questions. Each question contributes towards the acronym CAGE 1) Have you ever tried to cut down on your drinking, 2) do you get annoyed when people talk about your drinking, 3) do you feel guilty about your drinking, and 4) have you ever had an eye-opener (a drink first thing in the morning) to steady your nerves or get rid of a hangover? (Ewing, 1984). Responses are either “yes” or “no” and the questions are framed in a life-time perspective. Answering “yes” to two or more questions indicates alcohol problems (Aertgeerts, Buntinx, Ansoms, & Fevery, 2001).

Most studies have found the CAGE to be both practical and useful (Allen, Maisto, & Connors, 1995). Skogen and colleagues reported an adequate internal reliability of 0.68. Compared to current consumption, the CAGE had good concurrent validity, even though it was better in women than in men (Skogen, Øverland, Knudsen, & Mykletun, 2011). There is ambiguity regarding CAGE’s applicability in a general population-based setting. In relation to general population-based studies, the main controversy regards indications of questionable validity (Bisson, Nadeau, & Demers, 1999; Koppes, Twisk, Snel, Van Mechelen, & Kemper, 2004); cross-cultural differences (Messiah, Encrenaz, Sapinho, & Gilbert, 2008) and gender differences (O’Hare & Tran, 1997)). For instance, Bisson and colleagues concluded against the use of the CAGE as a screening tool for heavy drinking and drinking problems in a general population study because of its poor discrimination between heavy drinkers and non-heavy drinkers (Bisson et al., 1999). Additionally, another general population-based study found that the CAGE performed worst of three screening questionnaires for alcohol problems (Koppes et al., 2004). The CAGE identifies more severe cases of problem drinking (Dhalla & Kopec, 2007; McCusker, Basquille, Khwaja, & Lyon, 2002).

The Alcohol Use Disorders Identification Test (AUDIT) is an instrument used to screen for hazardous and harmful patterns of alcohol consumption (Babor, Fuente, Saunders, & Grant, 1992; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). The AUDIT was developed by the World Health Organization (WHO) as a simple method of screening for excessive drinking and to aid in brief assessment (Saunders, Aasland, & Babor, 1993a). It may help in identifying excessive drinking as the cause of the presenting illness in primary care, where intervention and treatment may be initiated.

AUDIT assesses a collection of alcohol use patterns. Hazardous drinking (World Health
Organization, 1994) is “a pattern of alcohol consumption that increases the risk of harmful consequences for the user or others”. Hazardous drinking patterns are of public health significance despite the absence of any current disorder in the individual user. Harmful use refers to “alcohol consumption that results in consequences to physical and mental health and social health” (World Health Organization, 1993; 1994). Alcohol dependence is a “cluster of behavioural, cognitive, and physiological phenomena that may develop after repeated alcohol use” (World Health Organization, 1993). This includes a strong desire to consume alcohol, impaired control over its use, persistent drinking despite harmful consequences. People with alcohol dependence prioritize alcohol consumption over other activities and obligations and tend to have increased tolerance, and a physical withdrawal reaction when alcohol use is discontinued (World Health Organization, 1993).

Questions appraise high level of alcohol use each day, repeated episodes of drinking to intoxication, use that is causing physical or mental harm, and drinking that has resulted in the person becoming dependent or addicted to alcohol. The AUDIT tool surveys alcohol use beyond the number of drinks, but consequences of alcohol use as well.

The AUDIT has been used in many different countries in both the original English-language version and its many translated versions (Saunders, Aasland, Amundsen, & Grant, 1993b). Studies report a high internal consistency and high reliability indicated by a test-retest reliability study (r=.86) (Fertig, 1997; Fleming, Barry, & Macdonald, 1991). The validity of the tool has been established (Fertig, 1997). In one study comparing the AUDIT to self-report weekly measures of alcohol consumption, the construct validity reported was 0.7 (Seppä, Mäkelä, & Sillanaukee, 1995). The psychometric properties of the AUDIT have been well studied (de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009; Piccinelli et al., 1997).

Tobacco surveillance is often based on self-reported information, which is generated from population-level surveys. Questions such as “At the present time do you smoke cigarettes daily, occasionally, or not at all?” or “Have you smoked at least 100 cigarettes in your life?” may be used to assess smoking status. Smoking status may be classified with three categories, “current smoker”, “former smoker” (used to smoke, but have not smoked in the last thirty days and “never-smokers” (have not smoked 100 cigarettes in their lifetime).

Many studies have investigated the accuracy of self-reports of tobacco use through biochemical
validation with cotinine, carbon monoxide, nicotine, or thiocyanate levels (Laatikainen, Vartiainen, & Puska, 1999; Parker et al., 2002). The conclusions from these studies have not been consistent, with sensitivity values ranging from 0% (Slattery, Hunt, French, & Ford, 1989) to 100% (Riboli, Haley, Waard, & Saracci, 1995). To evaluate the accuracy of self-reported smoking, a comprehensive systematic review assessed the relationship between estimates of smoking status determined through self-report and those based on direct biological measurement. In this review, sixty-seven studies were identified that examined the relationship between self-reported smoking and smoking confirmed by cotinine measurement (Gorber, Schofield-Hurwitz, Hardt, Levasseur, & Tremblay, 2009). Generally, the findings indicated that self-reports underestimate smoking prevalence. There were varying sensitivity levels for self-reported estimates depending on the population studied and how the biological sample was measured. Sensitivity values were consistently higher when cotinine was measured in saliva instead of urine or blood. They did not conduct a meta-analysis due to the variety of cutoff points used to define smokers and the poor reporting on outcomes. It would be beneficial to adopt a standardization of cutoff points to define current smokers. Population studies are important as they generate national estimates of smoking status, which may be used by agencies to allocate resources and set health care priorities.

Another component of smoking behaviour focuses on cigarette dependence. Such measures are important for both treatment and research purposes. There has been difficulty developing valid measures due to the lack of consensus regarding the definition of tobacco dependence. One approach in this field is based on model of physical dependence. The Fagerstrom Test of Nicotine Dependence (FTND) was a revision of the Fagerstrom Tolerance Questionnaire (FTQ). The FTQ was developed as a short and convenient self-report of nicotine dependence (Fagerstrom, 1978). This measure was derived from theoretical notions of reliance on nicotine. The tool is comprised of six questions surveying 1) the timing of the first cigarette, 2) difficulty abstaining from smoking, 3) preference for a cigarette in the morning, 4) the number of cigarettes smoked a day, 5) frequency of smoking and 6) smoking despite illness. Two of the original components, “nicotine rating” and inhalation have been eliminated, as they did not add to the prediction of biochemical levels (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). Test-retest correlations in a subsample of sixty participants reported a Cronbach alpha of .64 for the FTND and .58 for the FTQ (Pomerleau, Carton, Lutzke, & Flessland, 1994). There are
limitations with the FTND. First, it was not developed according to standard psychometric methods (Etter, 2005). Second, it cannot be used to apply to moderate smokers (Etter, Duc, & Perneger, 1999). Third, another criticism is that the tool does not measure a single construct of physical dependence. Fourth, FTND is not a good predictor of withdrawal symptoms in smokers who subsequently quit smoking (Hughes & Hatsukami, 1986; Shiffman, Waters, & Hickcox, 2004) nor is it a good predictor of subsequent smoking cessation (Etter, Le Houezec, & Perneger, 2003; Piper et al., 2004).

A second approach to assess dependence is based on The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and The International Statistical Classification of Diseases and Related Health Problems (ICD-10) definitions of dependence (American Psychiatric Association, 1994; World Health Organization, 1993). These definitions describe a set of symptoms, such as a desire for the substance, tolerance and withdrawal (Edwards & Gross, 1976). A DSM-IV diagnosis of dependence can be established through standardized clinical interviews, such as the composite international diagnostic interview (CIDI) (Üstün, Compton, Mager, & Babor, 1997). Using this assessment has limitations. A dichotomous classification is insensitive to changes over time. A DSM-IV diagnosis of dependence requires the presence of any three symptoms in a list of seven symptoms, which is an arbitrary designation and not all symptoms may not have the same significance. Some symptoms in the DSM-IV definition may not be very relevant to cigarette dependence (e.g. reduction of social activities). Only trained personnel can administer the DSM interviews, which is costly. Self-administered measures are much more convenient for clinical and research purposes. There are limited comparisons of dependence using FTND and DSM measures, but research has shown that there is little overlap between the two measures (Breslau & Johnson, 2000; Hughes et al., 2004). This suggests that FTND and DSM may measure different aspects of dependence.

1.1.3 Studying cue reactivity in smokers

Craving, “the desire to use a drug” (Sayette et al., 2000), is a characteristic of any addiction (World Health Organization, 1993). There are various determinants of craving including the addictive properties of the drug (Domino, 1998), affect (Collins, Nair, & Komaroff, 2011), stress (Buchmann et al., 2010), and cues associated with the drug (Carter et al., 2006). Our discussion below is restricted to cues associated with tobacco use.
The most commonly studied cues of tobacco craving are stimuli related to smoking behaviour, including smoking paraphernalia (Niaura, Shadel, Abrams, & Monti, 1998; Shiffman et al., 2013), environments that smokers frequent (Conklin, Robin, & Perkins, 2008), people around whom smokers smoke (Conklin, Salkeld, Perkins, & Robin, 2013) and emotions (Cameron, Reed, & Ninnemann, 2013; Perkins, 2009). These factors have been shown to influence craving. Craving is associated with smoking relapse. For instance, the mean craving intensity over the first weeks of quitting predicts whether a person will be successful with their quit attempt (Ferguson, Shiffman, & Gwaltney, 2006; Killen & Fortmann, 1997; Shiffman et al., 1997). In addition, periods of intense acute craving are associated with relapse (Shiffman, Paty, Gnys, Kassel, & Hickcox, 1996). However, it is still unclear how cravings in a laboratory setting are associated with smoking cessation or if craving in this setting has clinical relevance.

Smokers are defined as “cue reactive” if they reported increased craving when exposed to various cues. There are several methodological issues to consider when studying cue reactivity, such as the inclusion of neutral cues, the satiation or deprivation period, and the order of cues. Cue reactivity research emphasizes “cue exposure manipulation to focus on the difference between urges found during the smoking cue exposure and those during an abstinence-based ‘baseline’ or control cue exposure”. This difference in cravings is thought to expose “cue-elicited or cue-specific craving” (Sayette & Tiffany, 2013). Glautier and Tiffany suggest that there is limited justification for concluding that changes from baseline can be attributed to the drug-salience of the cue and not just due to response to any stimulus (Glautier & Tiffany, 2015). Indeed, in a meta-analysis of cue reactivity studies, studies were excluded if the design did not include a comparison of craving in response to a drug cue and in response to a neutral stimulus, comparing instead to a pre-drug cue baseline (Powell, 1995; Robbins & Ehrman, 1992). However, a baseline control may be valuable for some research questions, such as determining a change in craving as result of an intervention.

A second methodological issue concerns satiation. Cue reactivity may be studied under two main conditions. First, participants may be satiated; that is, they are instructed to smoke before they begin the experiment. In this condition, all participants start the experiment at a similar baseline as the amount of time after cigarette is controlled. Furthermore, this condition decreases the chance of a ceiling effect. In contrast, cue reactivity may be studied under conditions of
deprivation. In this condition, participants are instructed to abstain from smoking prior to the experiment. However, baseline craving is typically higher, which has a number of consequences. First, beginning in a state of deprivation makes it harder to identify increases in craving. For instance, if a study utilizes a visual analogue scale, a participant who has abstained from smoking may rate their baseline craving at 90 units. After exposure to a cue, this participant is only able to report a maximum increase of craving of ten units to 100 units (the highest value of the craving scale). This ceiling effect renders the scale insensitive to larger increases in craving (Sayette et al., 2000; Sayette, Martin, Wertz, & Shiffman, 2001). Determining the degree of deprivation or satiation under which research may be conducted depends on the research question, because certain conditions may be more suitable for particular hypotheses. For instance, Weinberger suggested that in their study, the satiated condition produced more valuable information because there was more variation in urges than in the one hour deprivation condition (Weinberger, McKee, & George, 2012).

Another consideration is the order of the cues. For example, if a particular cue has already yielded a maximum increase in craving, the effects of a second cue may not be detected. Furthermore, past research has reported carryover effects when smoking cues are presented before neutral cues (Fonder et al., 2005; Sayette, Griffin, & Sayers, 2010). Randomization of cues is important in order to try to limit order effects.

Below, studies will be summarized in terms of their deprivation condition, use of neutral cues and order of the cues.

One study recruited two hundred daily smokers to test the effects of images associated with one of six cue sets (cigarettes, positive and negative affect, alcohol, smoking prohibitions, and neutral cues) in separate sessions. To roughly ensure that subjects have a similar level of satiation, subjects were instructed to smoke as much as they wished prior to arriving for the session, and were surveyed on the time of their last cigarette. Subjects then entered a 30-minute abstinence period while they completed questionnaires. Changes in craving and smoking in response to smoking-relevant cues were assessed. Craving intensity predicted likelihood of smoking, latency to smoke, and amount smoked. Time since last cigarette had no main effect on cue reactivity (Shiffman et al., 2013).
Another study completed cue reactivity procedures under two conditions, a satiated condition and a brief deprivation condition (participants abstained for one hour). This research group had used the brief deprivation condition in their previous work (Fonder et al., 2005). The goal of this study was to assess cue reactivity in people with a Major Depressive Disorder history. There were fifty-two participants in total (thirty-one smokers with no Major Depressive Disorder history, twenty-one smokers with past Major Depressive Disorder). Participants completed a laboratory session during which they were exposed to neutral (e.g. pencils) and smoking cues (e.g. cigarettes) in the satiated condition and then in the deprivation condition. This study discussed the usefulness of including two study conditions. Findings indicated that the satiated condition provided more informative data than the deprivation period. In the deprivation period, there was less variation in changes in craving from pre- to post-cue exposure cues. They reasoned that the difference may have resulted due to the short time frame between the two conditions. Participants also knew that they would be able to smoke after the deprivation condition (Weinberger et al., 2012).

Maude-Griffin and Tiffany assessed the impact of affect and abstinence on urges to smoke produced through an imagery paradigm (Maude-Griffin & Tiffany, 1996). Participants were assigned randomly to either an abstinence condition, in which they were instructed to remain abstinent until their next session, or a smoking condition, in which they were instructed to continue smoking at their regular rate. One hundred smokers were recruited for the study. They were exposed to audiotaped scripts describing different affect (positive, negative and neutral) and smoking urges (present or absent). Each volunteer participated in two sessions scheduled either six or twenty-four hours apart. Half the volunteers refrained from smoking between their two sessions. There were changes in physiological responses, self-reported mood, and verbal reports of smoking urges in response to the audio recordings. The results also showed that participants who were abstinent from cigarettes for six or twenty-four hours reported significantly stronger urges to all of the imagery scripts than did participants who continued to smoke over those intervals. There was no evidence that the twenty-four hour period of abstinence produced greater withdrawal, mood, urge, or physiological reactions than the six-hour period of abstinence. The investigators suggested that the similar effects of the two abstinence intervals may be because the maximum impact of abstinence had occurred by six hours. Another way to explain this result was that participants who abstained for six hours were tested in the
afternoon and early evening hours. Participants who abstained for twenty-four hours were tested in the morning. Some research has shown that cravings in smokers who abstain are lowest in the morning and then rise throughout the day to a peak in the evening (Maude-Griffin & Tiffany, 1996; West & Schneiders, 1987). There were no neutral cues in this experiment.

Another experiment was conducted to determine the impact of cigarette deprivation and cigarette availability on reactivity measures to cigarette cues. One hundred smokers were randomly assigned to two conditions, 1) abstain from smoking for twenty-four hours or 2) continue smoking. Participants were exposed to trials of either a lit cigarette or a glass of water with a 0, 50 or 100% probability of being able to sample the cue on each trial. Craving, mood and latency to access door to sample the cue were measured. Both exposure to cigarette cues and increasing availability of those cues produced higher levels of craving to smoke. The twenty-four hour deprivation condition produced a generalized increase in craving. However, there was no consistent evidence that even under conditions of high cigarette availability, deprived smokers reported selectively enhanced cue-induced craving (Bailey, Goedeker, & Tiffany, 2010).

The studies above employed varying deprivation conditions and cues (verbal, image or object), but all were able to detect changes in their variable of interest. Furthermore, there are inconsistencies. For example, while there is an expectation that the deprivation period would provoke higher cue-reactive cravings, Powell reported that overnight cigarette deprivation reduced cue-reactive craving relative to a non-deprived condition (Powell, Dawkins, & Davis, 2002). In that study, cue-reactivity was studied as a difference from baseline, a procedure that may provide a less sensitive assessment than measuring reactivity as response difference between drug cues and neutral cues (Warthen & Tiffany, 2009). A later study from that same group (Dawkins, Powell, West, & Powell, 2006), in which cue reactivity was studied as craving differences between smoking and neutral cues, found no evidence that abstinence moderated the magnitude of cue-reactive craving.

In summary, cue reactivity allows the study of craving, which is thought to be associated with smoking behaviour. For lab settings where measuring actual smoking behaviour is not possible, cue reactivity is a practical and useful paradigm to use as part of a preliminary study to into certain hypotheses. However, careful attention to methods is necessary in order to correctly interpret results.
1.2 Childhood Adversity

1.2.1 Issues in researching childhood adversity

Studying childhood adversity is challenging for several reasons. A fundamental problem is that child abuse is taboo, and so its occurrence is often denied and under-reported. Other challenges are that definitions of abuse vary, and both the choice of cohorts and methods of data collection influence the identification of cases (Hardt, Sidor, Bracko, & Egle, 2006; Hardt, Vellaisamy, & Schoon, 2010). Furthermore, both the determinants and the consequences of child abuse and other forms of adversity are complex.

Definitions of childhood adversity vary according to the focus of the particular study. Most research on childhood adversity has focused on physical and sexual abuse. In 1997, Brabant and colleagues noted that there “is little consensus among researchers what constitutes sexual abuse, [and] what age defines a child” (Brabant & Forsyth, 1997). In one study, sexual abuse was considered sexual contact between “children and substantially older persons; sexual contact which occurs to a child as a result of threat, force, deceit, while unconscious, or through manipulation of an authority relationship, no matter what the age of the companion. Includes buttock and breast fondling, improper sexual requests, and encounters with exhibitionists” (Finkelhor & Hotaling, 1984). The ACE study adapted four questions from Wyatt’s research (Wyatt, 1985). The ACE Study questions for sexual abuse are “While you were growing up during your first 18 years of life … Did an adult or person at least 5 years older ever… 1) Touch or fondle you in a sexual way? 2) Have you touch their body in a sexual way? 3) Attempt oral, anal, or vaginal intercourse with you? 4) Actually have oral, anal, or vaginal intercourse with you?” Questions which work best to identify abuse and neglect tend to investigate concrete behaviours rather than examine concepts or perception (Hardt & Rutter, 2004).

Childhood adversity has been used to refer a broader category of experiences that includes physical and sexual abuse as well as exposure to other types of adverse experiences before the age of eighteen. Childhood adversity includes material or emotional neglect, exposure to household members with substance use, mental illness, or incarceration, witnessing family violence, parental separation and emotional abuse. Because of the varied foci of studies on childhood adversity, the prevalence of adversity reported may vary.
Unfortunately, childhood adversity is pervasive. In Canada, there have been a number of studies surveying the prevalence of child abuse. A general population study, the Ontario Health Survey, assessed about ten thousand Ontario residents and reported on the prevalence of physical and sexual abuse. Childhood physical abuse was reported more often by men (31%) than women (21%) while childhood sexual abuse was reported more frequently by women (13%) than men (4%) (MacMillan et al., 1997). The presence of any abuse was similar in men (32%) and women (27%). It is noteworthy that this study excluded people who were homeless, in institutions, first nations people living on reserves and those residing in remote locations. These exclusions may have resulted in underestimations of child abuse. This group also reported on the relationship between childhood physical or sexual abuse and lifetime psychopathology. Their results indicated that those who had a history of childhood physical abuse were more likely than those without a history of childhood physical abuse to have disorders including anxiety disorder, alcohol abuse/dependence, and antisocial behaviour (MacMillan, Fleming, & Streiner, 2001).

The 2012 Canadian Community Health Survey: Mental Health surveyed participants aged 15 years and older in 10 provinces. This study reported that about 26% of people reported physical abuse (31% men, 21% women) and about 10% of people reported sexual abuse (6% men, 14% women). This study also reported on childhood exposure to imitate partner violence. About 8% of participants endorsed such exposure. In this study, child abuse was associated with mental illnesses including depression, bipolar disorder, anxiety disorder, and alcohol or drug abuse/dependence (Afifi et al., 2014).

The Adverse Childhood Experiences (ACE) Study surveyed thousands of people in San Diego who were part of a Kaiser Permanente’s San Diego Health Appraisal Clinic. In the first wave of surveys, this study compiled the prevalence of 7 types of adversity include abuse (physical, sexual, emotional) and household dysfunction, which included living in a household with someone do had an alcohol or drug problem, someone with mental illness, where the mother was treated violently, or where someone was incarcerated. This study reported that prevalence of abuse as follows: psychological abuse (11%), physical abuse (11%), sexual abuse (22%), household – substance abuse (26%) mental illness (19%), mother treated violently (13%), criminal behaviour (3%). This survey specifically studied violence against the mother, although men can also be victims of domestic violence (Kimmel, 2002). The list of childhood adversities surveyed in the ACE questionnaire was expanded in the second wave of surveys to include
material neglect, emotional neglect, and parental divorce and separation. This study reported 64% of people endorsed one of more categories of childhood adversity (up to 10 categories) (Centers for Disease Control and Prevention (U.S.), 2016). Other adverse childhood experiences may include parental death, serious physical illness, or family economic adversity. For example, these other adversities were studied by Green et al (Green et al., 2010).

Green’s study examined the associations of twelve categories of childhood adversities and the first onset of mental health and substance disorders in the National Comorbidity Survey Replication. They studied parental maladjustment, interpersonal loss, maltreatment and illness. Findings indicated that different types of childhood adversity often co-occur (Green et al., 2010). Furthermore, multiple categories of childhood adversity had significant sub-additive associations with disorder onset. Children who have experienced poly-victimization are more symptomatic than children with one kind of victimization (Finkelhor, Ormrod, & Turner, 2007).

Another issue with studying childhood adversity lies in the populations that are studied and in sampling methods, which contribute to different rates of childhood adversity. For instance, convenience samples, as are often found in studies of college students are less representative than random samples of the larger community (Goldman & Padayachi, 2000). College samples may represent a psychologically healthier group. Population studies are preferred, but even they risk underestimations due to surveying restrictions, such as not including people who are homeless, in institutions, etc.

The method of collecting information may also influence the data that is collected. Surveying childhood adversity is usually done by interviews and questionnaires. It is not clear how much prevalence rates differ with these two methods of data collection. Some reviews reported that studied using interviews find a higher prevalence than those using questionnaires (Pereda, Guilera, Forns, & Gómez-Benito, 2009a; 2009b) while others did not report a difference (Goldman & Padayachi, 2000). Both interviews and questionnaires rely on retrospective self-report recollection. Perhaps people may be less likely to report child sexual abuse when interviewed for a health history at a doctors’ appointment than if they are asked with an anonymous survey tool.

Finally, a major challenge in studying childhood adversity is that the majority of research relies on retrospective surveys, in which adults are surveyed about their childhood experiences, which
raises concern is about the accuracy of recalled of events. Fortunately, there is evidence that retrospective surveys are valid (see below). Furthermore, using the survey method may bias the study population. It is possible that some people with childhood adversity may not want to participate in studies encompassing this experience (or they may be attracted by the opportunity to share their experience) resulting in a cohort that is biased towards a lower or higher prevalence. It is also possible that there are differences between people with childhood adversity who do are willing to participate in research respond and those with childhood adversity who are not willing to participate. Retrospective surveys may be self-report (reported by own participants) or substantiated by others people such as parents, siblings or even court documentation. However, child abuse is often underestimated because only a limited number of cases are reported to other family members or child protective services.

Alternatively, childhood adversity can be studied with incidence studies. The incidence of childhood adversity refers to the number of new cases of abuse that are reported during a specific time (Fallon et al., 2010) usually to law enforcement services. Unfortunately, incidence studies may underestimate the occurrence of abuse because only a small proportion of abuse cases are reported.

### 1.2.2 Reliability and validity of the surveys

While there is concern about the reliability and validity of retrospective reports of adversity, evidence suggests that retrospective studies have sufficient validity to be valuable.

The ACE study investigated the possibility of biased participation in their cohort, which would affect both the validity and generalizability of the results. Since the ACE study was done at a clinic, they were able to perform chart reviews on patients who did not participate in their study (non-responders) to compare their characteristics to the patients that did complete the survey (responders). In terms of sexual abuse, they found that there was a small over-representation of people exposed to sexual abuse among responders. The difference in the prevalence of child sexual abuse in responders and non-responders was small (6.1%, 5.4%, respectively). These results indicate no evidence of a significant upward bias of childhood sexual abuse. If their findings were generalized, they found that retrospective self report survey responses are perhaps conservative in their estimation of child abuse (Edwards et al., 2001).
The ACE study had mailed out surveys in two waves. The first wave of surveys was from 1995 to 1996 while the second save of surveys was mailed out in 1997. Because of this, the test-retest reliability of the ACE survey tool could be tested. Test-retest reliability provides an estimate for consistency of the survey tool. Dube and colleagues reported the test-retest reliability of the survey in the response to the questions about childhood adversity (kappa .51 to .86 depending on category of adversity) to be good (Fließ, 1981). The results indicate that retrospective responses to childhood abuse and neglect may be stable over time (Dube, Williamson, Thompson, Felitti, & Anda, 2004).

Hardt and Rutter studied the validity of retrospective recall of childhood adversity. This study reviewed eighteen articles from 1980-2001, which consisted of studies of samples of forty or more participants. The adverse experiences that were studied included sexual abuse, physical abuse, physical, emotional neglect and family conflict. They concluded that retrospective recall of major adverse childhood experiences in adult life was sufficiently valid despite possibilities of under-reporting and bias. However, retrospective recall of more subtle aspects of family life was less satisfactory as they rely on judgment and interpretation (Hardt & Rutter, 2004).

With respect to the reliability of interviews, one hundred patients were interviewed with the Mainz Structured Bibliographical Interview 2.2 years apart. The survey included questions about family background, parental health, violence in the family, sexual abuse, and protective factors. Findings of this study indicated that the survey showed moderate to good reliability for most childhood experiences. The degree of reliability was dependent on the concreteness of the questions (Hardt et al., 2006).

Overall, despite concerns about the reliability and validity of retrospective research on childhood adversity, there is substantial evidence that the quality of survey measures is good enough to trust the results. This is important since the most common method of studying childhood adversity is through these retrospective studies.

1.2.3 Childhood adversity as a determinant of adult disease

Why is studying childhood adversity important in health research? Research on childhood adversity sheds light on its many negative outcomes, which include delayed development (Andersen & Teicher, 2004; Hildyard & Wolfe, 2002), poor academic performance (Nikulina,
It may also provide insights and knowledge that can benefit victims of adversity and their family. Studying the determinants of childhood adversity and designing and implement preventative measures will help reduce long-term economic costs associated with the consequences of childhood adversity such as health care services, foster care, and delinquency (Conrad, 2006; Fang, Brown, Florence, & Mercy, 2012).

One of the reasons that studying adversity is important is because it is associated with many adverse health outcomes in adulthood. Heart disease is the leading cause of hospitalization and death in the United States (Mokdad et al., 2005) and Canada (Statistics Canada, 2015). In a survey of about thirteen thousand participants from two Canadian provinces (Manitoba and Saskatchewan), childhood physical abuse was associated with a substantial increase in the risk of heart disease. The odds ratio among people who had childhood physical abuse relative to those who did not was 1.6 (95% CI = 1.12, 2.20). This relationship persisted even when controlling for five other factors that are thought to mediate this relationship: childhood stressors, adult health behaviors, adult stressors, depression, and high blood pressure (Fuller-Thomson, Brennenstuhl, & Frank, 2010). Abused males had nearly three times the odds of myocardial infarction compared to non-abused males (OR = 2.96; 95% CI = 1.12, 7.85). However, childhood sexual abuse was not associated with heart attack in women (OR = 0.88; 95% CI = 0.28, 2.75) (Fuller-Thomson, Bejan, Hunter, Grundland, & Brennenstuhl, 2012).

In another study, experiencing childhood adversity was associated with a 49% higher odds of a cancer diagnosis (Fuller-Thomson & Brennenstuhl, 2009). In contrast, the ACE study did not report increased prevalence of cancer in people who have experienced childhood adversity (Felitti et al., 1998). However, the ACE study reported a graded relationship between the number of categories of childhood and prevalence and odds ratio of heart disease, stroke, bronchitis, diabetes, and hepatitis (Felitti et al., 1998).

This body of research suggests a consistent relationship between childhood adversity and a wide range of adult health problems (Felitti et al., 1998; Fuller-Thomson et al., 2010; 2012; Fuller-Thomson & Brennenstuhl, 2009; Fuller-Thomson, Bottoms, Brennenstuhl, & Hurd, 2011). Indeed meta-analyses have confirmed that childhood abuse and neglect are associated with both adult physical health outcomes (gastrointestinal, cardiopulmonary, and pain disorders) as well as
with mental health (anxiety, depression, PTSD, sleep disorders) (Chen et al., 2010; Hillberg, Hamilton-Giachritsis, & Dixon, 2011; Irish, Kobayashi, & Delahanty, 2010). Future research focusing on potential mechanisms that link childhood adversity to poor adult outcomes is necessary.

1.2.4 Childhood adversity leads to adult disease through risky behaviours

One mechanism that connects childhood adversity to adult health outcomes may be through risky health behaviours. These behaviours may include substance use, poor physical activity, risky sexual health, and not using seat belts.

The ACE study reported on the relationships between childhood adversity and these risky health behaviours. They found a graded relationship between the number of categories of childhood adversity reported and the prevalence and odds ratio of being a current smoker, having no physical activity, alcohol abuse, drug use and risky sexual health (having more than 50 partners, or ever having had a sexually transmitted infection) (Felitti et al., 1998). All of those risky health behaviours are associated with disease (Centers for Disease Control and Prevention, 2010; Paula et al., 2010; Roerecke & Rehm, 2014). A study reviewing the relationship between childhood adversity and cardiovascular disease explored potential mechanisms. Some of these mechanisms included smoking, lack of exercise, sleeping problems, maladaptive coping, and emotional regulation problems. For example, they reasoned that childhood adversity is associated to cardiovascular disease by way of smoking. Furthermore, they proposed that cigarettes have nicotine which may help regulate stress in those who have been exposed to adversity (Su, Jimenez, Roberts, & Loucks, 2015).

Other consequences of childhood adversity, such as anxiety and depression, also influence substance use. Childhood sexual and physical abuse are associated with depression and anxiety over life course (Lindert et al., 2013). The likelihood of major psychiatric disorder was increased by history of childhood physical or sexual abuse in both males and females. In women, the association with childhood physical and sexual abuse was statistically significant for all disorders (anxiety, alcohol, drug abuse). In men, physical abuse associated alcohol abuse, but not with drug abuse. In men, sexual abuse was associated with alcohol dependence, but not drug abuse. (MacMillan et al., 2001)
Experiences of childhood adversity have detrimental effects on health, which include physical as well as mental health. One possibility is that people who have experienced adversity adopt these risky health behaviours are to help deal with negative emotions. Symptoms of anxiety and depression are associated with substance abuse. More research is need into potential mechanisms that drive these relationships.

1.2.5 Mediators between childhood adversity and substance use

In the past, a number of hypothesized mediators between childhood adversity and substance use have been studied including psychological distress, post-traumatic stress disorder, stressful life events, criminality, prostitution, homelessness, and school problems (Douglas et al., 2010; Strine, Dube, et al., 2012a; White & Widom, 2008; Wilson & Widom, 2008). The following will describe these studies and their conclusions.

Strine’s group assessed anxiety and depression as mediators between childhood adversity and alcohol use and, in a separate study, tobacco use. Their hypothesis was tested using data on about seven thousand men and women from the ACE Study (Felitti et al., 1998). Anxiety and depression mediated between specific categories of adversity and adult alcohol problems. Psychological distress mediated childhood adversity (emotional abuse and neglect, physical abuse and neglect, mental illness in the household, parental separation or divorce, sexual abuse, and household drug use) and alcohol problems in women. In men, psychological distress mediated between childhood adversity (mental illness in the household, emotional neglect, physical abuse, household drug use, and sexual abuse) (Strine, Dube, et al., 2012a). For current smoking, anxiety and depression mediated between emotional abuse, physical abuse, physical neglect and parental divorce and current smoking in women only (Strine, Edwards, et al., 2012b). The mediation relationships were not tested in men because the study used the Sobel Test to evaluate mediation, in which a significant relationship between the independent variable and dependent variable is required (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

Another cross-sectional study surveyed two thousand people and five hundred controls recruited from universities and hospitals, who were pooled from a database of people participating in family-based and case-control genetic studies. Lifetime diagnosis of abuse or dependence of alcohol, cocaine, opioids, nicotine, cannabis, sedatives and stimulants was studied. This study reported that anxiety and depression mediated between adversity and substance abuse.
Furthermore, anxiety and depression mediated between living in a household with substance abuse and adult substance use (Douglas et al., 2010).

Criminality, prostitution, homelessness, and school problems have also been tested as mediators between childhood adversity and illicit drug use. In this cohort study, abused children were matched with non-abused children and followed prospectively into adulthood. The data on childhood adversity was collected prospectively. Only court-documented cases were included in this study, which may have biased the cohort towards more serious cases of child abuse. Participants were interviewed twice after the initial enrolment. In early adulthood (mean age 29 years), participants were asked about post-traumatic stress disorder, stressful life events, and criminality. Then, during middle adulthood (mean age 40 years), participants were surveyed about substance use. Analyses were performed separately for women and men. These researchers found that criminality, prostitution, homelessness, and school problems, analyzed together as one risk factor (characterized as “problem behaviour syndrome”), mediated between child abuse or neglect and illicit use in women, but not men. When analyzed as individual factors, none of the four hypothesized variables mediated between childhood abuse and drug use in either men or women (Wilson & Widom, 2008).

Another study utilized the same prospective database as the study above. However, this research studied women only. Post-traumatic stress disorder, stressful life events, criminality were assessed as mediators between childhood abuse and neglect on adult substance abuse and illicit drug use in women. The analyses indicated that stressful life events mediated between childhood abuse and substance use problems while post-traumatic stress disorder mediated between childhood adversity and illicit drug use (White & Widom, 2008).

Identifying psychological distress or post-traumatic stress disorder as a mediator between childhood adversity and substance use may be helpful. Psychological distress (anxiety and depression) and post-traumatic stress disorder may be targeted by pharmacotherapy and psychotherapy. Thus, identifying these psychological consequences of childhood adversity may facilitate designing interventions. Furthermore, clinicians may consider targeting these psychological variables when they are comorbid with substance use. Studying stressful life events, criminality, prostitution, and homelessness, as potential mediators improves the understanding of potential pathways that result in substance use. However, these variables
themselves are often studied as outcomes for prevention. For instance, there has been work on the association with childhood abuse and homelessness (Galea & Vlahov, 2002), prostitution (Widom & Kuhns, 1996) and criminality (Widom, 1989). Also, criminality, prostitution, and homelessness and substance use are often temporally close to each other. Furthermore, these variables (homelessness, criminality) are very closely associated with substances use, and may be considered comorbidities. School problems may be identified in life and may differ from the other variables.

1.3 Attachment Phenomena

1.3.1 Attachment as a trait

Attachment theory, developed by John Bowlby, is a theory of particular interpersonal relationships (Bowlby, 1982). Bowlby used this framework to describe an attachment bond between a child and the person(s) who parent him or her, referred to as an attachment figure. A child experiences repeated exchanges with an attachment figure, including many interactions that occur during play and in response to various threats or stressors. The child learns how responsive an attachment figure is to his or her needs or concerns, learns about the attachment figure’s ability to provide protection and soothing, and learns about the attachment figure’s ability to promote independent play and exploration. In response to these many interactions, a child develops certain expectations about him/herself and others, especially with respect to responding to threats and stress. These expectations are linked to preferences for behaviours that are complementary to them; for example, an expectation that an attachment figure will be inconsistently available or ineffective as a protector becomes linked to a tendency towards excessive vigilance and behaviours that attract the attachment figure’s attention and promote proximity. Taken together, the combined tendencies towards certain interpersonal expectations, preferences and behaviours, especially at times of stress can be referred to as an attachment pattern or style.

Attachment patterns are trait-like and are usually continuous into adulthood, although they can be influenced by extreme or consistent, repeated, positive or negative experiences (Fraley, Vicary, Brumbaugh, & Roisman, 2011b). In adults, attachment patterns can be measured with two dimensions of attachment insecurity, attachment anxiety and attachment avoidance (Fraley,
Heffernan, Vicary, & Brumbaugh, 2011a). Attachment anxiety is characterized by a preoccupation with rejection or separation. People with high anxiety prefer to be emotionally intimate and physically close to their attachment figure. Attachment avoidance is characterized by a relative aversion to closeness in relationships. People with high attachment avoidance prefer to maintain emotional and physical independence in their relationships. They may also suppress expressions of distressing emotions (Mikulincer & Shaver, 2007).

Attachment insecurity is associated with processes that are directly relevant to health outcomes including physiological stress responses, behavior used to regulate affect, biases toward expression or suppression of symptoms, and interpersonal behaviour between care-providers and those they care for (Maunder & Hunter, 2001). Relationships between attachment insecurity and health have been studied in many conditions, such as mood, anxiety and conduct disorders (Mickelson, Kessler, & Shaver, 1997), inflammatory bowel disease (Caplan, Maunder, Stempak, Silverberg, & Hart, 2014), and eating disorders (Tasca & Balfour, 2014). The association of insecure attachment to substance use is less well understood. In Study 1, our focus on attachment in this context will build on the current limited literature.

1.3.2 Attachment as a dynamic process

In addition to understanding patterns of attachment insecurity as interpersonal traits, another perspective on attachment phenomena is to appreciate the dynamic interaction between two individuals in an attachment relationship. In adulthood, an attachment figure is typically a romantic partner. Overall, the presence of an attachment figure may help a person regulate his or her emotions at times of stress to feel more secure. An attachment figure fulfills three specific functions. First, a person prefers to be physically close to their attachment figure. In this way, the presence or absence of an attachment figure will influence a person’s affect. Second, a person uses the attachment figure as a safe haven, someone they can return to when safety is threatened. Third, a person uses the attachment as a secure base in order to feel confident to explore the surrounding environment. Zeifman and Hazan call a person who serves all three functions a “full blown” attachment figure (Hazan & Zeifman, 1994). In adulthood, attachment relationships are usually reciprocal.
1.3.3 Determinants of attachment security and insecurity

There are various determinants of attachment security and insecurity. Attachment patterns develop over the first twelve to 18 months through repeated interactions between a child and the adults who parent him or her, typically a mother, but may also be a father, a grandparent or other adults who consistently serve in the parenting role. These interactions result in behaviours, preferences and beliefs concerning close relationships, known as patterns of attachment that persist long after development.

Factors that influence the quality of interactions between a child and his or her caregiver may influence attachment patterns. This section will discuss determinants of attachment patterns including maternal sensitivity, other maternal factors, demographic factors and biological factors.

The most consistent contributor to attachment security is maternal responsiveness to infant cues (Belsky & Fearon, 2008). A mother’s sensitivity as defined by Ainsworth entails being “capable of perceiving things from [the child’s] point of view and regarding her child as a separate person; she also respects his activity-in-progress and this avoids interrupting him” (Ainsworth, Stayton, & Bell, 1971). This description implies that a mother is able to decipher her child’s behaviour in order to make accurate interpretations about his or her mental states. Maternal sensitivity extends beyond the ability to identify and respond to the child’s basic states, such as hunger and distress. Mothers who do not display high sensitivity towards their children may “socialize with the baby when he is hungry, play with him when he is tired, and feed him when he is trying social interaction” (Ainsworth, Bell & Stayton, 1974). Maternal sensitivity does not refer to the mere presence or absence of a behaviour, but the appropriateness of such behaviour. Mothers who are sensitive to their children are able to respond to their children in appropriate ways as they are able and willing to assess why the child is behaving in a certain way.

Studying maternal sensitivity was initially challenging because of a lack of specificity in the definition of the construct. This led to varying interpretations of sensitive mothering. The Ainsworth scale (Ainsworth et al., 1971) is a measure based on the observer’s perception of the mother’s sensitivity during an observation period. The mother receives a score of 1 to 9, with higher scores indicating greater sensitivity. However, observers are not given guidelines about specific behaviours that need to be coded, or briefed on whether the frequency of behaviour is
important. Furthermore, the observation period is also not specified. Subsequently, observer rater procedures with high reliability have been developed, such as the Maternal Behavior Q-sort (Pederson et al., 1990; Tarabulsy et al., 2009; van IJzendoorn, Vereijken, Bakermans-Kranenburg & Marianne Riksen Walraven, 2004).

There have been many studies, which have demonstrated a link between early care and attachment. However, they varied in the estimates of the strength of the effects of the relationship. In a meta-analysis by De Wolff and Van IJzendoorn (Wolff & IJzendoorn, 1997), over half of the 68 articles focused exclusively on the synchrony of responses, or on maternal stimulation or support, without any appraisal of whether a mother’s responses were appropriate to cues from the child. In this case, maternal sensitivity accounted for less variance than was expected (effect sizes 0.24-0.32).

Due to these challenges, Meins (Meins, 2017) developed the term “maternal mind-mindedness” in order to describe a mother’s inclination consider her infant as an individual with a mind, rather than just as a creature with needs that must be satisfied. The concept of mind-mindedness aims to include Ainsworth et al.’s distinction between sensitive and insensitive mothering (Ainsworth et al., 1971). The mind-minded mother is sensitive to the child’s current state and is willing to change her focus of attention in response to cues from the infant. The construct of mind-mindedness allows the distinction between a mother’s general sensitivity to her child’s physical and emotional needs (suggested by Ainsworth et al., 1974) and a more specific sensitivity to the child’s mental states and ongoing activity. This ability to decipher the mental states underlying a child’s behaviour is most likely to be apparent in situations where the child’s physical and emotional needs are satisfied.

Meins and colleagues have assessed maternal mind-mindedness and its relation to attachment insecurity within the contexts of mothers’ descriptions of their children, and their interpretations of their children’s vocabulary items at 20 months. A link between attachment security in infancy and mothers’ descriptions of their children at age 3 years has been reported. In contrast to their insecure counterparts, mothers whose infants had been securely attached were more likely to focus on their mental characteristics, rather than their physical appearance or behavioural tendencies, when asked to describe their children 2 years later (Meins, Fernyhough, & Russell, 1998).
There are other maternal factors, such as the psychological health of mothers that may influence attachment insecurity. The majority of studies have found that mothers who are depressed postnatally were more likely to develop insecure attachments with their infants, although there are some contradictory results from empirical studies (DeMulder & Radke-Yarrow, 1991; Martins & Gaffan, 2000; Murray, 1992; Teti, Gelfand, & Messinger, 1995). For instance, reoccurring symptoms of maternal depression during the first three years predicted high prevalence of insecurity attachment at 36 months (Murray, 1992). In one study, attachment assessments were made using the Strange Situation procedure of 112 mothers and their children. Sixty-seven percent of the children of bipolar depressed mothers were classified insecure, in comparison with 42% of children of well and unipolar mothers (DeMulder & Radke-Yarrow, 1991). In a meta-analysis, seven studies compared mothers with and without clinically diagnosed depression and the attachment patterns of their infants using the Strange Situation. These cohorts studied middle-income mothers, free of risk factors other than maternal depression. Infants of depressed mothers were significantly less likely to be classified as securely attached and were more likely to be (Martins & Gaffan, 2000).

Furthermore, maternal social support systems appear to play a role in attachment insecurity as well. In high social risk groups, lack of support was associated with higher rates of insecure attachment. In contrast, extensive support was found to be correlated with attachment security (Crittenden, 1985; Crnic, Greenberg, Ragozin, & Robinson, 1983). One study assessed maternal life stress, social support, and life satisfaction was assessed at the one-month home visit. Both stress and support significantly predicted maternal attitudes at 1 month. Mothers with greater stress were less positive in their attitudes and behavior, while mothers with greater support were significantly more positive. Intimate support proved to have the most general positive effects. Additionally, social support moderated the adverse effects of stress mother's life satisfaction and on several behavioral variables. Maternal social support further found to have several significant effects on infant interactive behavior (Crnic et al., 1983). This study demonstrates the influence of social support on material behaviour, which in turn affects the quality of attachment relationships.

Research has reported on the influence of different demographic risk factors and how the accumulation of these factors may affect the attachment patterns through their influence on parenting. Income and family size, parental age and education, major stressful events, such as
loss of a parent, birth of a sibling, severe illness, marital relationships and break-down affect the quality of attachment relationships (Cummings & Davies, 2002; Huerkamp, 1998; Moss, Cyr, & Dubois-Comtois, 2004; Nair & Murray, 2005; Owen & Cox, 1997; Teti, Sakin, Kucera, Corns, & Eiden, 1996; Zeanah, Danis, & Hirshberg, 1999).

Biological factors such as temperament may also influence attachment insecurity. Temperament may interact with environmental factors (maternal sensitivity, demographics) and as a result increase the likelihood of attachment insecurity.

Temperament may also influence attachment insecurity. Babies are born with an innate capability for self-regulation of arousal and distress, which has an impact on parents. The individual variation in these capabilities can be described by temperamental dimensions such as the infant's disposition for distress or negative emotionality, irritability and ability to be soothed (Boom, 1994; Rothbart, 1981). The role of temperament on attachment security has been long debated. Attachment theorists have suggested that temperament has no direct effect on the quality of attachment as infant characteristics such as difficult temperament can be accommodated by sensitive caregivers, who can still foster secure attachment relationships (Sroufe, 1985). However, temperament researchers, have emphasized that infant-caregiver interactions in the Strange Situation reflect the infant's temperament rather than the quality of the relationship (Kagan, 1994). In a review, Vaughn and Bost (Vaughn & Bost, 1999) contend that temperament and attachment are separate constructs. However, whether temperament and attachment are independent or dependent depends on how the two constructs are conceptualized and assessed. There is a body of empirical research results, which has demonstrated relations between attachment quality and infant irritability, proneness to distress or stress regulation (Boom, 1994; Crockenberg, 1981; Spangler & Grossmann, 1993; Spangler & Schieche, 1998). In a review, Mangelsdorf and Frosch (Mangelsdorf & Frosch, 1999) have suggested that effects of infant temperament on attachment may be indirect and moderated by other maternal and social variables.

1.3.4 Measures of Attachment

There are two main ways to conceptualize adult attachment. The first is to conceptualize attachment as a person’s “state of mind with respect to attachment”. These states of mind are observed in a person’s ability to reflect coherently on his or her attachment figures and their
relationships. Observational methods are used to identify a person’s “states of mind” and so unconscious aspects of attachment can be inferred. The second way to conceptualize attachment is through a person’s own report of behaviors, expectations and preferences about his or her interactions with an attachment figure. These conscious observations and preferences are surveyed through self-report measures. Both observational and self-report measures can generate either categorical or dimensional measures of attachment. A few commonly used tools will be described below.

The Adult Attachment Interview (AAI) examines an adult's mental representations (George, Kaplan, & Main, 1985). The subject recollects and describes his or her childhood experiences with his or her parents in a semi-structured interview. These descriptions are transcribed and then coded for parental behaviour (loving, rejecting, neglecting, involving, or pressuring), the subject’s “state of mind” (idealization, insistence on lack of recall, active anger, derogation of parents or of attachment, fear of loss), as well as the overall coherence of the transcript. The coding and grading of these scripts result in four main classifications, secure/autonomous, dismissing, preoccupied, or “cannot classify” (also known as “unresolved”). People classified as secure/autonomous are able to recollect both positive and negative experiences with their parents and able to recall specific memories to support their descriptions. Their affect appropriately matches their descriptions, whether positive or negative. People classified as dismissing tend to be uncomfortable being interviewed, may have difficulty recalling specific events and tend to idealize negative experiences. People classified as preoccupied appear anxious when discussing attachment relationships and provide descriptions that are confusing and inconsistent. People who cannot be classified do not follow these patterns. This latter category is referred to as “unresolved” because of the frequent evidence of unresolved experiences of attachment related-trauma, loss, or abuse (Hesse, 2008). The distribution of AAI classifications in one nonclinical sample (studied prior to the introduction of the fourth category) was 58% secure/autonomous, 24% dismissing, 18% preoccupied (Bakermans-Kranenburg & van IJzendoorn, 1993). In a review of more than 200 studies using AAI in both clinical and non-clinical samples, the distribution was 23% dismissing, 58% secure, 19% preoccupied, and 18% unresolved (Bakermans-Kranenburg & van IJzendoorn, 2009).

Among the more commonly used self-report measures, the Relationship Questionnaire (RQ) was designed by Bartholomew and Horowitz to correspond to their four-category model of adult attachment (Bartholomew & Horowitz, 1991). In this model, the first dimension is “Model of
Self” which describes a person’s dependence, while the second dimension, “Model of Other” describes avoidance of intimacy. People may be classified as “low” or “high” in these dimensions, yielding four categories: “secure”, “preoccupied”, “dismissing” and “fearful”. In the RQ, the four categories of attachment are described in brief paragraphs. People rate the degree to which they resemble each style on a 7-point scale. The secure prototype describes a person who is comfortable being close to others, but also doesn’t worry about being alone. The dismissing prototype describes a person who rejects close relationships and prefers to feel independent. The preoccupied prototype describes a person who focuses on emotional intimacy and is preoccupied with rejection. Finally, the fearful prototype describes a person who wants, but is also uncomfortable with closeness and dependence on others.

Another self-report tool, the Experiences in Close Relationships (ECR) instrument resulted from a factor analysis of three hundred attachment items from 60 self-report measures of attachment (Brennan, Clark & Shaver 1998a). This analysis produced factors related to attachment anxiety (which corresponds to model of other) and attachment avoidance (which corresponds to model of self). Attachment anxiety is characterized by a fixation on rejection and separation. Attachment avoidance is characterized by a disregard of close relationships and indifference towards emotional attachment. The tool is made up of thirty-six items, half describing attachment anxiety and half describing attachment avoidance. Reported α coefficients are near or above .90, and test–retest coefficients are reported to be between .50 and .75, with little correlation between the two scales of anxiety and avoidance in most samples (Mikulincer & Shaver, 2007).

There are advantages and disadvantages of the tools used to study attachment. Studying “states of mind” by conducting interviews requires substantial resources. While the interview itself takes only about one hour, coding and scoring AAI transcripts takes several hours and can only to be performed by a reliable coder who has specialized training. This training costs several thousand dollars and consists of learning interviewing and coding skills over a two-week period, followed by supervised coding to obtain certified reliability over several months. On the other hand, the self-report surveys are easy to implement in research studies. For instance, the ECR-Short Form consists of twelve items and can be completed in about ten minutes (Wei, Russell, Mallinckrodt, & Vogel, 2007). The tool includes simple instructions to calculate the scores. These scores can be tallied up anyone with the instructions, such as research assistants and graduate students. Correlations between observational and self-report measures are typically low, suggesting that
they tap into different aspects of adult attachment (Roisman et al., 2007).

When choosing between categorical or dimensional measurements of attachment, Ravitz and colleagues suggested that categories maybe helpful in clinical settings as they can aid clinicians in tailoring interventions based on an understanding of attachment prototypes. Dimensions of attachment may describe more refined differences between individuals, provide greater statistical power, and may be more useful in research (Ravitz, Hunter, Sthankiya, & Lancee, 2010).

1.3.5 Attachment trait and substance use

Insecure attachment has been found to be associated with the use of alcohol, tobacco, and other drugs (Ahrens, Ciechanowski, & Katon, 2012; Cooper, Shaver, & Collins, 1998; Kassel, Wardle, & Roberts, 2007; McNally, Palfai, Levine, & Moore, 2003). Overall, it appears that attachment anxiety has been most consistently found to be associated with substance use. For instance, attachment anxiety (but not attachment avoidance) was reported to be associated with frequency of cigarette use, and associated with using alcohol, tobacco or marijuana to reduce stress in college students (Kassel et al., 2007). In a second study, attachment anxiety (“model of self”) was associated with using alcohol in order to cope (McNally et al., 2003). In high school students, avoidant adolescents were less likely to have used alcohol or drugs compared to anxious adolescents. Anxiously attached adolescents reported significantly more drinking problems in the last 6 months than avoidant adolescents. Anxious adolescents also reported more frequent use of marijuana (Cooper et al., 1998). However, research results as to which dimension of attachment insecurity is more strongly associated with substance use are not consistent. Attachment avoidance (but not attachment anxiety) was associated with quantity and frequency of drinking alcohol in one cohort (Brennan & Shaver, 1995) and of being a current smoker in another (Ahrens et al., 2012).

The literature on the relationship between attachment insecurity and substance use has several weaknesses. First, the populations studied were mostly limited to high school or university students (Brennan & Shaver, 1995; Cooper et al., 1998; Kassel et al., 2007; McNally et al., 2003). Second, some studies used methods to survey attachment insecurity that are not validated or are not psychometrically robust. The use of different measures also makes it difficult to compare these studies’ results. Third, the studies, while they surveyed both males and females, did not report on sex differences. In one study, results were reported in adult women only
(Ahrens et al., 2012). Fourth, all of these studies were cross-sectional.

1.3.6 How is attachment insecurity associated with substance use?

Attachment insecurity may be associated with substance use because it is related to other variables that are themselves linked to substances use. These other variables include support-seeking, affect regulation, anxiety and depression and weight or body concerns.

Attachment insecurity is strongly related to affect regulation (Mikulincer, Shaver, & Pereg, 2003). Affect regulation is defined as “the process by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions” (Gross, 1998). Emotional regulation centers around specific emotions such as sadness, fear or anger and includes efforts to up and down regulate both positive and negative emotions (Gross, 1998). The presence of very high levels of attachment insecurity implies a relative deficit in affect regulation through internal processes that are developed in early attachments (Kobak, Cole, Ferenz-Gillies, & Fleming, 1993; Maunder & Hunter, 2001; Mikulincer, 1998). Because of this, people with high attachment insecurity may use substances, in part, to regulate negative emotions. Food or substances, when consumed in order to reduce feelings of insecurity, have been called “external regulators of affect” (Maunder & Hunter, 2001). In essence, high attachment insecurity may lead people to using substances instead of using other skills to regulate affect, which may include physical exercise, seeking support from family or friends. Bidirectional effects are also possible, since harmful drinking may have consequences that challenge enduring relationships and increase attachment insecurity.

Attachment insecurity is linked to psychological distress in adolescents and adults (Bifulco, Moran, Ball, & Bernazzani, 2002; Hankin, 2005; Hankin, Kassel, & Abela, 2005; Muris & Meesters, 2002; Wei, Mallinckrodt, Russell, & Abraham, 2004). Psychological distress may include symptoms of anxiety and depression. People with high attachment insecurity are more likely to report symptoms of anxiety and depressions (Bifulco et al., 2002). Furthermore, anxiety and depressive disorders are associated with both alcohol (Kuo, Gardner, Kendler, & Prescott, 2006) and tobacco use (Fergusson, Goodwin, & Horwood, 1999; Lawrence, Considine, Mitrou, Zubrick, Zubrick, 2010; Sung, Prochaska, Ong, Shi, & Max, 2011). Attachment insecurity may influence substance use as it is strongly associated with anxiety and depression.
There has been conflicting evidence regarding the influence of social support on substance use and smoking cessation. Attachment theory describes support-seeking in close relationships. People use relationships with attachment figures to feel secure. When an attachment figure acts as a “secure base,” it enables a person to be able to explore as he or she knows that he or she has a safe and supportive environment to return to if necessary (Bowlby, 1969). People with high attachment anxiety and avoidance are more likely to doubt the support of their partners. In one study, participants with high attachment insecurity who received “low-support” messages appraised these messages more negatively than participants with low attachment insecurity. Even when participants received “high-support” message, they still perceived their messages as less supportive (Collins & Feeney, 2004). This study provided evidence that individuals are predisposed to evaluate perceived support depending on their attachment patterns. It is possible that if a person does not get a sense of security from relationships, he or she may resort to other resources including consuming substances. Some data suggests that social support influences substance use. For instance, social influences appeared to positively affect men’s ability to reduce their smoking, but were less effective for women. There was greater reduction in men’s smoking at 4 months post quit date if there was increased reports of a spouse or partner’s and family and friends’ influence. However, in women, greater reports of spouse or partner and of family and friends’ influence were only associated with smaller reductions in smoking (Westmaas, Wild, & Ferrence, 2002). A Cochrane review concluded that the interventions that were designed to enhance partner support in cessation programs did not result in increased quit rates. Limited data also suggested that these interventions did not succeed in increasing partner support. No conclusions could be made about the impact of partner support on smoking cessation (Park, 2014).

Attachment insecurity is also associated with a higher likelihood to have body or weight concerns. Some people use tobacco to control their food consumption and ultimately their weight. People who smoke report that they have a suppressed appetite because they are unable to taste or enjoy their food and end up eating less. Female smokers are more likely to cite concerns of gaining weight when they are trying to quit smoking (Pirie, Murray, & Luepker, 1991; Rosenthal et al., 2013). Attachment insecurity may be related to smoking because attachment anxiety is also associated with body dissatisfaction in women (McKinley & Randa, 2005; Tasca et al., 2006; Troisi et al., 2006; Troisi, Massaroni, & Cuzzolaro, 2005). People with high
attachment are more likely to be dissatisfied with their weight and thus use tobacco to control their weight.

1.3.7 Attachment as a dynamic process and substance use

While attachment insecurity, as a trait, has been studied as a correlate of substance use, there is no research on the influence of attachment on substance use or abuse from a dynamic perspective. Currently, research involving attachment figures focuses on who can act as an attachment figure (partner, friend, parent, pet, god, therapist) (Farber, Lippert, & Nevas, 1995; Fraley & Davis, 1997; Granqvist, Mikulincer, Gewirtz, & Shaver, 2012; Kurdek, 2009), and the effects of the loss of an attachment figure (Hennessy, Deak, & Schiml-Webb, 2010; Holman, Galbraith, Mead Timmons, Steed, & Tobler, 2008). However, there is less research on how the presence of an attachment figure may influence other processes. According to attachment theory, having a supportive attachment figure nearby makes a person feel more secure. Experiments have shown that the presence of an attachment figure decreases negative affect (Allen, Blascovich, & Tomaka, 1991; Edens, Larkin, & Abel, 1992; Kamarck, Manuck, & Jennings, 1990) and may increase positive affect (Gerstel & Gross, 1984). Furthermore, the presence or even viewing a photo of a partner may decrease subjective pain ratings in the context of child birth, migraines and pain (Eisenberger, Master, & Inagaki, 2011; Kennell, Klaus, McGrath, Robertson, & Hinkley, 1991; Montoya, Larbig, Braun, Preissl, & Birbaumer, 2004). In one particular study, participants were exposed to pain in a form of heat stimulation. During that time they were also shown photos of a partner, a stranger and an object. Participants reported less pain when they were looking at photos of their partner compared to photos of the stranger and object (Eisenberger et al., 2011).

Since there is no existing research on the effect of the presence of an attachment figure on substance use, this thesis work drew on two streams of research to inform the hypotheses for Study 2. The first stream of work concerns the influence of a partner on pain as described above. The second stream of research involves cue reactivity. The majority of cues that have been studied involve objects that are directly associated with smoking behaviour, such as cigarettes, a lighter or an ashtray. However, Shiffman has criticized that these cues are too narrow (Shiffman, 2009).

In the last 10 years, cue reactivity research has expanded to include environments and people.
Environments include places where people smoke and places where people do not smoke. Furthermore, these cues can be personalized. Smokers report more craving when exposed to photos of locations where they smoke (e.g. a bar) and even more craving if these photos are of actual places where they smoke (e.g. an actual bar they frequent) (Conklin, 2006; Conklin, Perkins, Robin, McClernon, & Salkeld, 2010). This effect persisted even with all smoking paraphernalia removed. In 2013, Conklin and colleagues studied if people can serve as cues to smoke. In this study, participants reported lower craving when exposed to photos of people around whom they did not smoke and higher cravings when exposed to photos of people around whom they did smoke (Conklin et al., 2013). These findings were explained by classical conditioning.

1.3.8 Attachment insecurity as a mediator between childhood adversity and health outcomes

There has been no other research that has examined attachment insecurity as a mediator between childhood adversity and substance use. However, there has been previous work on the relationship between childhood adversity, attachment security and other health outcomes including psychotic symptoms (Sitko, Bentall, Shevlin, Sullivan, & Sellwood, 2014), depression and anxiety (Bifulco et al., 2006), eating disorders (Tasca et al., 2013) and adult psychological symptomatology (Muller, Thornback, & Bedi, 2012). These studies will be described below.

Sitko and colleagues tested the relationships between specific categories of adversity and various psychotic symptoms. This cross-sectional study was part of a nationwide epidemiological investigation of the prevalence and correlates of mental disorders. Six thousand people between the ages of 15-54 years old participated. Attachment style was assessed with the Adult Attachment Questionnaire (Hazan & Shaver, 1987). Three paragraphs described 3 categories of attachment: secure, anxious, and avoidant styles. Participants were asked to pick one paragraph that best described their attachment behaviours. Both anxious and avoidant attachment mediated between neglect and paranoia. The relationship between sexual abuse and hallucinations was independent of attachment style. The relationship between rape and hallucinations was partially mediated via anxious attachment; however this effect was negated when depression was included as a mediating variable (Sitko et al., 2014).
Bifulco and colleagues assessed attachment style as mediator between childhood neglect or abuse and adult depression or anxiety. One hundred and fifty women with childhood adversity and adult vulnerability (low support) were recruited. In the first phase of the study, childhood adversity and attachment were assessed. The second phase, which occurred one to four years later, consisted of a psychiatric assessment. Attachment was assessed by an investigator-based interview. The Attachment Style Interview (ASI) assessed attachment base on the ability to form and maintain relationships as well as attitude towards closeness in relationships. For instance, having a minimum of two supportive relationships qualified as an ability to form and main relationships. Attachment avoidance was further broken down to different types (e.g. mistrust, constraints on closeness, high self-reliance and fear of rejection) as is anxious/ambivalence (e.g. desire for engagement, fear of separation and anger). The ASI scale allowed the assessment of the four insecure attachment styles (Enmeshed, Fearful, Angry-Dismissive and Withdrawn) at three levels (marked, moderate, or mild). Fearful and Angry- dismissive styles were shown to partially mediate the relationship between childhood adversity and depression or anxiety (Bifulco et al., 2006).

Tasca and colleagues tested a model in which attachment insecurity mediates the relationship between childhood maltreatment and eating disorders (Tasca et al., 2013). Three hundred adults seeking treatment for eating disorders completed this cross-sectional study. They completed questionnaires about childhood maltreatment, eating disorder psychopathology, and adult attachment. The Experiences in Close Relationships (ECR) scale, a 36-item self-report measure, was used to asses attachment. A shortened version of this tool was used in Study 1 (Chapters 3, 4) (Brennan et al., 1998). The scales yield two scores, one for attachment anxiety and one for attachment avoidance, with the higher score representing higher insecurity. The attachment anxiety sub-scale (18 items) assesses concern with rejection and preoccupation with abandonment. The attachment avoidance sub-scale (18 items) assesses fear of intimacy and discomfort with closeness or dependence. The study reported that attachment anxiety and attachment avoidance each equally mediated the childhood maltreatment to eating disorder psychopathology (Tasca et al., 2013).

Another study examined the mediating role of attachment in the relationship between childhood maltreatment perpetrated by parents and psychological symptoms in adults. A total of eight hundred young adults were recruited from a local university to complete questionnaires on
childhood adversity, adult attachment, and psychological symptomatology. The Relationship Questionnaire (RQ) (Bartholomew & Horowitz, 1991), a self-report measure, was used to assess adult attachment. Participants read four paragraphs describing four attachment styles and choose the paragraph they feel best describes them. The four attachment styles include secure attachment (characterized by low anxiety and avoidance in relationships), fearful attachment (high anxiety and avoidance), preoccupied attachment (high anxiety and low avoidance), and dismissing attachment (low anxiety and high avoidance). Attachment was found to be a mediator for all three types of abuse (psychological, physical, and exposure to family violence). Furthermore, a more robust mediated effect was found in the case of psychological abuse. When all three types of parental maltreatment (psychological, physical, and exposure to family violence) were considered simultaneously, attachment mediated the relationship between only psychological abuse and symptomatology.

There are various limitations in the studies of attachment insecurity as a mediator between childhood adversity and adult outcomes. The biggest limitation lies in the design of the studies. The majority of the studies employed a cross-sectional design, which limited the ability to make causal conclusions because the sequence of events could not be established (Mathieu & Taylor, 2006). For instance, does childhood adversity lead to high attachment insecurity, or are people with high attachment insecurity more prone to experiencing adversity? It cannot be ascertained if attachment insecurity was present before the health outcomes either. Longitudinal data is needed to make any potential conclusions. Furthermore, there may be bidirectional relationships between the variables making the direction hard to conclude. These studies only explored one possible pathway; alternative or complementary pathways are also possible. There may be other factors that also contribute to the relationship between child abuse and adult health outcomes.

The results reported by the studies may not be generalizable because of the specific cohorts they surveyed. For instance, one studied only people with eating disorders. As such, it happens that ninety-seven percent of the participants were women. Another study surveyed only women with adverse experiences. One article reported on university students, who may represent a very narrow age range, cultural background and socioeconomic status. It would be beneficial to study a variety of clinical and non-clinical adult populations to be able to further generalize the findings.
1.4 Sex differences

Sex differences have been studied in the prevalence of childhood adversity, attachment insecurity and substance use. However, sex differences have not been studied as thoroughly in the bivariate relationships between these variables.

1.4.1 Sex differences in childhood adversity, attachment insecurity and substance use

Childhood adversity may be gendered in a number of ways. First, the prevalence of childhood adversity may be gendered. Men generally report more childhood physical abuse than women while women report more childhood sexual abuse than men (MacMillan et al., 1997; 2001; Maikovich-Fong & Jaffee, 2010). As indicated above, Afifi found that physical abuse was endorsed in 31% of men and 21% of women, while sexual abuse was endorsed in 6% of men and 14% of women. In the ACE study, women (13%) were almost twice as likely to endorse emotional abuse as men (8%), and also reported sexual abuse more frequently (25% women, 16% men). However, the prevalence of physical abuse was similar in men and women (30%, 27%) (Centers for Disease Control and Prevention (U.S.), 2016). There are also sex differences in the specific sexual abuse experiences of males and females. One study of adversity found that sexually abused boys were more likely to experience fondling and oral intercourse whereas girls were more likely to experience penetrative abuse. In this study, boys were more likely to be abused by strangers while girls were more likely to be sexually abused by family members (Maikovich-Fong & Jaffee, 2010).

Interestingly, in the ACE study, women (19%) reported a higher prevalence of household mental illness than men (15%) (Centers for Disease Control and Prevention (U.S.), 2016). While it is possible that there was a higher prevalence of mental illness in families with girls, it may be possible that girls were more observant and aware of the household situation, or more distressed by it. Both men and women reported similar prevalence of living with a household member who was incarceration, parental separation or divorce and violence toward the mother.

Not much research has reported on sex differences in attachment insecurity. There are two common ways to measure attachment patterns (Ravitz et al., 2010). One is by dimensions, attachment anxiety and attachment avoidance, as described earlier. Another way is to describe attachment patterns is using a categorical method yielding 4 categories, secure, avoidance,
anxious and unclassified (or fearful) (Griffin & Bartholomew, 1994). One study surveyed eight thousand Americans and found that distribution of attachment patterns was 59% secure, 25% avoidance, 11% anxious. They reported that men (27.6%) were more likely endorse attachment avoidance than women (22.8%) (Mickelson et al., 1997).

Men and women differ in all phases of substance use including initiation, escalation of use, addiction and relapse following abstinence. Currently, the rates of drug abuse are lower in women than in men. Fewer women abuse alcohol than men (7-12% vs 20%) (Becker & Hu, 2008). However, the large differences in alcohol consumption between men and women, which were observed in the past, are now declining. In the 1980s, the ratio of alcohol disorders in men and woman was 5:1 (Helzer, Burnam, & McEvoy, 1991). More recently, this ratio has narrowed to 3:1 (Hasin, Stinson, Ogburn, & Grant, 2007).

In terms of the rate of escalation of substance use, on average, women increase their rate of consumption of alcohol more rapidly than men. For example, telescoping, which is the rapid progression from drug initiation to drug dependence, was considered to occur primarily in women. Recent research as reported that the telescoping effect may be influenced by cohort. They found that younger cohorts of men actually had a shorter time from first drug use to drug dependence (Keyes, Martins, Blanco, & Hasin, 2010). While the severity of alcohol dependence did not differ by sex, women reported more severe psychiatric and medical complications (Hernandez-Avila, Rounsaville, & Kranzler, 2004).

In 2015, the prevalence of smoking in men was 16.7% and in women was 13.6% (Jamal et al., 2016). The differences in smoking habits (mean cigarettes per day, pack-years smoking) between men and women have also decreased over time (Peters, Huxley, & Woodward, 2014). However, once addicted to smoking, women may still find it more difficult to quit than men. For instance, cessation rates are lower for women in nicotine replacement therapy (Cepeda-Benito, Reynoso, & Erath, 2004; Perkins & Scott, 2008).

1.4.2 Sex differences in the association between childhood adversity and attachment

There is no research on sex differences in the relationship between childhood adversity and attachment insecurity. Since negative experiences in childhood are likely to influence feelings of security in both boys and girls, there is little reason to expect that there would be sex differences
in this relationship. However, since boys and girls experience different kinds of abuse, it is possible that these affect attachment insecurity differently.

1.4.3 Sex differences in the association between childhood adversity and substance use

Among the many studies that have investigated the association between childhood adversity and substance use, only a few have studied and reported on sex differences. One study did not find sex differences in the relationship between childhood adversity and self-reported alcohol problems (Strine, Dube, et al., 2012a). Several other studies have found the relationship between childhood adversity and substance use was present in women, not men (Horwitz, Widom, & McLaughlin, 2001; Khoury, Tang, Bradley, Cubells, & Ressler, 2010; MacMillan et al., 2001; White & Widom, 2008; Widom, White, Czaja, & Marmorstein, 2007). One study reported that specific types of adversity were associated with men and women having ever smoked as well as current smoking. In women, ever smoking was associated with physical, sexual, and verbal abuse, as well as living with an alcoholic and living with a drug abuser and having parents who divorced. In women, physical abuse and living with a drug user was associated with higher odds ratio of current smoking. Among males who had ever smoked, this study found significantly elevated odds of current smoking for those who had reported parental separation or divorce and those who had reported household drug abuse. Interestingly, findings in this study suggest that there were two categories of childhood adversity (household problem drinking (OR 0.83, 95% CI 0.71-0.96) or verbal abuse (OR 0.72, 95% CI 0.61-0.86)) were associated with decreased odds of being a current smoker (Fuller-Thomson, Filippelli, & Lue-Crisostomo, 2013).

Thompson and colleagues reported that female abuse victims appeared to be at greater risk for some health problems than their male counterparts. This was found to be the case with mental health problems, however, unlike prior studies, this group did not find sex difference in the effects of childhood abuse on alcohol and drug abuse (Thompson & Kingree, 2004).

It is important to study sex as a moderator of the link between childhood adversity and subsequent substance use to parse out the mechanisms that underlie this relationship. Generally, more studies have reported that the relationship between childhood adversity and substance use is significant in women, but not men. However, much more research needs to be done in this area. This trend of childhood adversity being associated with substance use supports work that
women typically use substances to regulate negative emotions (Grayson & Nolen-Hoeksema, 2005).

### 1.4.4 Sex differences association between in attachment insecurity and substance use

Sex differences in the relationship between attachment insecurity and substance abuse or use have not been tested or reported. Studies on attachment insecurity and substance that have included both men and women, do not report on sex differences (Brennan & Shaver, 1995; Cooper et al., 1998; McNally et al., 2003). Moreover, these studies surveyed high school and college students only and none of them studied an adult population. Studying sex as a moderator in this relationship is important to help understand the mechanisms that drive these behaviours and whether they differ in men and women.

### 1.5 This Thesis

#### 1.5.1 Study 1

This thesis is comprised of two studies, which are described in three peer-reviewed papers. For the first study, we focused on childhood adversity, attachment insecurity and substance use. Currently, an association has been established between childhood adversity and substance use, as well as between childhood adversity and attachment insecurity. However, the relationship between attachment insecurity and substance use is still tentative and sex differences have not been explored. A summary of these relationships are presented in Figure 1-1.

The first study had 3 major aims. The first aim was to test the associations between childhood adversity, attachment insecurity and substance use and abuse with a focus on alcohol and tobacco. Two substances were studied in order to tease apart any similarities and differences in these uses and their determinants. The second aim was to test if attachment insecurity is a potential mediator between childhood adversity and substance use. The third aim was to test for sex differences in these associations and potential mediation relationships.
Figure 1-1. Study 1: Current state of knowledge. Childhood adversity is associated with substance use and high attachment security. Research on the association between attachment insecurity and substance use is limited in use of validated tools and is overly reliant on student populations. Black arrows represent associations that have been established. Grey arrows represent associations that are tentative.

Justifying studying attachment insecurity in this context requires an argument for the importance of attachment insecurity relative to more distal determinants of substance use outcomes (e.g. childhood adversity) and more proximal determinants (e.g. coping with stress). The rationale for studying attachment insecurity in addition to the distal determinant, childhood adversity, rests on the enhancement of cessation options that result from identifying exposure to childhood adversity, which in itself cannot be altered (Brown, Harris, & Fallot, 2013; Covington, 2008).

First, identifying insecure attachment as a mediator could provide new opportunities to personalize cessation therapy with adaptations that are better suited to a person high in
attachment anxiety, or high in attachment avoidance. For example, patients with attachment anxiety are often more needy and anxious. Perhaps smokers with high attachment anxiety who are trying to quit may be more successful with treatments that supplement support from others, especially support from partners or family, or that enhance independent regulation of stress and anxiety (e.g. relaxation or coping skills training). In contrast, smokers with high attachment avoidance may benefit from treatments, which preserve their sense of autonomy, such as online self-management programs or pharmacotherapies (e.g. NRTs, bupropion SR, varenicline for smoking cessation).

Second, there is also a rational for identifying attachment insecurity in addition to more proximal factors, which may serve as mediators between attachment insecurity and substance use. For example, attachment insecurity is associated with less effective affect regulation (Mikulincer, 1998), which may in turn promote substance use. While affect regulation as well as other determinants of substance have been identified and studied, this knowledge has not resulted in consistently effective cessation therapies. Current interventions include behavioural and psychological interventions, nicotine replacement therapy, pharmacological interventions (Hajek et al., 2013; Park, 2014; Stead, Koilpillai, Fanshawe, & Lancaster, 2016). As such, additional new targets of treatment and the personalization of treatment may be valuable. Third, as mentioned, the influence of attachment insecurity appears to be upstream of coping. Indeed, attachment insecurity may in fact influence other factors that are relevant to substance use such as regulation of psychological distress (Bifulco et al., 2006; Muller et al., 2012), and concerns with body image or weight (Tasca et al., 2013). As such, attachment may be an important variable in a model of substance use. Thus, attachment insecurity could serve as a construct that integrates and explains the influence of otherwise disparate determinants of substance use. Finally, attachment theory may have a theoretical value by providing a new perspective that explains, in part, the mechanisms that underlie the relationship between childhood adversity and substance use.

1.5.2 Study 2

The second study was designed after analysis of data from the first study. Study 1 suggested that attachment anxiety was associated with tobacco and alcohol use. Furthermore, attachment anxiety may mediate between childhood adversity and harmful drinking and current smoking.
Based on this finding, we decided to focus on aspects of smoking behaviour and to use a more robust design that would allow tests of causal hypotheses. Instead of designing another cross-sectional survey study, an experiment was designed. Because we did not have a lab to measure actual smoking behaviour (e.g. number of cigarettes, the number of puffs, puff length), we focused on variables that are closely associated with smoking behaviour, namely craving and affect. Craving and affect can be easily measured with a survey tool. Self-report ratings measuring craving are the standard measurement in this area of research (Sayette et al., 2000). It has been established that cigarette cues increase craving in smokers. However, the effect of cigarette cues on affect is inconsistent. An attachment figure decreases negative affect and may increase positive affect. The influence of an attachment figure photo on craving is unknown and will be tested. The current state of the knowledge is presented in Figure 1-2.

Our main hypothesis revolved around the influence of the presence of an attachment figure photo on craving and affect. Following the methods of cue reactivity research, we operationalized the “presence of an attachment figure” as the presentation of a photo of the face of a person who served all three functions of an attachment figure (safe haven, secure base, desire for proximity). This cue was completely novel in the context of substance use. As such, in our cohort we also wanted to test another cue that has been well studied in smokers for comparison. Because of this, the first aim of the study was to test the influence of a cigarette cue on craving and affect. The second aim of the study was to test the influence of an attachment figure photo on craving and affect. The third aim of the study was to compare the size of the effect of a cigarette cue and a photo of an attachment figure. Much of our understanding on cue reactivity has been understood in terms of conditioning theory (Niaura et al., 1988). Attachment theory provides a novel perspective to understanding smoking, which may aid in the development of novel or supplemental therapies for smoking cessation.
Figure 1-2. Study 2: Current state of knowledge. Cigarette cues increase craving in smokers and may influence negative and positive affect. An attachment figure influences affect. The effects of an attachment figure photo on craving is unknown. The black arrows represent relationships that have been supported by previous literature. The grey arrow represents a relationship that has been studied with inconsistent results. The hatched arrow represents a relationship that is unknown and will be tested.
Chapter 2
Research Aims and Hypotheses

2 Overview

The overarching goal of this thesis was to study childhood adversity and attachment phenomena as determinants of substance use with a focus on alcohol and tobacco use.

In this thesis work, two studies were conducted. The first study approached attachment phenomena as a trait. We investigated associations between childhood adversity, attachment insecurity and alcohol and tobacco use. Building from the results of the first study, we decided to approach dynamic processes within attachment relationships and chose to focus on tobacco use. In the second study, we investigated how an attachment figure influences craving and affect, two variables proximal to smoking behaviour.

2.1 Specific Aims

The first study aimed to examine the associations between childhood adversity, attachment insecurity and alcohol and tobacco use.

STUDY 1. **Aim 1**: To assess how childhood adversity and attachment insecurity are related to alcohol use.

A cross-sectional study was performed at the Mount Sinai Hospital family medicine clinic. The study surveyed childhood adversity, attachment insecurity and alcohol use in patients of the clinic. In this and subsequent hypotheses, attachment insecurity refers to both attachment anxiety and attachment avoidance. Furthermore, alcohol use refers to both harmful drinking and number of alcohol drinks consumed over a month.

We hypothesized:

1. childhood adversity is positively correlated with alcohol use,
2. attachment insecurity is positively correlated with alcohol use,
3. attachment insecurity as a plausible mediator between childhood adversity and harmful drinking,
4. in the mediation model proposed in hypothesis 3, sex moderates the relationship between attachment insecurity and alcohol misuse (moderated double mediation).

The hypotheses were tested separately for harmful drinking and number of drinks.

STUDY 1. **Aim 2**: To assess how childhood adversity and attachment insecurity are related to tobacco use.

In this and subsequent hypotheses, attachment insecurity refers to both attachment anxiety and attachment avoidance. Furthermore, tobacco use refers to both ever smoking and current smoking.

We hypothesized:

1. An association between
   a. childhood adversity and tobacco use,
   b. childhood adversity and attachment insecurity,
   c. attachment insecurity and tobacco use,
2. That attachment insecurity is a plausible mediator of the relationship between childhood adversity and tobacco use,
3. That the relationship between childhood adversity and smoking (Hypothesis 1a) would be present in women, but not men,
4. That there would be sex differences in the relationships described in Hypotheses 1c, and 2.

The hypotheses were tested separately for ever smoking and current smoking. Additionally, the hypotheses were tested separately for attachment anxiety and attachment avoidance.

STUDY 2. **Aim 1**: To assess the influence of an attachment figure on craving and affect in smokers.

Participants were recruited from multiple sources including online sites and the Toronto public transit system. Two sets of experiments were performed. The first set of experiments was performed to replicate previous work by testing the effects of cigarette cues on cigarette craving in our cohort. The second set of experiments was performed to test the influence of a photo of an attachment figure on craving in smokers. The size of the effects of cigarette cues and attachment
figure photos on craving were compared.

1. In the first experiment, we hypothesized that exposure to cigarette cues would:
   a. increase craving,
   b. increase negative affect and
   c. decrease positive affect.

2. In the second experiment, we hypothesized that exposure to a photo of an attachment figure would:
   a. decrease craving,
   b. decrease negative affect and
   c. increase positive affect.
Chapter 3
Childhood adversity and alcohol consumption: the mediating role of attachment insecurity

3 Overview


ABSTRACT

Background: Harmful alcohol use is associated with disease and mortality. New determinants of harmful drinking need to be identified to aid the 16.3 million adults who have alcohol use disorders. Childhood adversity is associated with alcohol use, but is not amenable to change. Attachment insecurity (anxiety and avoidance) may be associated with alcohol use and may be a target for modification or used to personalize interventions.

Objectives: This study aims to 1) identify the association between attachment insecurity and harmful drinking, 2) determine if attachment insecurity may mediate between childhood adversity and harmful drinking and 3) test sex as a moderator between attachment insecurity and harmful drinking in the mediation relationship.

Methods: Adult primary care patients (N=348, 60% women) completed a cross-sectional study using validated measures. Statistical analyses were performed using Hayes’s PROCESS macro in SPSS.

Results: Experience of childhood adversity was reported by 61% of the sample and 11% endorsed harmful drinking. Both attachment anxiety (p ≤ .001) and attachment avoidance (p=.02) were associated with harmful drinking. Attachment anxiety may mediate between
childhood adversity and harmful drinking (95% CI .09, .30). Sex did not moderate the relationships between attachment anxiety (95% CI -.15, .20) or attachment avoidance (95% CI -.23, .03) and harmful drinking in the mediation relationship.

Conclusion: Attachment anxiety may mediate between childhood adversity and harmful drinking in both men and women. Attachment anxiety may be a potential therapeutic target for people with a history of childhood adversity.

3.1 Introduction

While much progress has been made in reducing the harmful consequences of alcohol use, major challenges remain (Anderson, Chisholm, & Fuhr, 2009; Room, Babor, & Rehm, 2005). Alcohol-related deaths remain an important cause of mortality, accounting for 6% of global deaths in 2014 (Management of Substance Abuse Unit in the Department of Mental Health and Substance Abuse of the World Health Organization, 2014). Furthermore, in 2010, alcohol use problems were estimated to have cost the United States $249 billion (Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015). While current interventions (Amato, Minozzi, & Davoli, 2011; Ferri, Amato, & Davoli, 2006; Jonas et al., 2014; Siegfried, Pienaar, & Ataguba, 2014; Smedslund, Berg, & Hammerstrøm, 2011) provide benefit, new approaches to understanding alcohol use are still needed in order to help the 16.3 million adults with alcohol use disorders (Substance Abuse and Mental Health Services Administration SAMHSA, 2016b). As such, identifying new modifiable contributors to alcohol use is valuable.

Interpersonal factors may contribute to alcohol use. One interpersonal factor, childhood adversity, is widespread and may have serious long-term effects, including an increased risk of substance use disorders. For example, the Adverse Childhood Experiences (ACE) Study surveyed over 15,000 participants in San Diego with a tool that studies 10 categories of childhood adversity (Felitti et al., 1998). The ACE Study found a graded relationship, such that exposure to more categories of adversity correlated with a higher probability of alcohol, tobacco and drug use. People who had experienced 4 or more categories of childhood adversity, 12% of people in the cohort, were 7.4 times more likely to report alcohol problems than people who reported no adversity. The reasons for this increased risk are complex and not fully understood.
however, strategies to reduce the negative impact of childhood adversity may depend on understanding these mechanisms.

While the established link between childhood adversity and harmful drinking may inform prevention and treatment approaches, childhood adversity cannot be changed after the fact. Studying attachment theory in the context of alcohol use may be helpful as it may provide a new perspective to explain the mechanisms that underlie the relationship between childhood adversity and alcohol use. Insecure attachment, a known consequence of childhood adversity (Baer & Martinez, 2006; Muller, Sicoli, & Lemieux, 2000), may be amenable to change (Kirchmann et al., 2012) and so could serve as a target for prevention or treatment. Furthermore, identifying insecure attachment as a mediator between early adversity and alcohol use may facilitate personalization of care (Strauss & Brenk-Franz, 2015). Therapeutic interventions that decrease this downstream consequence of childhood adversity, or modify its effects, could help people regulate alcohol use. However, this strategy depends on establishing that insecure attachment is associated with alcohol use.

Patterns of secure or insecure attachment develop in the attachment bond formed between infants and caregivers during repeated interactions at times of perceived threat (Bowlby, 1969). In particular, attachment behavior is directed towards to the goal of feeling more secure. Relevant aspects of attachment behaviours concern the degree to which a child seeks proximity to a parent at times of distress (and is soothed by contact) and the degree to which a child expresses or suppresses distress (and is able to calm down after being distressed). The behaviours that succeed in increasing feelings of security are reinforced and stable interpersonal patterns emerge (Waters, Hamilton, & Weinfield, 2000a). Attachment patterns subsequently influence the developing child’s expectations of others and guide the child’s behaviors towards others.

Adult attachment describe a person’s behaviors, expectations and preferences about his or her interactions with a romantic partner (Sibley, 2005). Secure attachment is an optimal pattern, in which feelings of security are relatively easily obtained and maintained. Insecure attachment refers to patterns of relating that are less flexible and less successful in obtaining feelings of security. Insecure attachment can be described with two dimensions. The first, attachment anxiety, is characterized by concern about abandonment and separation and amplification of expressions of distress. People with high attachment anxiety prefer to be close and intimate with
a partner and desire more support. The second dimension, attachment avoidance, is characterized by a relative aversion to very close relationships and suppression of expressions of distress. People with high attachment avoidance prefer emotional distance in relationships.

Attachment theory provides a framework to understand biological, psychological and social mechanisms that influence substance use, including alcohol use. This approach is useful especially because attachment insecurity is common; about 40% of the population endorse high attachment insecurity (Mickelson et al., 1997). Although insecure attachment is an aspect of normal psychology, it is also a risk factor for adult psychopathology. For example, evidence supports an association between attachment insecurity and anxiety and depressive symptoms in adolescents (Hankin, 2005; Muris & Meesters, 2002) and adults (Mickelson et al., 1997; Hankin et al., 2005; Wei et al., 2004). This association was shown to be independent of current mood state (Haaga et al., 2002). In a study of women, high attachment anxiety and attachment avoidance were associated with depression (Bifulco et al., 2002). In another study of women, attachment insecurity was found to partially mediate between childhood adversity and adult depression and anxiety disorders (Bifulco et al., 2006). Anxiety disorders and depression are more commonly reported in women than men and are known to play a role in substance use.

There are sex differences in exposure to childhood adversity, and in attachment insecurity and alcohol use. For instance, women are more likely to report sexual abuse whereas men are more likely to report physical abuse (MacMillan et al., 1997; 2001; Maikovich-Fong & Jaffee, 2010). Men are more likely to endorse attachment avoidance than women (Mickelson et al., 1997). Furthermore, men and women differ both in drinking patterns and in the consequences of alcohol consumption (Hasin, Stinson, Ogburn, & Grant, 2007; Ialomiteanu, Hamilton, Adlaf, & Mann, 2014; Keyes et al., 2010). For example, men are more likely to report heavy drinking (Dube, Anda, Felitti, Edwards, & Croft, 2002) and women are more likely to be life-time abstainers (Substance Abuse and Mental Health Services Administration SAMHSA, 2016a). With respect to consequences, men are less likely to report related alcohol-related physical illness than women (Fillmore et al., 1997). In recent years, there has been some evidence that these sex differences may be decreasing (Keyes et al., 2010).

Overall, more work is needed on sex differences in the relationships between the three variables. Sex differences in the relationship between childhood adversity and attachment insecurity have
received little study. However, in the large body of work on the relationship between childhood
adversity and the use of alcohol, tobacco and other drugs, some studies have investigated sex
differences (Fuller-Thomson et al., 2013; Horwitz et al., 2001; Khoury et al., 2010; Strine, Dube,
et al., 2012a). Widom found significant relationships between childhood adversity and drug use
in women but not in men (Widom, Marmorstein, & Raskin White, 2006). In one study, ever
smoking was associated with six types of adversity in women (physical, sexual, or verbal abuse,
parental divorce, having lived with a family member with drug use or problem drinking), while
in men two of these types of adversity (sexual abuse and verbal abuse) were not associated with
ever smoking (Fuller-Thomson et al., 2013). On the other hand, Dube and colleagues found a
strong graded relationship between exposure to adversity and alcohol abuse in both women and
men. There was no significant differences in the odds ratio between the two sexes (Dube et al.,
2002). These data suggest nuanced sex differences in the associations between childhood
adversity and substance use.

Several studies have found associations between insecure attachment and alcohol use, drug use
and risky sexual behaviour. Insecure attachment is associated with alcohol consumption in high
school (Cooper et al., 1998) and university students (Brennan & Shaver, 1995; Kassell et al.,
2007; McNally et al., 2003). These studies measured a variety of alcohol use characteristics:
frequency of alcohol use, use of alcohol to cope, and measures of problem drinking. Despite
methodological differences, these studies indicate that both dimensions of attachment insecurity
may be associated with drinking behaviors. For instance, attachment anxiety was associated with
stress-motivated alcohol use or drinking to cope and attachment avoidance was related to
“drinking behaviour” (Brennan & Shaver, 1995). In high school students, attachment anxiety
was associated with having more drinking problems within a six month period (Cooper et al.,
1998). While these studies suggest that attachment insecurity may be related to problematic
alcohol consumption, the link is not considered to be established because of a lack of validated
measures of attachment and an over-reliance on student samples. For instance, Kassel
deconstructed Hazen and Shaver’s attachment instrument and performed a factor analysis,
revealing three dimensions, named close, depend and anxious. These scales had adequate
reliability (Cronbach α of 0.64, 0.81, and 0.66, respectively), but were not independently
validated (Kassell et al., 2007). Brennan and Shaver used seven 10-item scales, which
theoretically assessed relevant attachment constructs (Brennan & Shaver, 1995), but this tool has
not been used in further research.

No studies of the relationship between attachment insecurity and alcohol consumption have looked at sex differences. Recently, we observed that attachment anxiety is associated with current tobacco smoking in women but not men. Furthermore, we found that attachment anxiety may mediate the relationship between childhood adversity and current smoking in women but not in men (Le, Mann, Levitan, George, & Maunder, 2016). Similar relationships could apply to alcohol use. The current study extends the literature by studying the relationship between attachment insecurity and alcohol use with validated measures in a male and female adult population in a primary care setting.

This study addresses important gaps in knowledge. First, this study tests attachment insecurity as a currently unrecognized mediator between childhood adversity and harmful drinking and suggests using attachment theory as a new framework to study this relationship. Second, this study furthers the literature by proposing sex as a potential moderator of the relationship between attachment insecurity and harmful drinking. To date, no studies have studied these variables in one adult population. Understanding sex differences, and the factors that contribute to them, may provide important insights for preventing and treating harmful drinking.

This study aims to examine the impact of childhood adversity and attachment insecurity on alcohol use (harmful drinking and number of drinks per month) in a sample of adults attending a primary care clinic. We hypothesize that: 1) childhood adversity is positively correlated with alcohol use, 2) attachment insecurity is positively correlated with alcohol use (in this and subsequent hypotheses, attachment insecurity refers to both attachment anxiety and attachment avoidance), 3) attachment insecurity mediates the relationship between childhood adversity and alcohol use, 4) in the mediation model proposed in hypothesis 3, sex moderates the relationship between attachment insecurity and alcohol use (moderated double mediation). In a post-hoc analysis, we also explored psychological distress as a mediator (in parallel with attachment anxiety and attachment avoidance) between childhood adversity and alcohol use in a triple mediation model.
3.2 Method

3.2.1 Design and recruitment

Participants in this study were consecutive consenting patients attending an outpatient family medicine clinic at a large teaching hospital in Toronto. Figure 3-1 summarizes the recruitment process. Participants were between the ages of 25 to 65 years old and had sufficient English skills to complete the survey. Women who were pregnant and breastfeeding were excluded from the study because their alcohol consumption patterns may have been temporarily influenced by their pregnancy or post-partum. This population is intended to include adults who present to healthcare and are available for potential treatment. The Mount Sinai Hospital Research Ethics Board approved this study.

3.2.2 Measures

To assess recent alcohol use, participants provided retrospective assessments of alcohol consumption over the last month using the Timeline Follow Back Method, a calendar-based tool (Sobell & Sobell, 1995). Participants reported the number of standard alcohol drinks consumed each day. The Timeline Follow Back Method has been found to be reliable and valid in drinkers who did not have problematic drinking (Sobell, Sobell, Leo, & Cancilla, 1988), college students (Sobell, Sobell, Klajner, Pavan, & Basian, 1986) and both outpatient and inpatient alcoholics (Maisto et al., 1979). We reported on the number of drinks consumed over the past month.

The Alcohol Use Disorders Identification Test (AUDIT) identified participants with hazardous or harmful drinking (Babor et al., 1992). The AUDIT has been validated as a screening instrument for alcohol problems in primary care in 6 different countries (Saunders et al., 1993b). A systematic review of the literature concluded that the AUDIT is superior to other questionnaires such as the CAGE and the MAST (Fiellin & Reid, 2000) as a screening tool. Studies report that there is a high internal consistency and high reliability indicated by a test-retest reliability study (r=.86) (Fertig, 1997; Fleming et al., 1991). The psychometric properties have been well studied (de Meneses-Gaya et al., 2009; Piccinelli et al., 1997). The AUDIT consists of 10 questions (e.g. “How often during the last year have you had a feeling of guilt or remorse after drinking?”) yielding a total score of 0-40. A recommended cut off score of 10 was
used in our post-hoc analysis, which reflects a greater severity of hazardous and harmful alcohol use and dependence, as well as a greater need for more intensive treatment (Babor et al., 2001).

In the current study the distribution of AUDIT scores was skewed toward low scores, median 3, interquartile range (IQR) 1-6, Cronbach α 0.80.

The Adverse Childhood Experiences (ACE) Survey consists of 17 yes/no questions to assess ten categories of adverse exposure (Felitti et al., 1998). These questions yield a total adversity score of 0 (none) to 10 (highest) categories of exposure to childhood adversity. These include three categories of abuse (physical, emotional, and sexual), two of neglect (material and emotional) and five of other types of household dysfunction (household member with substance abuse, household member with mental illness, parental separation/divorce, household member incarcerated, mother treated violently). For regression analyses, the total adversity score was used. The ACE Study has shown a graded relationship between the ACE score and the prevalence of current smoking, self-reported alcohol problems and illicit drug use (Felitti et al., 1998). In the current study the distribution of ACE scores was skewed toward low scores, median 1, IQR 0-2.

The Experiences in Close Relationships-Short Form (ECR-S) was used to study attachment insecurity. Attachment insecurity was measured on two scalar dimensions, attachment anxiety and attachment avoidance. The ECR-S is composed of 12 out of the 36 questions from the Experiences in Close Relationships-Revised (ECR-R). The ECR-S has similar internal consistency, test-retest reliability, factor structure and construct validity as the ECR-R (Wei et al., 2007). The ECR-S consists of statements about how participants “generally feel in romantic relationships,” endorsed from strongly disagree (1) to strongly agree (7). In the current study, median attachment anxiety was 3.2, IQR 2.3-4.0, Cronbach alpha 0.72; median attachment avoidance was 2.0, IQR 1.3-3.2, Cronbach alpha 0.79.

Psychological distress (depressive and anxiety symptoms) was surveyed with the Kessler-10, which was developed for use in the annual US National Health Interview Survey to measure non-specific psychological distress. This tool has been found to have excellent internal consistency reliability (α .92) (Kessler et al., 2002). Numerous studies have reported on the reliability and validity of the K10 across diverse settings (Baillie, 2005; Furukawa, Kessler, Slade, & Andrews, 2003; Spies et al., 2009). The tool yields a score from 10 to 50. In the current
study, mean psychological distress score was 17.3, SD 7.0, Cronbach α 0.92.

3.2.3 Analysis

Sex was examined as a potential moderator. Participant characteristics and primary study variables were calculated in men and women and compared. Furthermore, correlational analyses were performed in men and woman separately to identify any potential sex differences in the bivariate relationships.

Descriptive characteristics were calculated for all variables. Correlational analyses were conducted among the primary study variables (childhood adversity, attachment insecurity, alcohol use) and potential covariates (psychological distress, age, and education) in men and women separately using Spearman rank correlations. From this matrix, only psychological distress was significantly associated with our primary study variables, while age and education were not. Thus, age and education were not included in subsequent models.

Regressions were completed to test the relationship between childhood adversity and harmful drinking, and between attachment insecurity and harmful drinking.

The mediation, and moderated mediation hypotheses were tested with the PROCESS macro of IBM SPSS Statistics (Version 24), which is appropriate for data that is not normally distributed (Hayes, 2013). PROCESS provides asymmetric bias-corrected bootstrap confidence intervals for inferences about conditional (i.e. moderated) indirect effects (i.e. mediated relationships). Effects are significant when the 95% confidence interval (CI) does not cross 0. We used bootstrapping with 5,000 samples. In all analyses, the variables were mean centered and heteroscedasticity was accounted for. We tested our hypotheses using PROCESS’s Model 4 (two parallel mediators) and Model 14 (moderated double mediation). In the mediation analyses, attachment anxiety and attachment avoidance were entered simultaneously in parallel. Moderated mediation was tested with the index of moderation (Hayes, 2015). With a cross-sectional study design, a positive test is consistent with mediation but does not indicate a causal relationship. A positive test indicates that a mediation relationship is plausible.
3.3 Results

3.3.1 Descriptive Statistics

Four hundred and seventy-nine people were approached in the clinic. Sixty-five did not meet the inclusion criteria and sixty-six who met criteria declined to participate. The recruitment rate was 84%, for a total of 348 participants. Table 3-1 describes the participants. Sixty percent were women (209) and 40% were men (139). The majority of the participants were white (72%), had completed post-secondary education (67%), and reported themselves to be in very good to excellent health (61%). Men and women did not differ with respect to age, education, health, or psychological distress. Ethnic background differed by sex; men were more likely to be white. Table 3-2 compares the main study variables by sex. Men and women did not differ with respect to number of categories of adversity or attachment insecurity. However, men drank more alcohol than women. A trend toward more hazardous drinking in men failed to reach significance ($p = .06$).

![Figure 3-1. Summary the recruitment at Mount Sinai Hospital Family Medicine](image-url)
Table 3-1. Characteristics of Participants

<table>
<thead>
<tr>
<th></th>
<th>Total N=348</th>
<th>Men N=139</th>
<th>Women N=209</th>
<th>P-value</th>
</tr>
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<tr>
<td><strong>Age (mean, SD)</strong></td>
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<tr>
<td></td>
<td>44.6 (10.9)</td>
<td>45.4 (10.3)</td>
<td>44.0 (11.3)</td>
<td>.25</td>
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<tr>
<td><strong>Education, N (%)</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Up to High School Degree</td>
<td>39 (11.2)</td>
<td>14 (10.1)</td>
<td>25 (12.0)</td>
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<tr>
<td>Any Post-Secondary Degree</td>
<td>75 (21.6)</td>
<td>29 (20.9)</td>
<td>46 (22.0)</td>
<td></td>
</tr>
<tr>
<td>Bachelor Degree</td>
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<td>48 (34.5)</td>
<td>83 (39.7)</td>
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<td>Graduate Degree</td>
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<td>48 (34.5)</td>
<td>55 (26.3)</td>
<td>.42</td>
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<td><strong>Self-rated Health, N (%)</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very good-Excellent</td>
<td>211 (60.6)</td>
<td>78 (56.1)</td>
<td>133 (63.9)</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>104 (29.9)</td>
<td>44 (31.7)</td>
<td>60 (28.7)</td>
<td></td>
</tr>
<tr>
<td>Poor-Fair</td>
<td>32 (9.2)</td>
<td>17 (12.2)</td>
<td>15 (7.2)</td>
<td>.19</td>
</tr>
<tr>
<td><strong>Ethnic Background, N (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>252 (72.4)</td>
<td>112 (80.6)</td>
<td>140 (67.0)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>47 (13.5)</td>
<td>11 (7.9)</td>
<td>36 (17.2)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>49 (14.1)</td>
<td>16 (11.5)</td>
<td>33 (15.8)</td>
<td>.01</td>
</tr>
<tr>
<td><strong>Reason for appointment, N (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td>116 (33.3)</td>
<td>43 (30.9)</td>
<td>73 (34.9)</td>
<td></td>
</tr>
<tr>
<td>Chronic</td>
<td>77 (22.1)</td>
<td>37 (26.6)</td>
<td>40 (19.1)</td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>80 (23.0)</td>
<td>30 (21.6)</td>
<td>50 (23.9)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>73 (21.0)</td>
<td>29 (20.9)</td>
<td>44 (21.1)</td>
<td>.40</td>
</tr>
<tr>
<td><strong>Kessler-10 Score, N (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (10-15)</td>
<td>174 (50.0)</td>
<td>74 (53.2)</td>
<td>100 (47.8)</td>
<td></td>
</tr>
<tr>
<td>Moderate (16-21)</td>
<td>91 (26.1)</td>
<td>35 (25.2)</td>
<td>56 (26.8)</td>
<td></td>
</tr>
<tr>
<td>High – Very High (22-50)</td>
<td>69 (19.8)</td>
<td>26 (18.7)</td>
<td>43 (20.6)</td>
<td>.71</td>
</tr>
</tbody>
</table>
Table 3-2. Childhood adversity, attachment insecurity and alcohol use

<table>
<thead>
<tr>
<th>Categories of Childhood Adversity, N (%)</th>
<th>Total N=348</th>
<th>Men N=139</th>
<th>Women N=209</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>137 (39.4)</td>
<td>57 (41.0)</td>
<td>80 (38.3)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>83 (23.9)</td>
<td>38 (27.3)</td>
<td>45 (21.5)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>43 (12.4)</td>
<td>13 (9.4)</td>
<td>30 (14.4)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>31 (8.9)</td>
<td>8 (5.8)</td>
<td>23 (11.0)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20 (5.7)</td>
<td>10 (7.2)</td>
<td>10 (4.8)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9 (2.6)</td>
<td>3 (2.2)</td>
<td>6 (2.9)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10 (2.9)</td>
<td>5 (3.6)</td>
<td>5 (2.4)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7 (2.0)</td>
<td>4 (2.9)</td>
<td>3 (1.4)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4 (1.1)</td>
<td>0 (0.0)</td>
<td>4 (1.9)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>3 (0.9)</td>
<td>0 (0.0)</td>
<td>3 (1.4)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>.18</td>
</tr>
</tbody>
</table>

Attachment Insecurity (Mean, SD)

| Attachment Anxiety | 3.3 (1.3) | 3.2 (1.2) | 3.3 (1.4) | .62     |
| Attachment Avoidance | 2.3 (1.2) | 2.4 (1.3) | 2.2 (1.1) | .18     |

Number of Drinks, N (%)

<table>
<thead>
<tr>
<th>0-2</th>
<th>94 (27.9)</th>
<th>28 (21.2)</th>
<th>66 (32.2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-12</td>
<td>82 (24.3)</td>
<td>27 (20.5)</td>
<td>55 (26.8)</td>
</tr>
<tr>
<td>13-29</td>
<td>78 (23.1)</td>
<td>34 (25.8)</td>
<td>44 (21.5)</td>
</tr>
<tr>
<td>30-124</td>
<td>83 (24.6)</td>
<td>43 (32.6)</td>
<td>40 (19.5)</td>
</tr>
</tbody>
</table>

AUDIT Score, N (%)

<table>
<thead>
<tr>
<th>0-1</th>
<th>90 (25.9)</th>
<th>25 (18.0)</th>
<th>65 (31.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td>87 (25.0)</td>
<td>26 (18.7)</td>
<td>61 (29.2)</td>
</tr>
<tr>
<td>4-6</td>
<td>92 (26.4)</td>
<td>41 (29.5)</td>
<td>51 (24.4)</td>
</tr>
<tr>
<td>7-40</td>
<td>77 (22.1)</td>
<td>46 (33.1)</td>
<td>31 (14.8)</td>
</tr>
</tbody>
</table>

3.3.2 Correlation Analyses

As shown in Table 3-3, in men, childhood adversity was weakly to moderately associated with both attachment insecurity ($r_s = .27$) and attachment avoidance ($r_s = .26$). These correlations were very similar in women, ($r_s = .27$, $r_s = .23$). In men, childhood adversity was not associated with harmful drinking ($r_s = .01$), but it was in women ($r_s = .17$). Childhood adversity was not associated with the number of drinks in either men ($r_s = -.07$) or women ($r_s = .03$). Attachment anxiety was weakly associated with harmful drinking in both men and women ($r_s = .18$, $r_s = .19$), but attachment avoidance ($r_s = .07$, $r_s = .08$) was not. Among the covariates, only psychological...
distress was associated with the primary study variables (childhood adversity, attachment insecurity and harmful drinking).

Table 3-3. Correlations between study variables and covariates (N=139) and women (N=209)

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Childhood Adversity</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Attachment Anxiety</td>
<td>.27*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Attachment Avoidance</td>
<td>.26*</td>
<td>.39*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Number of drinks</td>
<td>-.07</td>
<td>.05</td>
<td>-.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Harmful Drinking</td>
<td>.01</td>
<td>.18*</td>
<td>.07</td>
<td>.80*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Age</td>
<td>-.06</td>
<td>-.17</td>
<td>.10</td>
<td>-.06</td>
<td>-.21*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Education</td>
<td>-.20</td>
<td>-.21*</td>
<td>-.09</td>
<td>.05</td>
<td>-.07</td>
<td>.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Distress</td>
<td>.22*</td>
<td>.45*</td>
<td>.23*</td>
<td>.04</td>
<td>.19*</td>
<td>.32*</td>
<td>-.16</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Childhood Adversity</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Attachment Anxiety</td>
<td>.27*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Attachment Avoidance</td>
<td>.23*</td>
<td>.33*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Number of drinks</td>
<td>.03</td>
<td>.07</td>
<td>-.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Harmful Drinking</td>
<td>.17*</td>
<td>.19*</td>
<td>.08</td>
<td>.82*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Age</td>
<td>-.01</td>
<td>-.11</td>
<td>-.004</td>
<td>-.03</td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Education</td>
<td>-.15*</td>
<td>-.10</td>
<td>-.14*</td>
<td>.09</td>
<td>.05</td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Distress</td>
<td>.34*</td>
<td>.61*</td>
<td>.35*</td>
<td>-.01</td>
<td>.15*</td>
<td>-.05</td>
<td>-.11</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.

3.3.3 Mediation Analyses

1) Harmful Drinking

a) Double mediation analysis: investigating attachment anxiety and attachment avoidance as mediators between childhood adversity and harmful drinking (Figure 3-2)
Attachment Anxiety

Childhood Adversity

Attachment Avoidance

Harmful Drinking

d₁, e₁ = indirect effect of childhood adversity on harmful drinking through attachment anxiety, d₂, e₂ = indirect effect of childhood adversity on harmful drinking through attachment avoidance

Figure 3-2. Investigating attachment anxiety and attachment avoidance as mediators between childhood adversity and harmful drinking. Attachment anxiety, but not attachment avoidance, mediated between childhood adversity and harmful drinking. d₁ x e₁ = indirect effect of childhood adversity on harmful drinking through attachment anxiety, d₂ x e₂ = indirect effect of childhood adversity on harmful drinking through attachment avoidance
Table 3-4. Results of analysis investigating attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and harmful drinking

<table>
<thead>
<tr>
<th>Effect of childhood adversity on attachment anxiety (d₁ path)</th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of attachment anxiety on harmful drinking (e₁)</td>
<td>.31</td>
<td>.18</td>
<td>5.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Effect of childhood adversity on attachment avoidance (d₂ path)</td>
<td>.15</td>
<td>.04</td>
<td>3.89</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Effect of attachment avoidance on harmful drinking (d₂ path)</td>
<td>.12</td>
<td>.20</td>
<td>2.26</td>
<td>0.02</td>
</tr>
<tr>
<td>Direct effect of childhood adversity on harmful drinking (f path)</td>
<td>.23</td>
<td>.12</td>
<td>2.03</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**Indirect effects**

<table>
<thead>
<tr>
<th>Total Indirect effect of childhood adversity on harmful drinking</th>
<th>Bootstrap Estimate</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of childhood adversity on harmful drinking through attachment anxiety (d₁ x e₁)</td>
<td>.17</td>
<td>.05</td>
</tr>
<tr>
<td>Effect of childhood adversity on harmful drinking through attachment avoidance (d₂ x e₂)</td>
<td>.02</td>
<td>.03</td>
</tr>
</tbody>
</table>

Details of the analysis of attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and harmful drinking are found in Table 3-4. Childhood adversity was significantly associated with both attachment anxiety and attachment avoidance. Both attachment anxiety and attachment avoidance were significantly associated with harmful drinking. Childhood adversity was significantly associated with harmful drinking. The indirect effect of childhood adversity on harmful drinking through attachment anxiety was significant (B=.17, SE=.05, 95% CI: .09 - .30). On the other hand, the indirect effect through attachment avoidance was not significant (B=.02, SE=.03, 95% CI: -.034 - .078). The results indicate that only attachment anxiety and not attachment avoidance, acted as a mediator between childhood adversity and harmful drinking.
b) Double mediation analysis: investigating attachment anxiety and attachment avoidance as mediators between childhood adversity and harmful drinking with psychological distress as a covariate

Table 3-5. Results of analysis investigating attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and harmful drinking with psychological distress as a covariate

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of childhood adversity on</td>
<td>.06</td>
<td>.03</td>
<td>1.84</td>
<td>.07</td>
</tr>
<tr>
<td>attachment anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect of attachment anxiety on</td>
<td>.09</td>
<td>.04</td>
<td>2.32</td>
<td>.02</td>
</tr>
<tr>
<td>hazardous drinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect of childhood adversity on</td>
<td>.10</td>
<td>.04</td>
<td>2.25</td>
<td>.03</td>
</tr>
<tr>
<td>attachment avoidance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect of attachment avoidance on</td>
<td>.18</td>
<td>.20</td>
<td>.92</td>
<td>.36</td>
</tr>
<tr>
<td>hazardous drinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct effect of childhood adversity on hazardous drinking</td>
<td>.04</td>
<td>.12</td>
<td>.29</td>
<td>.77</td>
</tr>
</tbody>
</table>

Indirect effects

<table>
<thead>
<tr>
<th></th>
<th>Bootstrap Estimate</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Indirect effect of childhood adversity on hazardous drinking</td>
<td>.05</td>
<td>.03</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on hazardous drinking through attachment anxiety</td>
<td>.04</td>
<td>.03</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on hazardous drinking through attachment avoidance</td>
<td>.01</td>
<td>.02</td>
</tr>
</tbody>
</table>

Details of the analysis of attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and harmful drinking with psychological distress are found in Table 3-5. When controlling for psychological distress, childhood adversity was significantly associated with attachment avoidance. A trend towards an association between childhood adversity and attachment anxiety did not reach significance after adjusting for psychological distress. Only attachment anxiety, but not attachment avoidance, was significantly associated with number of drinks. Childhood adversity was not significantly associated with harmful drinking. The indirect effect of childhood adversity on number of drinks through attachment
anxiety was significant ($B=0.04$, $SE=0.03$, 95% CI: .002 to .12). On the other hand, the indirect effect through attachment avoidance was not significant ($B=0.01$, $SE=0.02$, 95% CI: -.03 to .06). The results indicate that only attachment anxiety and not attachment avoidance acted as a mediator between childhood adversity and harmful drinking.

Our results suggested that controlling for psychological distress did not eliminate the mediation relationship. Both our own results (Table 3.3) and previous work has suggested that childhood adversity is associated with psychological distress (Felitti et al., 1998) and that psychological distress is associated with alcohol use (Fergusson, Boden, & Horwood, 2009; Markman Geisner, Larimer, & Neighbors, 2004). Because of this, we decided to test psychological distress as an additional mediator between childhood adversity and harmful drinking. In a post-hoc analysis, we tested a triple mediation where attachment anxiety, attachment avoidance, and psychological distress mediate between childhood and harmful drinking.
c) Triple mediation analysis: investigating attachment anxiety, attachment avoidance and psychological distress as mediators between childhood adversity and harmful drinking (Figure 3-3)

Figure 3-3. Investigating attachment anxiety, attachment avoidance and psychological distress as mediators between childhood adversity and harmful drinking. Attachment anxiety and psychological distress, but not attachment avoidance, mediated between childhood adversity and harmful drinking. $g_1 \times h_1$ = indirect effect of childhood adversity on harmful drinking through attachment anxiety, $g_2 \times h_2$ = indirect effect of childhood adversity on harmful drinking through attachment avoidance, $g_3 \times h_3$ = indirect effect of childhood adversity on harmful drinking through psychological distress.
Table 3-6. Results of the triple mediation analysis investigating attachment anxiety, attachment avoidance and psychological distress as mediators between childhood adversity and harmful drinking

<table>
<thead>
<tr>
<th>Effect of childhood adversity on attachment anxiety (g₁ path)</th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of attachment anxiety on harmful drinking (h₁)</td>
<td>.31</td>
<td>.18</td>
<td>5.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Effect of childhood adversity on attachment avoidance (g₂ path)</td>
<td>.15</td>
<td>.04</td>
<td>3.72</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Effect of attachment avoidance on harmful drinking (h₂)</td>
<td>.12</td>
<td>.20</td>
<td>2.26</td>
<td>0.02</td>
</tr>
<tr>
<td>Effect of childhood adversity on distress (g₃ path)</td>
<td>1.2</td>
<td>.18</td>
<td>6.56</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Effect of distress on harmful drinking (h₃)</td>
<td>.15</td>
<td>.03</td>
<td>4.62</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Direct effect of childhood adversity on harmful drinking (i path)</td>
<td>.23</td>
<td>.12</td>
<td>2.03</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Indirect effects

<table>
<thead>
<tr>
<th>Total Indirect effect of childhood adversity on harmful drinking</th>
<th>Bootstrap Estimate</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate</td>
<td>SE</td>
<td>Lower</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>.21</td>
<td>.07</td>
<td>.098</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on harmful drinking through attachment anxiety (g₁ x h₁)</td>
<td>.12</td>
<td>.04</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on harmful drinking through attachment avoidance (g₂ x h₂)</td>
<td>.01</td>
<td>.03</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on harmful drinking through distress (g₃ x h₃)</td>
<td>.10</td>
<td>.06</td>
</tr>
</tbody>
</table>

As detailed in Table 3-6, childhood adversity was significantly associated with attachment anxiety, attachment avoidance and psychological distress. Each of attachment anxiety, attachment avoidance and psychological distress were associated with harmful drinking. The indirect effect of childhood adversity on harmful drinking through attachment anxiety was
significant (B=.12, SE=.04, 95% CI: .04 - .21). The indirect effect through psychological distress was also significant (B=.10, SE=.06, 95% CI: .004 - .23). On the other hand, the indirect effect through attachment avoidance was not significant (B=.01, SE .03, 95% CI: -.04 - 07). The results indicate that both attachment anxiety and psychological distress acted as mediators between childhood adversity and harmful drinking but attachment avoidance did not.

d) Moderated double mediation analysis: investigating sex as a moderator between attachment insecurity and harmful drinking in the double mediation relationship (Figure 3-4)

![Moderated double mediation model](image)

Figure 3-4. Moderated double mediation model investigating sex as a moderator between attachment insecurity and harmful drinking. Sex did not moderate between attachment insecurity and harmful drinking.

In the regression with harmful drinking as a dependent variable, attachment anxiety and sex were significant (Table 3-7). The interactions were not significant. The conditional indirect effect of childhood adversity on harmful drinking though attachment anxiety was significant in both women (B=.16, SE=.06, 95% CI: .06 - .31) and men (B=.19, SE=.00, 95% CI: .08 - .38). In this case, sex was not a moderator.
Table 3-7. The effects of childhood adversity, attachment anxiety (mediator 1) attachment avoidance (mediator 2) and sex (moderator) on harmful drinking.

<table>
<thead>
<tr>
<th>Regression Model on Harmful drinking</th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of childhood adversity on harmful drinking</td>
<td>.06</td>
<td>.13</td>
<td>.48</td>
<td>.63</td>
</tr>
<tr>
<td>Effect of attachment anxiety on harmful drinking</td>
<td>.97</td>
<td>.22</td>
<td>4.40</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Effect of attachment avoidance on harmful drinking</td>
<td>.07</td>
<td>.21</td>
<td>.31</td>
<td>.75</td>
</tr>
<tr>
<td>Effect of sex on harmful drinking</td>
<td>1.59</td>
<td>.49</td>
<td>3.28</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Effect of attachment anxiety x sex on harmful drinking</td>
<td>.17</td>
<td>.49</td>
<td>.35</td>
<td>.72</td>
</tr>
<tr>
<td>Effect of attachment avoidance x sex on harmful drinking</td>
<td>-.50</td>
<td>.40</td>
<td>-1.25</td>
<td>.21</td>
</tr>
</tbody>
</table>

The conditional indirect effect of childhood adversity on harmful drinking through attachment avoidance was not significant in either men (B=.04, SE=.05, 95% CI: .03 - .15) or women (B=-.03, SE=.04, 95%: -.13 -.03). These results indicate that attachment avoidance was not a mediator in either sex. The index of moderated mediation was not significant for either attachment anxiety (Index=.03, SE=.09, 95% CI: -.15 -.20) or attachment avoidance (Index=-.07, SE=.06, 95% CI: -.23 -.03).
2) Number of Drinks

a) Double mediation analysis: investigating attachment anxiety and attachment avoidance as mediators between childhood adversity and number of drinks (Figure 3-5)

\[ j_1 \times k_1 = \text{indirect effect of childhood adversity on number of drinks through attachment anxiety, } j_2 \times k_2 = \text{indirect effect of childhood adversity on number of drinks through attachment avoidance} \]

**Figure 3-5. Investigating attachment anxiety and attachment avoidance as mediators between childhood adversity and number of drinks.** Attachment anxiety, but not attachment avoidance, mediated between childhood adversity and number of drinks. \( j_1 \times k_1 \) = indirect effect of childhood adversity on number of drinks through attachment anxiety, \( j_2 \times k_2 \) = indirect effect of childhood adversity on number of drinks through attachment avoidance
Table 3-8. Results of analysis investigating attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and number of drinks.

<table>
<thead>
<tr>
<th>Effect of childhood adversity on attachment anxiety (j1 path)</th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of attachment anxiety on number of drinks (k1)</td>
<td>2.71</td>
<td>1.09</td>
<td>2.48</td>
<td>.01</td>
</tr>
<tr>
<td>Effect of childhood adversity on attachment avoidance (j2 path)</td>
<td>.15</td>
<td>.04</td>
<td>3.92</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Effect of attachment avoidance on number of drinks (k2 path)</td>
<td>1.09</td>
<td>1.19</td>
<td>.92</td>
<td>.36</td>
</tr>
<tr>
<td>Direct effect of childhood adversity on number of drinks (l path)</td>
<td>-.39</td>
<td>.69</td>
<td>-.56</td>
<td>.58</td>
</tr>
</tbody>
</table>

**Indirect effects**

<table>
<thead>
<tr>
<th>Effect of childhood adversity on number of drinks</th>
<th>Bootstrap Estimate</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Indirect effect of childhood adversity on number of drinks</td>
<td>.62</td>
<td>.30</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on number of drinks through attachment anxiety (j1 x k1)</td>
<td>.53</td>
<td>.26</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on number of drinks through attachment avoidance (j2 x k2)</td>
<td>.09</td>
<td>.20</td>
</tr>
</tbody>
</table>

Details of the analysis of attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and number of drinks are found in Table 3-8. Childhood adversity was significantly associated with both attachment anxiety and attachment avoidance. Only attachment anxiety, but not attachment avoidance, was significantly associated with number of drinks. Childhood adversity was not significantly associated with number of drinks. The indirect effect of childhood adversity on number of drinks through attachment anxiety was significant (B=.53, SE=.26, 95% CI: .09 to 1.11). On the other hand, the indirect effect through attachment avoidance was not significant (B=.09, SE=.20, 95% CI: -.25 to .55). The results indicate that
only attachment anxiety and not attachment avoidance, acted as a statistical mediator between childhood adversity and number of drinks.

b) Double mediation analysis: investigating attachment anxiety and attachment avoidance as mediators between childhood adversity and number of drinks with psychological distress as a covariate.

**Table 3-9. Results of analysis investigating attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and number of drinks with psychological distress as a covariate.**

<table>
<thead>
<tr>
<th>Effect of childhood adversity on attachment anxiety</th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of attachment anxiety on number of drinks</td>
<td>.07</td>
<td>.04</td>
<td>2.08</td>
<td>.04</td>
</tr>
<tr>
<td>Effect of childhood adversity on attachment avoidance</td>
<td>.10</td>
<td>.04</td>
<td>2.21</td>
<td>.03</td>
</tr>
<tr>
<td>Effect of attachment avoidance on number of drinks</td>
<td>.95</td>
<td>1.27</td>
<td>.75</td>
<td>.46</td>
</tr>
<tr>
<td>Direct effect of childhood adversity on number of drinks</td>
<td>-.79</td>
<td>.76</td>
<td>-1.04</td>
<td>.30</td>
</tr>
</tbody>
</table>

**Indirect effects**

<table>
<thead>
<tr>
<th>Total Indirect effect of childhood adversity on number of drinks</th>
<th>Bootstrap Estimate</th>
<th>SE</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect effect of childhood adversity on number of drinks through attachment anxiety</td>
<td>.18</td>
<td>.13</td>
<td>.01</td>
</tr>
<tr>
<td>Indirect effect of childhood adversity on number of drinks through attachment avoidance</td>
<td>.08</td>
<td>.14</td>
<td>-.12</td>
</tr>
</tbody>
</table>

Details of the analysis of attachment anxiety and attachment avoidance as parallel mediators between childhood adversity and number of drinks with psychological distress are found in Table 3-9. Childhood adversity was significantly associated with both attachment anxiety and attachment avoidance after adjusting for psychological distress. Only attachment anxiety, but not
attachment avoidance, was significantly associated with number of drinks. Childhood adversity was not significantly associated with number of drinks. The indirect effect of childhood adversity on number of drinks through attachment anxiety was significant (B=.53, SE=.26, 95% CI: .09 to 1.11). On the other hand, the indirect effect through attachment avoidance was not significant (B=.09, SE=.20, 95% CI: -.25 to .55). The results indicate that only attachment anxiety and not attachment avoidance, acted as a mediator between childhood adversity and number of drinks. These results of the double mediation remained the same with psychological distress included as a covariate.
c) Triple mediation analysis: investigating attachment anxiety, attachment avoidance and psychological distress as mediators between childhood adversity and number of drinks (Figure 3-6)

Figure 3-6. Investigating attachment anxiety, attachment avoidance and psychological distress as mediators between childhood adversity and number of drinks. Neither attachment anxiety, attachment avoidance nor psychological distress mediated between childhood adversity and number of drinks. 

\[ m_1 \times n_1 = \text{indirect effect of childhood adversity on harmful drinking through attachment anxiety} \]

\[ m_2 \times n_2 = \text{indirect effect of childhood adversity on harmful drinking through attachment avoidance} \]

\[ m_3 \times n_3 = \text{indirect effect of childhood adversity on harmful drinking through psychological distress} \]
As detailed in Table 3-10, childhood adversity was significantly associated with attachment anxiety, attachment avoidance and psychological distress. Attachment anxiety was associated with number of drinks. Neither attachment avoidance nor psychological distress was associated with the number of drinks. In the regression with number of drinks as a dependent variable, neither childhood adversity nor attachment anxiety nor attachment avoidance nor psychological
distress was significant. Neither attachment anxiety, nor attachment avoidance, nor psychological distress mediated between childhood adversity and number of drinks.

c) Moderated double mediation analysis: investigating sex as a moderator between attachment insecurity and harmful drinking in the double mediation relationship (Figure 3-7)

![Diagram](image)

Figure 3-7. Moderated double mediation mode investigating sex as a moderator between attachment insecurity and number of drinks.
Table 3-11. The effects of childhood adversity, attachment anxiety (mediator 1) attachment avoidance (mediator 2) and sex (moderator) on number of drinks.

<table>
<thead>
<tr>
<th>Regression Model on Number of Drinks</th>
<th>Coefficient</th>
<th>SE</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of childhood adversity on number of drinks</td>
<td>-.93</td>
<td>.67</td>
<td>-1.39</td>
<td>.17</td>
</tr>
<tr>
<td>Effect of attachment anxiety on number of drinks</td>
<td>2.90</td>
<td>1.31</td>
<td>2.22</td>
<td>.03</td>
</tr>
<tr>
<td>Effect of attachment avoidance on number of drinks</td>
<td>.31</td>
<td>1.31</td>
<td>.23</td>
<td>.82</td>
</tr>
<tr>
<td>Effect of sex on number of drinks</td>
<td>9.60</td>
<td>3.04</td>
<td>3.15</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Effect of attachment anxiety x sex on number of drinks</td>
<td>-.40</td>
<td>2.95</td>
<td>-.14</td>
<td>.89</td>
</tr>
<tr>
<td>Effect of attachment avoidance x sex on number of drinks</td>
<td>-1.87</td>
<td>2.73</td>
<td>-.68</td>
<td>.50</td>
</tr>
</tbody>
</table>

In the regression with number of drinks as a dependent variable, attachment anxiety and sex were significant (Table 3-11). The interactions were not significant. The conditional indirect effect of childhood adversity on number of drinks through attachment anxiety was significant in both women (B=.16, SE=.06, 95% CI: .06 - .31) and men (B=.19, SE=.00, 95% CI: .08 - .38). In this case, sex was not a moderator.

3.4 Discussion

The purpose of this study was to examine the relationships among childhood adversity, attachment insecurity and alcohol use, as indicated by harmful drinking and number of drinks consumed, in men and women. Our results suggest that attachment anxiety, but not attachment avoidance, may mediate between childhood adversity and harmful drinking. We find that attachment anxiety is a potential mediator in the association between attachment insecurity and harmful drinking in both men and women. In a post hoc analysis we found that psychological distress may also act as a mediator between childhood adversity and harmful drinking, independent of the role of attachment anxiety. These interpersonal variables, childhood adversity and attachment anxiety, may influence harmful drinking in both men and women. The results
were similar when we studied number of drinks as the dependent variable. Finally, this was the first study to investigate sex differences in the relationship between attachment insecurity and harmful drinking and our findings did not support sex moderating this mediation relationship.

This study indicates that attachment anxiety may play an important role in harmful drinking as a mechanism that links childhood adversity and harmful drinking. These results may aid in the development and design novel therapies in two ways. First, these results provide a rationale to study how alcohol abuse interventions that increase attachment security, such as interpersonal psychotherapy or cognitive behavioral therapy (Kirchmann et al., 2012; Travis, Bliwise, & Binder, 2001), may influence alcohol consumption. Second, interventions can be personalized according to attachment style. People with attachment anxiety are more likely to rely on others for support. They tend to have a higher desire for acceptance and to please partners (Mikulincer, 1998). Perhaps people with high attachment anxiety may benefit from therapies that incorporate a relational component, such as counseling, which may provide a strong sense of alliance.

Attachment theory provides a novel framework to explain the relationship between childhood adversity and harmful drinking. Indeed, attachment insecurity is associated with several factors that are related to alcohol use. First, attachment theory describes support-seeking in close relationships. From infancy through adolescence and adulthood, people use relationships with attachment figures to feel secure (Bowlby, 1969). When an attachment figure acts as a “secure base,” it facilitates a person’s ability to explore comfortably, by knowing that he or she is able to come back to a safe and supportive environment if necessary. Thus, attachment security is associated with a felt sense of security. Through experiences of abuse and neglect, children learn that they cannot obtain support from their caregivers. In adulthood, people with high attachment anxiety are more likely to doubt the support of their partners (Davila & Kashy, 2009). It is possible that if a person does not get a sense of security from relationships, he or she may resort to other resources including consuming alcohol.

A second influence of attachment insecurity is that it is strongly related to affect regulation. The presence of very high levels of attachment insecurity implies a relative deficit in affect regulation through internal processes that are developed in secure early attachments (Kobak et al., 1993; Maunder & Hunter, 2001; Mikulincer, 1998). As a result, individuals with high attachment insecurity may drink alcohol, in part, to regulate dysphoric emotions. Food or substances, when
consumed in order to reduce feelings of insecurity, have been called “external regulators of affection” (Maunder & Hunter, 2001). In essence, high attachment insecurity may lead to using substances instead of relationships to regulate feelings. Bidirectional effects are also possible, since hazardous drinking may have consequences that challenge enduring relationships and increase attachment insecurity.

Third, attachment insecurity is associated with psychological distress (anxiety and depression). People with high attachment insecurity are more likely to report symptoms of anxiety and depressions (Bifulco et al., 2002). Furthermore, these symptoms are linked to alcohol consumption although the direction of this relationship is unclear (Fergusson et al., 2009; Kuo et al., 2006). Because attachment insecurity and state psychological distress are highly correlated, it could be questioned if measures of attachment anxiety and state anxiety (a component of psychological distress) are essentially measuring the same phenomena. Our post-hoc analysis of the triple mediation relationship indicated that attachment anxiety and psychological distress each act as mediators between childhood adversity and harmful drinking. This suggests that attachment anxiety and psychological distress act in independent pathways between childhood adversity and harmful drinking.

A previous study utilized the same data that was collected in the ACE study to assess the associations between childhood adversity, psychological distress and adult alcohol problems. In this study, psychological distress mediated between specific adversities (emotional abuse, emotional neglect, physical abuse, and physical neglect, mental illness in the household, parental separation or divorce, sexual abuse and household use and adult alcohol problems in women. In men, psychological distress mediated between emotional neglect, physical abuse, household drug use, and sexual abuse in men (Strine, Dube, et al., 2012a). These results are similar to the results in this study, although we did not assess associations between individual adversities and alcohol consumption.

Contrary to our hypothesis, sex did not moderate the association between childhood adversity and hazardous drinking. Instead, attachment anxiety was a plausible mediator between childhood adversity and harmful drinking in both men and women.

Attachment insecurity is closely related to affect regulation. Children raised by parents who are relatively unresponsive or inconsistently responsive to the child’s cues develop deactivating
strategies or hyper-activating strategies to regulate negative affect. The goals of deactivating strategies are to avoid the frustration and distress caused by the unavailability of the attachment figure (parent) by not signaling need or seeking contact. When deactivating strategies are used in adulthood with an attachment figure (romantic partner), they are characterized by denying attachment needs, avoiding closeness and intimacy, maximizing emotional distance in relationships and striving for self-reliance. This is the pattern of attachment avoidance. On the other hand, the goals of a child’s hyper-activating strategies are to maximize opportunities for parental responsiveness by maintaining close proximity and amplifying signals of distress. When hyper-activating strategies are used in adulthood with an attachment figure (romantic partner), they are characterized by efforts to elicit a partner’s involvement, care, and support. These goals are aimed at minimizing physical and emotional distance from a partner (Mikulincer & Shaver, 2003). Overdependence in relationships is the result of perceived helplessness or incompetence in affect regulation triggering hyperactivating strategies (Mikulincer & Florian, 1998). This is the pattern of attachment anxiety.

Attachment anxiety is associated with exaggerated appraisal of threats, negative views of the self, and pessimistic beliefs about other people (Bartholomew & Horowitz, 1991; Mikulincer, 1995; Mikulincer & Florian, 1998). People with high attachment anxiety tend to overreact to stressful events with intense distress and to tend to ruminate (Mikulincer & Florian, 1998). In addition to this vulnerability to perceived threat in general, people with high attachment anxiety tend to be preoccupied with the threat of abandonment and so experience more interpersonal threats than those with lower attachment anxiety.

People with high attachment anxiety may use alcohol for several reasons. First, alcohol may be used to reduce distressing emotions (Conger, 1956; Pohorecky, 1991), perhaps from negative emotions that emerge from relationships. In addition, by temporarily reducing perceived relationship tensions, consuming alcohol may relieve vigilance and preoccupation and thus temporarily reduce perceived or actual interpersonal difficulties. Furthermore, attachment anxiety is associated with a desire for acceptance and proximity, which may make some individuals susceptible to the influence of a partner.

The relationship between attachment anxiety and alcohol use may be bidirectional. In one direction, people with high attachment anxiety may be more likely to adopt harmful drinking
patterns. At the same time, the consequences of harmful drinking may undermine self-esteem and efficacy, making it more difficult to feel secure within a close relationship. Furthermore, harmful drinking patterns are also likely to create tensions within romantic relationships. Partners of people with harmful drinking patterns may distance themselves from their partner or act in ways that are critical or rejecting, which in turn may reinforce hyper-activating strategies and attachment anxiety.

In this study, there were similar trends in the results between harmful drinking and number of alcoholic drinks. First, attachment anxiety a plausible mediator between childhood adversity and both alcohol consumption variables (hazardous drinking and number of drinks) even when adjusting for psychological distress in the double mediation model. Second, sex did not moderate between attachment insecurity and either alcohol use variables in the double mediation models. It is noteworthy, that the number of drinks and harmful drinking were strongly correlated. Indeed, the number of drinks consumed is a component of harmful drinking as measured by AUDIT. The AUDIT tool also surveys negative social consequences of alcohol consumption. This suggests that attachment anxiety not only mediates between childhood adversity and excessive alcohol use, but also between childhood adversity and the adverse consequences of alcohol use.

This study extends the literature by studying attachment insecurity in adults in a primary care setting. Primary care patients are more representative of the general population than high school and university students, who may differ with respect to both attachment and patterns of alcohol consumption. With respect to attachment, university students are in a period of transition in which attachment figures change from parents to close friends and romantic partners. Furthermore, university students are more likely to consume more alcohol than adults in other settings and to binge drink (Thomas, 2012). Furthermore, identifying and treating hazardous drinking is often initiated in primary care setting, and so the determinants of hazardous drinking in this population is of direct relevance. With respect to the representativeness of the sample, we note that the prevalence of current smoking and alcohol use disorder in our cohort (20%, 18%, respectively) is similar to that the prevalence in the Canadian population (17%, 14%) (Canadian Centre on Substance Abuse, 2004; Reid, Hammond, Burkhalter, & Ahmed, 2013). Furthermore, 13% of our cohort has experienced sexual abuse compared to 10% of the Canadian population. Therefore, on key variables, the sample of this study is similar to the general population. There is also striking similarity in the distribution of number of categories of adversity in our cohort to
that of the ACE Study in San Diego (Figure 3-8). In both our Toronto study and the San Diego study, about sixty percent of people endorsed one or more categories of adversity. Similarly, about twenty-five percent of people have been exposed to one category of childhood adversity. Furthermore, about 13% of people have experienced four or more categories of adversity.

Primary care patients are an important group to study because a family physician are often the first professional to identify and respond to harmful patterns of drinking (Statistics Canada, 2016).

Figure 3-8. The number of categories of childhood adversity and the prevalence of people in Toronto (Study 1) and San Diego (The ACE Study).

There are limitations to this study that must be recognized. First, the cross-sectional design does not allow any conclusions about causation. In particular, while the study provides important evidence that attachment anxiety may mediate between childhood adversity and adult alcohol consumption, longitudinal research is needed to confirm the causal nature of the relationships. Second, self-report surveys were used, which may result in over or under reporting. Childhood
adversity was not substantiated by other sources, such as court records. Third, the high socioeconomic background of our sample may limit generalizability. However, the prevalence of adversity and addiction in our sample and the general population is similar. In our study, we controlled for age, education, which we used as a proxy for socioeconomic status, and sex. However, there are numerous other confounders such as genetics, peer influence, and laws and policy, which influence alcohol use and have not been accounted for.

Our analyses support the plausibility of attachment anxiety as a mediator of the relationship between childhood adversity and harmful alcohol use in both men and women. Thus, these results suggest that considering attachment anxiety and its possible influence on alcohol consumption may contribute to the development of prevention and treatment strategies. While exposure to childhood adversity cannot be altered after the fact, attachment anxiety is a potential target for behavior modification or treatment personalization and may be especially relevant for people who have experienced childhood adversity. Our results suggest that an approach that takes into account the consequences of childhood adversity in both sexes deserves further study. Further investigation of the effect of attachment insecurity and the effect of romantic partners or other close confidantes on drinking behaviors may provide valuable information for improving treatment options.
Chapter 4
Sex differences in the relationships between childhood adversity, attachment insecurity and current smoking

4 Overview


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ABSTRACT

Background: Smoking behavior and smoking cessation are complex. Interpersonal factors such as childhood adversity are associated with smoking, especially in women. Identifying how and in whom these individual factors contribute to smoking behavior may support individualized smoking cessation strategies. Attachment insecurity (attachment avoidance and attachment anxiety) involves biological and psychological processes in close relationships and is associated with both childhood adversity, and in select populations, smoking. This study aims to identify an association between attachment insecurity and smoking in adults and to determine if attachment insecurity is a plausible mediator between childhood adversity and smoking.

Methods: In a cross-sectional survey, 348 primary care patients reported childhood adversity, attachment insecurity and smoking status. Statistical analyses were performed using regression and PRODCLIN.

Results: Sixty-one percent of participants had experienced childhood adversity and 20% were current smokers. In women, attachment anxiety was associated with both childhood adversity (p=.002) and current smoking (p=.04). The PRODCLIN test indicated that attachment anxiety may be a mediator between childhood adversity and current smoking in women (95% CI 0.003,
0.236). In men, current smoking was not associated with childhood adversity (p=.673) or attachment anxiety (p=.29). Attachment avoidance was not related to current smoking in men (p=.31) or in women (p=.16).

Conclusions: In women but not in men, attachment anxiety is associated with current smoking and may mediate the relationship between childhood adversity and current smoking. Childhood adversity and attachment anxiety may be factors to consider in the design of cessation strategies for women.

4.1 Introduction

The prevalence of smoking among adults has remained at about 20% over the last decade despite public health efforts to promote prevention and cessation (American Lung Association Research and Program Services Epidemiology and Statistics Unit, 2011). Successful cessation is associated with cognitive factors such as high self-efficacy and high motivation (Smit, Hoving, Schelleman-Offermans, West, & de Vries, 2014). Furthermore, a smoker’s social support can facilitate abstinence (Park, Tuiver, Schulz, & Campbell, 2004). On the other hand, a high degree of nicotine dependence (Killen, Fortmann, Kraemer, Varady, & Newman, 1992) and severe withdrawal increase the likelihood of relapse (West, Hajek, & Belcher, 1989). Relapse is also related to psychological variables such as depression (Boden, Fergusson, & Horwood, 2010) and stress (Cohen & Lichtenstein, 2013). While each of these determinants of relapse is targeted to some extent by current pharmacological, psychosocial and self-help approaches to smoking cessation, novel approaches to understanding smoking behaviour are still needed in order to help the 20% of adults who are unable to quit.

There is evidence that cessation strategies should also take sex into account. Population-based data show that the quit ratio is lower for women (55.2%) than for men (59.2%) (Rodu & Cole, 2007) and some biological strategies, particularly nicotine replacement therapy (Cepeda-Benito et al., 2004), are less effective in women. Furthermore, some psychosocial determinants of relapse are more applicable to women than men. For instance, women are more likely to be diagnosed with depression (Nakajima & al'Absi, 2012), to benefit from social support (Coppotelli & Orleans, 1985) and to have concerns about weight gain when trying to quit
smoking (Aubin et al., 2009). Therefore, understanding how sex differences in psychosocial factors affect smoking behavior may be important in developing personalized smoking cessation strategies.

In order to find new approaches, we focused on two interpersonal factors that have been independently associated with addictions, including smoking. These two factors, childhood adversity and attachment insecurity, are related to each other because exposure to adverse experiences in childhood is associated with a greater likelihood of attachment insecurity (Fowler, Allen, Oldham, & Frueh, 2013). While the association between childhood adversity and smoking may inform prevention strategies, childhood adversity cannot be altered after the fact. Identifying modifiable mediators is, therefore, essential, hence our focus on attachment insecurity. Importantly, if attachment insecurity mediates the relationship between childhood adversity and smoking, there would be rationale to explore therapeutic interventions that enhance feelings of security as an additional strategy for some smokers who are trying to quit. Both of these interpersonal factors have features that are sex-specific, which have not been explored in the context of smoking. A brief review will provide context for investigating these interpersonal influences on smoking.

Childhood adversity includes experiences of abuse, neglect and exposure to various types of household dysfunction. Unfortunately, childhood adversity is pervasive. For example, in a cohort of seventeen thousand participants from San Diego, 61% of the participants reported experiencing one or more categories of childhood adversity. In the same study, the prevalence of sexual abuse and physical abuse were twenty-one percent and twenty-eight percent, respectively (Dube et al., 2002). Furthermore, some of these exposures were sex-specific. In particular, approximately twenty-five percent of women reported sexual abuse during childhood compared to sixteen percent of men (Anda, Croft, Felitti, & Nordenberg, 1999).

Childhood adversity is related to adult behaviors that increase risk of disease. The Adverse Childhood Experiences (ACE) Study reported that the prevalence of current smoking, alcohol problems and drug use as well as cancer, heart disease and diabetes rose in a gradient from those with no exposure to those who had experienced one, two, three or four or more categories of childhood adversity. Furthermore, the relationship between childhood adversity and substance abuse is gendered. Childhood adversity is related to substance abuse more consistently in women
than in men (Widom et al., 2006; Widom, Weiler, & Cottler, 1999). Similarly, the ACE Study found that experiencing childhood adversity increased a woman’s odds of being a current smoker, but this relationship was not found in men (Strine, Edwards, et al., 2012b). Understanding the gendered nature of this relationship may be useful in the development of sex-specific strategies for cessation.

While there is evidence that childhood adversity is associated with smoking, the mechanisms that drive this relationship are not well understood. Attachment theory provides a new perspective that may provide new insight for personalized treatment for smokers who are trying to quit. In particular, attachment theory provides a schema to explain interpersonal processes which influence health behaviour and disease (Maunder & Hunter, 2008). Attachment insecurity can be described by referring to behaviours, attitudes and preferences reported by a person about his or her interactions with an “attachment figure”, which for adults is usually a romantic partner. Patterns of adult attachment are described with two dimensions of attachment insecurity. The first, attachment anxiety, is characterized by preoccupation with abandonment and separation, and is linked to proximity-seeking. The second, attachment avoidance, is characterized by devaluation of intimate relationships and a preference for emotional distance (Griffin & Bartholomew, 1994). While differences in attachment insecurity between sexes are modest, attachment avoidance is generally more common in men (Mickelson et al., 1997).

Attachment insecurity may have a substantial impact on smoking and smoking cessation rates because of its high prevalence (about 40% of the population has high attachment insecurity (Bakermans-Kranenburg & van IJzendoorn, 2009; Mickelson et al., 1997) ) and its association with a wide array of variables that may influence smoking. For example, attachment insecurity is related to adult psychopathology including mood, anxiety and conduct disorders (Mickelson et al., 1997). Furthermore, dimensions of adult attachment insecurity are associated with sleep disturbance, physical symptoms (Maunder, Hunter, & Lancee, 2011), subjective stress, and autonomic function (Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006). Adult attachment insecurity also acts as a mediator between childhood adversity and subsequent mental health problems (Bifulco et al., 2006; Sheinbaum et al., 2015; Sitko et al., 2014; Tasca et al., 2013) and moderates the relationship between childhood abuse and both disease activity and quality of life in inflammatory bowel disease (Caplan et al., 2014).
Attachment insecurity is also associated with harmful health behaviours such as alcohol consumption, drug use (Cooper et al., 1998) risky sexual behaviour, and smoking (Ahrens et al., 2012). With respect to smoking, previous studies have been inconsistent in terms of which dimension of insecurity, attachment anxiety or attachment avoidance, is more strongly related to smoking (Ahrens et al., 2012; Kassel et al., 2007). Furthermore, the cohorts studied were either college students or women only. To our knowledge, this question has not been studied in a mixed-gender adult population and sex differences have not been explored.

Attachment insecurity may be related to smoking, in part, because of its association with strategies used to cope with stress. People with high attachment avoidance downplay distress and typically don’t seek comfort from attachment figures (Phipps, Fairclough, & Mulhern, 1995). People with high attachment anxiety often exaggerate expressions of helplessness. People with high attachment insecurity in both dimensions (both attachment anxiety and attachment avoidance) typically focus coping on managing negative emotions rather than on problem-solving strategies (Phipps et al., 1995). Coping strategies are also gendered, in that women are more likely to adopt emotion-focused coping than men (Matud, 2004). Consequently, one process that may contribute to higher relapse in women is the use of smoking to regulate negative emotions (Pang & Leventhal, 2013; Perkins & Karelitz, 2015). Despite knowledge that coping and stress influence smoking, cessation strategies that focus on these variables have not been found effective or beneficial (Hajek et al., 2013).

Studying how attachment insecurity relates to smoking may allow for a more comprehensive model of smoking that could guide changes in treatment practices. In particular, if attachment insecurity is related to smoking cessation this could allow treatment to be personalized. For instance, people with high attachment anxiety who are trying to quit might benefit from standard care supplemented with social support. In contrast, people with high attachment avoidance might benefit more readily from interventions that emphasize self-management or medication to maximize their sense of autonomy.

People who have experienced childhood adversity are more likely to have high attachment insecurity (Fowler et al., 2013). Children who are exposed to negative experiences may develop more anxiety about relationships as well as strategies to deal with actual or anticipated relationship threats. In particular, children may adopt the strategies associated with attachment
insecurity in response to adversity within attachment relationships. For instance, children who have experienced adversity become hyper-vigilant about interpersonal danger (attachment anxiety), or they may suppress expressions of distress (attachment avoidance). These strategies are reinforced in childhood and may be continued in adulthood to deal with stressful situations.

Although childhood adversity and attachment insecurity have been studied separately as correlates of smoking, they have not been studied together. By studying childhood adversity and attachment insecurity together, we aim to develop a more comprehensive model of smoking that includes modifiable mediators of the effects of childhood adversity which may be new targets for intervention. We hypothesize that 1) attachment insecurity is related to smoking in both sexes, 2) the relationships between childhood adversity, attachment insecurity and smoking are gendered, and 3) attachment insecurity mediates the relationship between childhood adversity and smoking.

4.2 Methods

4.2.1 Design and recruitment

This cross-sectional study surveyed participants’ adverse childhood experiences, attachment insecurity, and smoking and alcohol consumption behaviour. Participants were recruited from an outpatient family medicine clinic at a teaching hospital in Toronto irrespective of their smoking status or whether they were interested in quitting. Patients were approached consecutively in the waiting room after checking in for their appointment. Screening ensured that participants were between the ages of 25 to 65 years old and had sufficient English skills to complete the survey. Because our intent was to test the relationship between childhood adversity or attachment insecurity and smoking, we excluded women who were pregnant and breastfeeding because smoking and drinking were expected to be uncommon in this group regardless of their use of substances over the long term. Including these women could lead to the type-II error of falsely identifying smokers as non-smokers. The Mount Sinai Hospital Research Ethics Board approved this study.

4.2.2 Measures

Smoking behavior was studied with questions from the Centre for Addiction and Mental Health (CAMH) Monitor Survey. Since 1996, the CAMH Monitor has been used to survey 2000-3000
Ontarians per year regarding their substance use and mental health (Ialomiteanu, Adlaf, Hamilton, & Mann, 2012). These two questions, which inquire about smoking status, are consistent with the definitions used in other national Health Canada surveys that collect data on tobacco use. The first question, “Have you smoked at least 100 cigarettes in your life?” denotes whether the participant has “ever smoked” (never vs. ever). We refer to this population as those who “ever smoked”. If the participant ever smoked, they are asked the second question, “At the present time, do you smoke cigarettes?” The second question indicates the participant’s current smoking status (former vs. current).

Childhood adversity was measured using seventeen yes/no questions from the Adverse Childhood Experiences (ACE) Survey. Ten categories make up a scale that includes three categories of abuse (physical, emotional, and sexual), two of neglect (material and emotional) and five of household dysfunction (household member with substance abuse, mental illness, parental separation/divorce, incarcerated, mother treated violently). A total adversity score ranges from 0 (none) to 10 (highest) categories of adversity. Publications utilizing this survey have showed that as the ACE score increased, so did the prevalence of obesity, ischemic heart disease, cancer, stroke, emphysema, and diabetes (Felitti et al., 1998). (Median score in this study=1, IQR=0-2)

Attachment insecurity was measured by the Experiences in Close Relationships-Short Form (ECR-S). This is a 12-item survey abbreviated from the 36-item ECR-R. This tool yields scores for two scalar dimensions of attachment insecurity, attachment anxiety and attachment avoidance. The ECR-S was found to have similar psychometric properties (internal consistency, test-retest reliability, factor structure and construct validity) as the ECR-R (Wei et al., 2007). The attachment anxiety subscale consisted of 6 items (M=3.2, SD=1.3, $\alpha=.72$ in this study), and the attachment avoidance subscale consisted of 6 items (M=2.3, SD=1.2, $\alpha=.78$ in this study). This tool was chosen for its psychometric properties and convenient length. Participants were asked to report how they generally feel in romantic relationships and did not need to be in a current relationship to complete this survey.
4.2.3 Analysis

The total adversity score was divided into 5 ordinal groups for people who have experienced none, one, two, three, four or more categories of childhood adversity, as was done in the ACE Study. This variable was used in regression analyses.

The analysis was conducted in three stages. First, childhood adversity, attachment anxiety, attachment avoidance, and the smoking variables were regressed on possible covariates (sex, education, and self-rated health). We found that none of the covariates were significantly related to all three variables in the mediation triangle and so the covariates were subsequently excluded from analysis.

Second, regression analyses were conducted to study the bivariate relationships between childhood adversity, attachment insecurity and smoking. Step 1 tested if experiencing childhood adversity was significantly associated with attachment insecurity using linear regression because the dependent variable is continuous. Step 2 tested if the smoking variable was significantly associated with attachment insecurity. Logistic regression was used because the dependent variable (smoking) is categorical (Iacobucci, 2012). These regressions were repeated with attachment insecurity as a mediator (first attachment anxiety, then attachment avoidance), and then with different dependent variables (first ever smoking, then current smoking).

Third, PRODCLIN (http://www.public.asu.edu/~davidpm/ripl/Prodclin/) was used to test the indirect effect of the independent variable (childhood adversity) on the dependent variable (ever smoking or current smoking) through the mediator (attachment anxiety or attachment avoidance) in each sex (MacKinnon, Fritz, Williams, & Lockwood, 2007). The PRODCLIN test was used when both the relationship between the independent variable and mediator (Step 1) as well as the relationship between the mediator and the dependent variable (Step 2) were significant. PROCLIN was chosen over the SOBEL test because our variables were not normally distributed (Fritz & MacKinnon, 2007). In order to determine if attachment insecurity mediates a relationship between childhood adversity and smoking cessation, the latter mediation only included individuals who had smoked more than 100 cigarettes during their lifetime (ever smokers). In PRODCLIN, if the confidence interval of the indirect effect does not cross zero, then there is a mediation relationship. The study design does not allow us to conclude mediation, but will indicate the plausibility of such relationship.
4.3 Results

4.3.1 Study Population

A total of 479 people were approached in the clinic. Of these, 65 did not meet the inclusion criteria and 66 declined to participate. This left 348 people who consented to participate in the study (recruitment rate 84%). The study population included 209 (60%) women and 139 (40%) men. Table 4-1 presents the characteristics of participants. The majority of participants identified themselves as white (72%), had completed post-secondary education (70%), and reported themselves to be in very good to excellent health (61%). Almost half (49%) of the cohort had smoked more than 100 cigarettes in their lifetime and about 20% were currently smoking.

Table 4-1. Characteristics of Participants

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, mean (S.D)</strong></td>
<td>44.6 (10.9)</td>
<td>45.4 (10.3)</td>
<td>44.0 (11.3)</td>
<td>.25</td>
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<tr>
<td><strong>Education, N (%)</strong></td>
<td>N=348</td>
<td>N=139</td>
<td>N=209</td>
<td>.42</td>
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<tr>
<td>Up to High School Degree</td>
<td>39 (11.2)</td>
<td>14 (10.1)</td>
<td>25 (12.0)</td>
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<tr>
<td>Any Post-Secondary Degree</td>
<td>75 (21.6)</td>
<td>29 (20.9)</td>
<td>46 (22.0)</td>
<td></td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>131 (37.6)</td>
<td>48 (34.5)</td>
<td>83 (39.7)</td>
<td></td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>103 (29.6)</td>
<td>48 (34.5)</td>
<td>55 (26.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Self-rated Health, N (%)</strong></td>
<td>N=347</td>
<td>N=139</td>
<td>N=208</td>
<td>.19</td>
</tr>
<tr>
<td>Very good-Excellent</td>
<td>211 (60.6)</td>
<td>78 (56.1)</td>
<td>133 (63.9)</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>104 (29.9)</td>
<td>44 (31.7)</td>
<td>60 (28.7)</td>
<td></td>
</tr>
<tr>
<td>Poor-Fair</td>
<td>32 (9.2)</td>
<td>17 (12.2)</td>
<td>15 (7.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnic Background, N (%)</strong></td>
<td>N=348</td>
<td>N=139</td>
<td>N=209</td>
<td>.01</td>
</tr>
<tr>
<td>White</td>
<td>252 (72.4)</td>
<td>112 (80.6)</td>
<td>140 (67.0)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>47 (13.5)</td>
<td>11 (7.9)</td>
<td>36 (17.2)</td>
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<tr>
<td>Other</td>
<td>49 (14.1)</td>
<td>16 (11.5)</td>
<td>33 (15.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Reason for appointment, N (%)</strong></td>
<td>N=348</td>
<td>N=139</td>
<td>N=209</td>
<td>.40</td>
</tr>
<tr>
<td>Routine</td>
<td>116 (33.3)</td>
<td>43 (30.9)</td>
<td>73 (34.9)</td>
<td></td>
</tr>
<tr>
<td>Chronic</td>
<td>77 (22.1)</td>
<td>37 (26.6)</td>
<td>40 (19.1)</td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>80 (23.0)</td>
<td>30 (21.6)</td>
<td>50 (23.9)</td>
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<td>Other</td>
<td>73 (21.0)</td>
<td>29 (20.9)</td>
<td>44 (21.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Smoking Status, N (%)</strong></td>
<td>N=348</td>
<td>N=139</td>
<td>N=209</td>
<td>.09</td>
</tr>
<tr>
<td>Never smoked</td>
<td>179 (51.4)</td>
<td>65 (46.8)</td>
<td>114 (54.5)</td>
<td></td>
</tr>
<tr>
<td>Former Smoker</td>
<td>101 (29.0)</td>
<td>39 (28.1)</td>
<td>62 (29.7)</td>
<td></td>
</tr>
<tr>
<td>Current Smoker</td>
<td>68 (19.5)</td>
<td>35 (25.2)</td>
<td>33 (15.8)</td>
<td></td>
</tr>
</tbody>
</table>
Table 4-2. Prevalence (N, %) of childhood adversity by sex

<table>
<thead>
<tr>
<th>Categories of Adversity</th>
<th>Total (N)</th>
<th>Total (N, %)</th>
<th>Men (N)</th>
<th>Men (N, %)</th>
<th>95% CI (%)</th>
<th>Women (N)</th>
<th>Women (N, %)</th>
<th>95% CI (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional Abuse</td>
<td>344</td>
<td>82 (23.6)</td>
<td>138</td>
<td>27 (19.4)</td>
<td>15.2-23.6</td>
<td>206</td>
<td>55 (26.3)</td>
<td>21.7-31.0</td>
<td>0.14</td>
</tr>
<tr>
<td>Physical Abuse</td>
<td>342</td>
<td>57 (16.4)</td>
<td>138</td>
<td>18 (12.9)</td>
<td>9.4-16.5</td>
<td>204</td>
<td>39 (18.7)</td>
<td>14.6-22.8</td>
<td>0.16</td>
</tr>
<tr>
<td>Sexual Abuse</td>
<td>344</td>
<td>43 (12.4)</td>
<td>138</td>
<td>12 (8.6)</td>
<td>5.6-11.6</td>
<td>206</td>
<td>31 (14.8)</td>
<td>11.1-18.6</td>
<td>0.09</td>
</tr>
<tr>
<td>Emotional Neglect</td>
<td>346</td>
<td>66 (19.0)</td>
<td>138</td>
<td>23 (16.5)</td>
<td>12.6-20.4</td>
<td>208</td>
<td>43 (20.6)</td>
<td>16.3-24.9</td>
<td>0.35</td>
</tr>
<tr>
<td>Material Neglect</td>
<td>345</td>
<td>18 (5.2)</td>
<td>138</td>
<td>8 (5.8)</td>
<td>3.3-8.3</td>
<td>207</td>
<td>10 (4.8)</td>
<td>2.5-7.1</td>
<td>0.69</td>
</tr>
<tr>
<td>Parents Divorced</td>
<td>344</td>
<td>85 (24.4)</td>
<td>138</td>
<td>39 (28.1)</td>
<td>23.4-32.9</td>
<td>206</td>
<td>46 (22.0)</td>
<td>17.6-26.4</td>
<td>0.20</td>
</tr>
<tr>
<td>Violence against mother</td>
<td>335</td>
<td>31 (8.9)</td>
<td>135</td>
<td>9 (6.5)</td>
<td>3.9-9.1</td>
<td>200</td>
<td>22 (10.5)</td>
<td>7.2-13.8</td>
<td>0.19</td>
</tr>
<tr>
<td>Household member: substance abuse problems</td>
<td>345</td>
<td>78 (22.4)</td>
<td>137</td>
<td>27 (19.4)</td>
<td>15.2-23.6</td>
<td>208</td>
<td>51 (24.4)</td>
<td>19.9-28.9</td>
<td>0.28</td>
</tr>
<tr>
<td>Household member: mental illness or suicide attempt</td>
<td>344</td>
<td>85 (24.4)</td>
<td>137</td>
<td>32 (23.0)</td>
<td>18.6-27.5</td>
<td>207</td>
<td>53 (25.4)</td>
<td>20.8-30.0</td>
<td>0.62</td>
</tr>
<tr>
<td>Household member: incarcerated</td>
<td>344</td>
<td>10 (2.9)</td>
<td>137</td>
<td>6 (4.3)</td>
<td>2.2-6.4</td>
<td>207</td>
<td>4 (1.9)</td>
<td>0.5-3.3</td>
<td>0.19</td>
</tr>
<tr>
<td>Any Category of Adversity</td>
<td>348</td>
<td>210 (60.3)</td>
<td>139</td>
<td>81 (58.3)</td>
<td>53.1-63.5</td>
<td>209</td>
<td>129 (61.7)</td>
<td>56.6-66.8</td>
<td>0.52</td>
</tr>
</tbody>
</table>
4.3.2 Bivariate relationships

Figure 4-1 depicts a summary of the regression coefficients for the bivariate relationships between childhood adversity, attachment insecurity and ever smoking. In both men and women, childhood adversity was related to ever smoking [men (B=.25, p=.049), women (B=.20, p=.041)]. Childhood adversity was associated with both dimensions of attachment insecurity in both sexes. Ever smoking was not associated with attachment anxiety [men (B=.28, p=.07), women (B=.12, p=.24)] or attachment avoidance [men (B=.08, p=.54), women (B=.12, p=.37)] in either sex.

Figure 4-1. Summary of bivariate relationships: childhood adversity, attachment insecurity, and ever smoking. Neither attachment anxiety nor attachment avoidance were associated with ever smoking in men or women. Childhood adversity was associated with ever smoking in both men and women.
Figure 4-2. Summary of bivariate relationships: childhood adversity, attachment insecurity, and current smoking. Neither childhood adversity nor attachment insecurity were associated with current smoking in men. In women, childhood adversity and attachment anxiety were associated with current smoking.
4.3.3 Mediation Analysis

We tested for the plausibility of a mediation relationship between childhood adversity, attachment anxiety, and current smoking in women. Attachment anxiety had a significant mediation effect between childhood adversity and current smoking in women (mean=.1, SD=0.06, 95% CI 0.003, 0.236). No mediation test was performed in men as the conditions for PRODCLIN were not satisfied.

4.4 Discussion

The overall goal of this work was to identify interpersonal factors that are associated with smoking behavior in adult men and women. First, we found that attachment anxiety is associated with current smoking in women. Second, the results support the plausibility of attachment anxiety as a mediator between childhood adversity and current smoking in women. Ultimately, we hope to identify modifiable factors that contribute to smoking behavior that may be used in the development of individualized smoking cessation strategies. These results provide rationale for evaluating cessation strategies that take into account childhood adversity and attachment insecurity for smokers, especially women, who are still having problems quitting despite utilizing conventional methods. These data build upon the current literature describing childhood adversity, attachment insecurity and smoking behavior.

Exposure to childhood adversity was associated with ever smoking in both men and women. Anda et al. found that childhood adversity was related to early smoking initiation but did not investigate sex differences (Anda et al., 1999). Contrary to our hypothesis, neither dimension of attachment insecurity was associated with ever smoking (starting to smoke). Our results suggest that the effect of childhood adversity on the risk of starting to smoke is mediated through some path other than attachment insecurity.

These data add to the developing body of evidence that explores the potential association between attachment insecurity and current smoking. Two studies in specific populations and using alternative instruments to measure attachment insecurity suggest that both attachment anxiety and attachment avoidance are associated with smoking. Ahrens et al. studied only adult women when they reported that attachment avoidance was associated with smoking (Ahrens et al., 2012). In another study with college students, attachment anxiety, in contrast, was found to
be related to smoking (Kassel et al., 2007). These studies focused on different cohorts and measured attachment dimensions using different tools making the results difficult to interpret and compare. In an adult population using the ECR-S, our study found that childhood adversity is associated with attachment anxiety in all participants, but amongst ever-smokers, this relationship was only found in women. These results suggest that in men, childhood adversity and attachment anxiety manifest in some fashion other than current smoking.

Our analysis supported the plausibility of attachment anxiety as a partial mediator of the relationship between childhood adversity and current smoking in women. While exposure to childhood adversity cannot be altered after the fact, attachment anxiety is a potential target for smoking cessation, and may be especially relevant for those who have experienced childhood adversity. Regarding other possible mediators, childhood adversity may also lead to mood and anxiety disorders, which may contribute to relapse. Our results suggest that an approach, which primes clinicians to the consequences of childhood adversity in both sexes, deserves further study.

Attachment anxiety may be related to several determinants of current smoking in women. Women with high attachment anxiety are more likely to doubt the availability of support (Davila & Kashy, 2009). People with high attachment anxiety may actually lack support or may perceive insufficient support even when it is present. In either case, their appraisal of this lack of support may hinder quit attempts because it has been found that the perception of general support and partner support is correlated with successful cessation (Mermelstein, Cohen, Lichtenstein, Baer, & Kamarck, 1986). High attachment anxiety is also associated with body dissatisfaction and disordered eating, which is more common in women (O'Shaughnessy & Dallos, 2009). Women who are concerned about weight gain are more likely to continue to smoke to maintain their weight. Finally, high attachment insecurity is associated with depression (Bifulco et al., 2002). Depression may interfere with the motivation required to adhere to a smoking cessation plan, which may interfere with their attempt to quit.

There are several limitations to this study. A cross-sectional study cannot assess causation between variables. Therefore, our study demonstrates the plausibility of a mediation relationship, but cannot test if mediation actually occurs. Further prospective testing is warranted. Retrospective measures of childhood adversity may result in under or over reporting of...
experiences. Self-report surveys may underestimate the prevalence of childhood adversity, although this is not thought to invalidate their findings (Hardt & Rutter, 2004). Furthermore, smoking behaviour is complex and multi-factorial. We had limited measures of smoking available for analysis and thus our results may be restricted to these measures. We were able to control for education, which we used as a proxy for socioeconomic status, self-rated health and sex, but there are other factors that influence consumption such as depression, genetics, and culture.

The ability to detect relations may have been limited due to a lack of power and relationships not detected in this study should not be ruled out. In particular, the differences in results for men and women may have resulted from a lack of power to detect the relationships in men (40% of population) rather than from the actual sex differences. Nonetheless, in this initial study of mediation, significant relationships between childhood adversity, attachment anxiety and current smoking were detected in women and studies in a larger sample may yield further insight.

The population we surveyed is of higher socioeconomic status and education than the general Canadian population. As such, the results may not be generalizable. Nonetheless, the prevalence of starting smoking and continuing to smoke of this cohort (47% and 19%, respectively) were similar to the Canadian Tobacco Use Monitoring Survey, 2009, (44% and 18%, respectively) (Reid et al., 2013). In addition, the overall prevalence of childhood adversity was similar to what was found in large populations such as the ACE study. This cohort, while it does not represent the Canadian population, does represent a population that presents to a primary care healthcare setting, and in whom there is an opportunity to intervene.

How and in what way the involvement of an attachment figure may influence smoking behavior is not known. Improving cessation therapies for those with high attachment insecurity is contingent on investigating the effect of attachment insecurity on smoking behaviors and elucidating whether the presence of an attachment figure modifies these behaviors. Further studies will allow us to clarify how attachment anxiety influences people who are trying to quit smoking.
4.5 Conclusion

There appear to be sex differences in the association between attachment anxiety and current smoking. Furthermore, attachment anxiety may mediate the relationship between childhood adversity and current smoking in women but not in men. Our results suggest that childhood adversity and attachment anxiety may be influences to consider in the design of cessation approaches for women.
Chapter 5
A photo of an attachment figure decreases craving in smokers

Le, T.L., George, T. P, Levitan, R.D., Mann, R. E., & Maunder, R.G. (2017). A Photo Of An Attachment Figure Decreases Craving in Smokers. Under Preparation.

5 Overview

ABSTRACT

Background: Craving is a central component of nicotine addiction. Conditioning theory explains why craving increases in response to stimuli such as cigarette cues and smoking-associated environments or people. Attachment theory may explain other influences on craving. This study aimed to test the effects of cigarette cues on craving and affect, and of an attachment figure photo on these two variables. We also compared the effects sizes of these cues.

Methods: Experiments were conducted in 38 smokers (29 men). Participants were exposed to cigarette cues and to photos of people. Changes in craving and affect were measured in each experiment.

Results: When exposed to cigarette cues, 61% participants reported increased craving (Neutral cue mean = 46.6 (SD 28.8), Cigarette cue mean = 61.1 (SD 29.4)), t(37)= 3.99, p<.001). When exposed to an attachment figure photo, 56% participants reported decreased craving (Neutral photo = 50.9 (SD 29.8), Attachment figure photo = 38.2 (SD 31.6), t(35)= -2.661, p=0.01). The effect sizes for cigarette cues (d=.50) and an attachment figure photo (d=.42) were similar. Cigarette cue reactivity and attachment figure smoking status did not influence responses to photo exposures.

Conclusions: A photo of an attachment figure decreases craving and the size of the effect is comparable to the increase caused by cigarette cues, but in the opposite direction. Attachment relationships may play a role in the determinants of smoking.
5.1 Introduction

Craving, the “desire to use a drug,” is a central feature of nicotine addiction that significantly affects success in quitting smoking (Sayette et al., 2000). Many factors increase craving in smokers including greater nicotine dependence (Domino, 1998; Jarvik, Madsen, & Olmstead, 2000), negative affect (Collins et al., 2011; Conklin, 2006), stress (Buchmann et al., 2010) and smoking cues (Carter et al., 2006). Both pharmacological and behavioural interventions are used to reduce craving (George & O’Malley, 2004; Lancaster, Stead, & Silagy, 2000; Stead, 2012). New approaches to understanding and reducing craving may contribute to further improvements in smoking cessation as stronger craving has been associated to a higher likelihood of relapse (Killen & Fortmann, 1997).

Conditioning theory has been used to explain some determinants of craving and how they can be manipulated. In particular, increased craving in response to smoking-related stimuli (“cues”) is thought to develop via conditioning that results from repeated pairing of these stimuli with smoking, or possibly with symptoms of withdrawal (Niaura et al., 1988). In cue reactivity research, smokers are exposed in the laboratory to stimuli that are associated with smoking, such as the sight or smell of cigarettes. These cues reliably elicit craving from approximately 50% of smokers (Carter & Tiffany, 1999). The majority of cue reactivity research focuses on cues that are directly associated with smoking behaviour (“proximal cues”), such as cigarettes (Carter et al., 2006; Niaura et al., 1998; Shiffman et al., 2013). In these studies, seeing photos of cigarettes and lighters increases craving more than occurs when seeing neutral cues (Shiffman et al., 2013). Conditioning theory has been important because it suggests ways to extinguish the effects of conditioned cues, thus potentially reducing exposure to stimuli that amplify craving (“cue-exposure” treatments). A review by Conklin et al. found that, unfortunately, the evidence for the effectiveness of cue-exposure treatments is inconsistent (Conklin & Tiffany, 2002). Furthermore, Shiffman criticized cue reactivity research for being too narrowly focused on the cigarette itself (Shiffman, 2009).

More recently, “distal cues” have been studied, such as environments in which smokers smoke. When participants were exposed to photos of places in which they would usually smoke (e.g. a bar) they would report more craving than when they saw photos of places where would not usually smoke (e.g. a dental office) (Conklin et al., 2008). Again, these cues could be
personalized, such that photos of actual locations where a participant smoked would elicit more craving than generic stock photos of similar settings (Conklin et al., 2010). Conklin found that people may also act as cues to smoke. When participants were exposed to photos of people around whom they usually smoke (e.g. a friend), they reported more craving than when they were exposed to photos of people around whom they do not usually smoke (e.g. their priest). Conklin’s work also highlights a novel finding, that exposure to photos of people around whom a subject does not smoke act in an inhibitory manner, to decrease craving (Conklin et al., 2013). The authors suggest conditioned learning as one possible mechanism to understand these relationships.

An alternative theoretical approach to understanding how people cues relate to craving is based on attachment theory (Maunder & Hunter, 2001; 2008). Attachment theory is a well-established interpersonal theory, but it has infrequently been applied to smoking (Ahrens et al., 2012; Kassel et al., 2007; Le et al., 2016) and never to craving. Because attachment is a developmental theory, adult attachment is easiest to understand as an extension of infant attachment. An attachment bond occurs between an infant and the person who parents him or her (“attachment figure”) and serves to regulate feelings of security or insecurity at times of threat or stress (Bowlby, 1969). Repeated interactions between the infant and attachment figure lead the child to develop interpersonal expectations, and preferred behavioural responses to distressing situations. An attachment figure who is sufficiently responsive, protective and warm fosters a secure pattern of attachment, in which interpersonal attitudes and preferences are flexible and distress is well-regulated. Less effective parent-child interactions can lead to insecure patterns of attachment (Weinfield, Sroufe, Sroufe, Egeland, & Carlson, 2008).

There is substantial continuity between infant or childhood patterns of attachment and those found in adulthood, where attachment figures are usually committed romantic partners and attachment bonds are reciprocal (Waters, Merrick, Treboux, Crowell, & Albersheim, 2000b). In adults, patterns of attachment are often described and measured with two dimensions of attachment insecurity (Ravitz et al., 2010). The first, attachment anxiety, is characterized by concern about abandonment or separation and amplification of expressions of distress. People with high attachment anxiety prefer to be close and intimate with a partner and desire support. The second dimension, attachment avoidance, is characterized by a relative aversion to very close relationships and suppression of expressions of distress. People with high attachment
avoidance prefer emotional distance in relationships and consider themselves self-reliant. These patterns have trait-like stability. High scores on either dimension indicate attachment insecurity.

Attachment insecurity, as a trait, may be related to smoking. In high school and college students, for example, attachment insecurity is associated with addictive behaviours, including current smoking, alcohol consumption and recreational drug use (Brennan & Shaver, 1995; Cooper et al., 1998; Kassel et al., 2007; McNally et al., 2003). In adult women, attachment avoidance, but not anxiety was related to current smoking (Ahrens et al., 2012). In our own research, we found that attachment anxiety was associated with current smoking in female primary care patients, and that in these women attachment anxiety mediated the relationship between childhood adversity and current smoking (Le et al., 2016).

The influence of attachment phenomena on distress and health outcomes is not fully described by trait-like patterns of security or insecurity, however, because attachment relationships are dynamic. Consistent with the developmental role of attachment figures as regulators of affect, in adult attachment relationships the presence or absence of an attachment figure influences subjective states. In order to understand how the presence of an attachment figure influences subjective states, it is important to clarify which persons can serve as an attachment figure for an adult. Zeifman and Hazan indicate that adult attachment figures serve three functions (Hazan & Zeifman, 1994). First, an attachment figure acts as a “safe haven”. That is, when threatened or distressed, an adult returns to his or her attachment figure to seek comfort and safety. Second, an attachment figure acts as a “secure base” from which a person can confidently explore his or her environment. Finally, an attachment figure is someone to whom a person prefers to be physically close. Since these functions are somewhat independent of each other (Fraley & Davis, 1997), Hazan and Zeifman suggest that a person who serves all three functions is a “full-blown attachment figure” (Hazan & Zeifman, 1994). Attachment figures are loosely thought of as romantic partners, which is often but not always the case. Sometimes partners do not fulfill all three functions of an attachment figure. For instance, young adults with partners may cite others, such as parents, as serving some attachment functions (Fraley & Davis, 1997).

Studying smoking from an attachment-informed perspective may provide a new approach. For example, while social support, in general, is reported to facilitate smoking cessation (May & West, 2000; Mermelstein et al., 1986; Murray, Johnston, Dolce, Lee, & O'Hara, 1995), a
Cochrane review of randomized controlled trials of interventions to enhance partner support for smokers in cessation programs was unable to detect an increase in quit rates (Park et al., 2014). Attachment theory would argue that the effectiveness of social support may depend on whether or not it occurs in the context of an attachment relationship, and may depend on the attachment security or insecurity of the person receiving support (Stroebe, Stroebe, Abakoumkin, & Schut, 1996a). Furthermore, attachment figures may indirectly influence smoking by influencing variables that are proximal to smoking, such as negative affect. In general, the presence of an attachment figure decreases negative affect. Tired, ill or distressed children are likely to be soothed by the presence of a primary caregiver (Heinicke & Westheimer, 1966). Similarly, in experiments on adults the presence of a partner during a stressful experience alleviates distress (Allen et al., 1991; Edens et al., 1992; Kamarck et al., 1990). The evidence that an attachment figure increases positive affect is less consistent (Gerstel & Gross, 1984). Whether or not the presence of an attachment figure can decrease craving has not been studied previously.

We hypothesized that a photo of an attachment figure would decrease craving in smokers. Since attachment dynamics and craving have not been studied previously, this hypothesis emerges from observations in other domains, in particular the impact of the presence of an attachment figure on pain. Based on the theoretical assumption that an attachment figure functions as a safe haven, to whom a person can return for comfort and safety in the face of fear or a threat, Eisenberger and colleagues hypothesized that the presence of an attachment figure photo would reduce the threatening experience of physical pain by acting as a safety signal, which would result in lower pain ratings (Eisenberger et al., 2011). Participants were exposed to a heat stimulus and at the same time were exposed to a photo of their attachment figure, a photo of a stranger, or a photo of an object. Participants reported significantly less pain when they were exposed to a photo of an attachment figure than when they were exposed to the other photos. They also found that in the attachment photo condition there was greater activity in the ventromedial prefrontal cortex, a brain area that is implicated in safety signaling and reducing distress or threat.

In order to test our hypothesis, we studied how a well-characterized stimulus, cigarette cues, and a novel stimulus, a photo of an attachment figure, influenced craving and affect in smokers. The study had three aims. The first aim was to test the effect of a cigarette cue on craving and affect. This experiment allowed us to confirm that we could replicate previous findings. The second aim
was to test the effect of an attachment figure photo on craving and affect. Identifying a response of craving to a photo of an attachment figure is a novel focus for research. Testing both cigarette cues and attachment photos allowed us determine if the same people react to both types of cues, which would suggest that craving reactivity to cues of all kinds depends on some within-subject characteristic. The third aim was to compare the size of the effect between the two stimuli, cigarette cues and an attachment figure photo.

5.2 Methods

We conducted two experiments exposing smokers to cigarettes cues and to photos of people and in each case testing changes in craving and affect.

5.2.1 Participants and recruitment

Thirty-eight smokers (29 men and 9 women) were recruited for the study through advertisements posted on online classifieds websites (Kijiji, Craigslist), at Mount Sinai Hospital and the University of Toronto campus, and on Toronto Transit Commission vehicles. Participants were daily smokers, between the ages of 19-65, who smoked more than 10 cigarettes a day, had their first cigarette within an hour of waking (i.e. mini-Fagerström score $\geq 3$), and had sufficient English skills to complete the study. Subjects were excluded if they did not have an attachment figure (see WHOTO instrument below) or screened positive for bipolar disease or schizophrenia. Subjects provided informed consent and received $20 for completing the first session and $30 for completing the second session. The Mount Sinai Hospital Research Ethics Board approved this study.

5.2.2 Procedures

In session 1, participants received a structured interview for mental health screening, completed baseline surveys, provided photos (for use in session 2), and participated in Experiment 1 - cue reactivity (craving, affect, arousal) to cigarette cues. In session 2, participants completed Experiment 2 - cue reactivity to photos of people.

Session 1

The participant was told to abstain from smoking for at least 6 hours prior to session 1. The participant reported the time of their last cigarette and provided a carbon monoxide (CO)
expired-air breath sample (Micro Direct CO Check+). Mental health status was assessed with the Modified Mini Screen. The participant completed surveys assessing demographic data, childhood experience, attachment style and substance use. The participant then completed the smoking cue reactivity experiment as described by Sayette and colleagues (Sayette et al., 2010). After the cue reactivity experiment, the participant smoked a cigarette and a second CO measurement was taken in order to capture a post-smoking CO level for comparison with the abstaining CO level.

The smoking cues were a cigarette and lighter provided by the participant and the neutral cues were a pencil and eraser. The sequence of the cues was randomized to avoid order effects (See Figure 5-1A). Session 1 lasted approximately 90 minutes.

**Figure 5-1. Diagram of experimental procedures.** A) In Experiment 1, participants were exposed cigarette cues and neutral cues in random order. Subjective ratings were taken before and after each cue. Cue exposures lasted 90s. B) In Experiment 2, participants were exposed to 4 randomized photos (attachment figure, non-attachment figure, photo matched to attachment figure, photo matched to non-attachment figure). Subject ratings were taken after each photo. Relaxation periods lasted 20s and photo exposures lasted 30s.
Session 2

Session 2 occurred on a separate day. As in session 1, in session 2, the participant was told to abstain from smoking for at least 6 hours prior to the session. The participant reported the time of his or her last cigarette and provided a CO expired-air breath sample (Micro Direct CO Check+). The participant then participated in the people photo reactivity experiment, as adopted from Conklin and colleagues (Conklin et al., 2013).

Participants provided photos of (i) an attachment figure (see WHOTO below) and (ii) a “non-attachment figure”, someone known to the participant but “who they would never go for help or support.” These photos were displayed on power-point slides during the experiment.

Session 2 cues were presented in a 2X2 within–subjects design. The conditions were 2 cues (attachment figure, non-attachment figure) x 2 controls (headshot photos from the Internet, matched to attachment figure and to non-attachment figure by skin color, sex, and age). Participants started the experiment at baseline, where they were instructed to sit and relax. The experiment consisted of baseline condition and 4 photos: 1) the attachment figure, 2) the non-attachment figure, 3) an internet-matched photo of the attachment figure and 4) an internet-matched photo to the “non-attachment figure.”

Experiment 2 was conducted using photos displayed with Microsoft PowerPoint on a computer screen. The participant was exposed to a relaxation period, baseline (3 minutes) and then a photo (30 seconds). After the photo trial, the participant completed subjective ratings. The participant was then exposed to the next relaxation period (20 seconds) and then the next photo. This sequence repeated until reactions to all four photos were obtained. To control for order effects, the order of photos presented was counterbalanced (to prevent 2 known-person photos being presented in a row). This allowed six possible orders of photos. The order of presentation was randomized from among the allowed combinations (See Figure 5-1B). The second session lasted approximately 60 minutes.

5.2.3 Instruments

Expiratory carbon monoxide was measured with Micro Direct CO Check+ (MD Spiro, Micro Direct Inc. Lewiston, ME).
Nicotine dependence was assessed with the Fagerström Test for Nicotine Dependence (FTND), which has acceptable levels of internal consistency (alpha=0.61), and is closely related to biochemical indices of heaviness of smoking (Buckley et al., 2005; Heatherton et al., 1991).

Psychological distress (depressive and anxiety symptoms) was surveyed with the Kessler-10 (K10), which was developed for use in the annual US National Health Interview Survey to measure the non-specific properties of psychological distress. This tool has been found to have excellent internal consistency reliability (alpha=.92) (Kessler et al., 2002). Numerous studies have reported on the reliability and validity of the K10 across diverse settings (Baillie, 2005; Furukawa et al., 2003; Spies et al., 2009; Stolk, Kaplan, & Szwarc, 2014).

Attachment figures were identified with the WHOTO questionnaire (Fraley & Davis, 1997), which consists of six questions that identify the person who serves each of three attachment functions: proximity-seeking (e.g. “Who is the person you most like to spend time with?”), safe haven (e.g. “Who is the person you want to be with when you are feeling upset or down?”) and secure base (e.g. “Who is the person you would want to tell first when you achieved something good?”). A person was identified as an attachment figure if s/he was named as this person for at least three of the six items.

There is no validated tool to identify a non-attachment figure. In this study, a non-attachment figure was identified as a person the participant knew, but would never go to for help or support, and who was not named in any of the WHOTO questions.

Craving was measured with two instruments. The first was a visual analogue scale (VAS) measuring “How strongly would you rate your craving for a cigarette at this moment?” (Fonder et al., 2005). The second instrument was the Questionnaire of Smoking Urges-4 (QSU-4) (Carter & Tiffany, 2001), Carter’s four-question revision of the QSU (Tiffany & Drobes, 1991), rated from values 0-100, as described by Conklin (Conklin et al., 2013).

Affect was surveyed with 2 visual analog scales (scored 0-100) derived from the 9-item Mood Form (Diener & Emmons, 1985) as was done by Conklin (Conklin et al., 2013). The two items were “I felt happy, joyful or pleased.” and “I felt depressed, angry, worried or frustrated.”

Childhood adversity was surveyed by the ACE Study survey tool (Felitti et al., 1998).
5.2.4 Analysis

1. Cigarette Cue reactivity

a. A pencil and eraser have been used as neutral cues in previous work (Weinberger et al., 2012). To establish the pencil and eraser cue as a neutral cue in this study, a t-test was used to compare the mean effect of the pencil and eraser cue to that of baseline on craving.

b. Cue reactivity was calculated as (Cigarette Cue craving) – (Neutral Cue craving). Participants who reported an increase in craving were “cigarette cue reactive” and those who showed no change or decrease craving were “cigarette cue non-reactors.” The prevalence of cigarette cue reactive participants was calculated.

c. Paired t-tests were used to describe the mean effect of the cigarette cue compared to neutral cues on craving, negative and positive affect.

2. Attachment Figure photo reactivity

a. There is no previous work on the effects of an attachment figure and non-attachment figure on craving. To establish a neutral cue for this experiment, within-subject repeated measures analysis of variance (ANOVA) was used to test the effect of 4 conditions on craving, negative affect, and positive affect (baseline, photo of the non-attachment figure, Internet-matched photo to attachment figure, Internet-matched photo to non-attachment figure). Because there was no significant difference in craving, negative affect or positive affect between the two Internet-matched photos, these were collapsed into a single group (labeled “strangers”) in order to reduce unnecessary degrees of freedom. As such, the analysis was repeated with repeated measures ANOVA testing 3 conditions. The latter results are reported. Post-hoc comparisons were corrected for multiple conditions using a Bonferroni test. From these results, the non-attachment figure was chosen as the neutral cue.

b. Photo Cue reactivity was calculated as (Attachment Figure craving) – (Non-Attachment Figure craving). Participants who reported a decrease in craving were “attachment figure photo reactive” and those who showed no change or an increase in craving were “attachment figure photo non-reactors.” The prevalence of people who reported decreased craving in response to the attachment figure photo was calculated.
c. Paired t-tests were used to describe the mean effect of the attachment figure photo compared to non-attachment figure (neutral cue) on craving, negative affect and positive affect.

d. The effect sizes of cigarette cues on increased craving and of the attachment photo on decreased craving were compared with Cohen’s d effect size estimates. A potential within-subject relationship between cigarette cue reactivity and attachment figure photo reactivity was tested by Chi-square test.

e. In order to test if cigarette cue reactivity influences craving and affect in responses to photos, cigarette cue reactivity status was entered as a between-subjects variable in ANOVA.

f. In order to determine if the attachment figure’s smoking status influenced these analyses, mean craving, negative affect and positive affect were compared with an unpaired t-test between those whose attachment figure was a smoker or a non-smoker.

5.3 Results

5.3.1 Study Population

Figure 5-2 presents the recruitment process. A total of 140 people were screened. Of these, 65 did not meet inclusion criteria and 11 declined to participate. Of 64 potential participants, 26 did not attend appointments, leaving 38 who consented to participate (48% of those eligible). Two participants completed session 1 but did not attend session 2. The study population included 9 (24%) women and 29 (76%) men. Table 5-1 presents their characteristics. With respect to modal characteristics, participants identified themselves as white (71%), high school graduates (37%), and reported very-good to excellent health (47%). Figure 5-3 describes the prevalence of people and the number of categories of adversity in this cohort (Toronto) compared to the cohort in the ACE Study (in San Diego). In a cohort of solely smokers (Toronto), there were almost twice as many people with four or more categories with childhood adversity and half as many people with no adversity compared to the ACE Study cohort (San Diego). Table 5-2 describes the social roles of attachment figures and non-attachment figures for these subjects.
Figure 5-2. Recruitment process.
Table 5-1 Characteristics of Participants

<table>
<thead>
<tr>
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<th>N=38</th>
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<tr>
<td>Age, mean (S.D)</td>
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<tr>
<td>Sex, N (%)</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>29 (76.3)</td>
</tr>
<tr>
<td>Women</td>
<td>9 (23.7)</td>
</tr>
<tr>
<td>Education, N (%)</td>
<td></td>
</tr>
<tr>
<td>Up to High School Degree</td>
<td>14 (36.8)</td>
</tr>
<tr>
<td>Any Post-Secondary Degree</td>
<td>12 (32.4)</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>11 (29.7)</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Self-rated Health, N (%)</td>
<td></td>
</tr>
<tr>
<td>Very good-Excellent</td>
<td>28 (47.3)</td>
</tr>
<tr>
<td>Good</td>
<td>14 (36.8)</td>
</tr>
<tr>
<td>Poor-Fair</td>
<td>6 (15.8)</td>
</tr>
<tr>
<td>Ethnic Background, N (%)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>26 (71.1)</td>
</tr>
<tr>
<td>Black</td>
<td>3 (7.9)</td>
</tr>
<tr>
<td>Asian</td>
<td>3 (7.9)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (13.1)</td>
</tr>
<tr>
<td>Relationship Status</td>
<td></td>
</tr>
<tr>
<td>Single, never married</td>
<td>13 (34.2)</td>
</tr>
<tr>
<td>Separated</td>
<td>3 (7.9)</td>
</tr>
<tr>
<td>In relationship or married</td>
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</tr>
<tr>
<td>Kessler-10 Score</td>
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</tr>
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<td>Low (10-15)</td>
<td>18 (47.4)</td>
</tr>
<tr>
<td>Moderate (16-21)</td>
<td>15 (39.5)</td>
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<tr>
<td>High –Very High (22-50)</td>
<td>5 (13.1)</td>
</tr>
<tr>
<td>Fagerström Score</td>
<td></td>
</tr>
<tr>
<td>Low (0-3)</td>
<td>14 (36.8)</td>
</tr>
<tr>
<td>Moderate (4-5)</td>
<td>10 (26.3)</td>
</tr>
<tr>
<td>High (6-10)</td>
<td>14 (36.8)</td>
</tr>
</tbody>
</table>
Figure 5-3. The prevalence of people and the number of categories of childhood adversity in Toronto (Study 2) and San Diego (The ACE Study).
Participants reported that they began smoking at a mean age of 14.8 (± S.D. 4.6) years old, started smoking daily at 18.5 (± 6.2) years old, and had smoked for 16.9 (± 13.3) years. Participants’ degree of nicotine dependence as measured by the Fagerstrom Test was as follows. The majority of participants (63%) smoked within 30 minutes of waking. Of all cigarettes smoked in the day, the majority of participants (57%) would most hate to give up their first cigarette in the morning. Twenty-nine (76%) participants smoked 11 or more cigarettes a day. Twenty-two participants (58%) smoked more frequently during the rest of the day than in the first hours of the day. Only 11 participants (29%) found it difficult to refrain from smoking in places where it is forbidden and 23 (61%) would not smoke when they are ill.

The mean CO level after abstaining was 12.2ppm (SD 6.7) and the mean level post-smoking was 15.3ppm (SD 7.0). The mean abstinence period was 11.7 hours.

5.3.2 Experimental Results

Cigarette Cue Reactivity

a) There was no significant difference between craving in response to baseline and in response to pencil and eraser cues (baseline craving = 51.29 (± 28.55) pencil and eraser = 46.63 (± 28.83),
t(37)=1.85, p=.07). These results suggest that the pencil and eraser cues worked as neutral cues in our study.

b) Twenty-three participants (61%) reported increased craving in response to cigarette cues compared to neutral cues.

c) There was a significant mean increase in craving from neutral cue to cigarette cue exposure seen in Figure 5-4A (Neutral cue mean = 46.6 (± 28.8), Cigarette cue mean = 61.1 (± 29.4), t(37)= 3.99, p<.001). With respect to changes in affect (Figure 5-5A), cigarette cues were not associated with changes in either negative affect (Neutral cue mean = 12.7 (± 19.9), Cigarette cue mean = 13.4 (± 18.8), t(37) =.326, p=.75) or positive affect (Neutral cue mean = 36.9 (± 30.4), Cigarette cue mean = 41.0 (± 29.6), t(37)=.916, p=.37) (Figure 3).

![Figure 5-4. Mean craving (Cues and Photos). A) Comparison of mean craving between neutral cue and cigarette cue. There was a significant difference between mean craving during cigarette cue exposure 61.1 (± 29.4) compared to neutral cue exposure 46.6 (± 28.8, p<.001). B) Comparison of mean craving between neutral cue and attachment figure cue. There was a significant difference between mean craving during attachment figure photo exposure 38.2 (± 31.6) compared to neutral cue exposure 50.9 (± 29.8, p=.01).](image)
Figure 5-5. Mean Negative Affect (Cues and Photos). A) Comparison of mean negative affect between neutral cue and cigarette cue. There was no significant difference between mean negative affect during cigarette cue exposure 13.4 (± 18.8) compared to neutral cue exposure 12.7 (± 19.9, p=.75). B) Comparison of mean negative affect between neutral cue and attachment figure cue. There was a significant difference between mean negative affect during attachment figure photo exposure 10.1 (± 16.8) compared to neutral cue exposure 27.8 (± 28.7, p<.001).

Figure 5-6. Mean Positive Affect (Cues and Photos). A) Comparison of mean positive affect between neutral cue and cigarette cue. There was no significant difference between positive affect cigarette cue exposure 41.0 (± 29.6) compared to neutral cue exposure 36.9 (± 30.4, p=.37). B) Comparison of mean positive affect between neutral cue and attachment figure cue. There was a significant difference between mean positive affect during attachment figure photo exposure 69.9 (± 23.9) compared to neutral cue exposure 40.3 (± 27.69, p<.001).
Attachment Figure Photo Reactivity

a) The following analyses were performed to determine the neutral photo cue for this experiment.

There was a significant effect of conditions (baseline, non-attachment figure, strangers) on craving (Wilk’s lambda=.68, F (df 2, 34)=7.96, p=.001). Craving was similar when participants were exposed baseline and non-attachment figure photo, (post-hoc pairwise comparison: mean difference = 1.33; 95% CI: -7.75 to 10.42, p = 1.00). Craving was significantly lower upon exposure to a stranger photo than at baseline (mean difference= 12.38; 95%: 2.78 to 21.97, p=.008) (Figure 5-7A).

There was a significant effect of conditions (baseline, non-attachment figure, strangers) on negative affect (Wilk’s lambda=.79, F (df 2, 34)=4.54, p=.02). Negative affect was similar when participants were exposed baseline and non-attachment figure photo, (post-hoc pairwise comparison: mean difference = -6.39; 95% CI: -20.28 to 7.50, p = .78). Negative affect was significantly lower upon exposure to a stranger photo than at baseline (mean difference= 4.92; 95%: -4.40 to 14.23, p=.58) (Figure 5-7B).

There was a significant effect of conditions (baseline, non-attachment figure, strangers) on positive affect (Wilk’s lambda=.79, F (df 2, 34)=4.54, p=.02). Positive affect was similar when participants were exposed baseline and non-attachment figure photo, (post-hoc pairwise comparison: mean difference = -6.39; 95% CI: -20.28 to 7.50, p = .78). Positive affect was significantly lower upon exposure to a stranger photo than at baseline (mean difference= 4.92; 95%: -4.40 to 14.23, p=.58) (Figure 5-7C)

These results suggest that the non-attachment figure influenced neither craving, nor negative affect, nor positive affect and may serve as a neutral cue in the photo reactivity analyses. The stranger photo was not a neutral cue in this experiment.
Figure 5-7. A) Mean craving, B) negative affect, C) positive affect after baseline, non-attachment figure photo and stranger photo.
b) Attachment figure photos were associated with lower craving compared to non-attachment photos in 20 of 36 (56%) participants.

c) There was significantly lower mean craving in response to attachment figure photo exposure compared to non-attachment figure photo exposure as seen in 5-4B (Non-Attachment figure = 50.9 (± 29.8), Attachment figure photo = 38.2 (± 31.6), t(35)= -2.66, p=0.01). With respect to changes in affect, cigarette cues were associated with changes in both negative affect in Figure 5-5B (Non-Attachment figure = 27.8 (± 28.7) Attachment figure photo = 10.1 (± 16.8), t(35) =- 4.481, p<.001) and positive affect (Non-Attachment figure = 40.3 (± 27.69), Attachment figure photo mean = 69.9 (± 23.9), t(35)=6.29, p<.001) (Figure 5-6B).

d) Cigarette cues increased craving by a mean of 14.5 units, while attachment figure photos decreased craving by a mean of 12.7 units on the VAS compared to neutral cues. The effect sizes for cigarette cues and an attachment figure photo were similar and would be considered medium, d=.50 and d=.42, respectively (Cohen, 1988). Being a cigarette cue reactor was not associated with being an attachment figure photo reactor (Chi-square = 1.29, p = .26).

e) There was no significant effect of cigarette cue reactivity status (entered as a between-subject variable) on photo reactivity, indicating that cravings from cigarette cue reactors and cigarette non-cue reactors were the same, F (1, 34)=.22, r=325.01, p=.65.

f) There was no significant difference in craving between participants whose attachment figures were current smokers (N=17, M=44.6 ± 32.1) and participants whose attachment figures were not current smokers (N=19, M=32.4 ± 30.7), t(34)= 1.17, p=.25). Negative affect and positive affect in response to attachment figure photo were compared between those whose attachment figure was a smoker or a non-smoker. Both were non-significant (negative affect: t = 0.35, p = .73; positive affect: t = 0.03, p = .97).

5.4 Discussion

The goal of this work was to study the effects of two stimuli on craving and affect in smokers, cigarette cues and attachment figure photos. First, we replicated previous results that cigarette cues increased craving. We did not find evidence, however, that cigarette cues altered negative
or positive affect. Second, we report on the novel finding that attachment figure photos decreased craving. Our results indicate that attachment figure photos also significantly decreased negative affect and increased positive affect. Interestingly, the effect size of cigarette cues and an attachment figure photo appeared to be similar, but in the opposite direction. Ultimately, we aimed to test the effects of a stimulus that has not previously been considered as a determinant of craving and affect. These findings add to the current literature that describes how smoking cues influence craving. In addition, these data extend the literature by introducing an attachment figure photo as a stimulus that influences craving.

Exposure to an attachment figure photo elicited less craving than non-attachment figure photo. Currently, most work on cue reactivity has focused on conditioned cues (e.g. cigarette cues, environments where smoking occurs, persons around whom smokers smoke). However, our results indicate that cues that are not directly associated with smoking may still influence craving. More specifically, we found that elements associated with an attachment figure photo activated processes that alleviate craving. This work further expands on Conklin’s work that people can act as stimuli to decrease craving (Conklin et al., 2013). This knowledge may have practical importance since reducing craving may aid in reducing smoking relapse.

Exposure to an attachment figure photo decreased negative affect and increased positive affect compared to a non-attachment figure photo. These results are consistent with previous work based on attachment theory, which proposes that physical availability or even thoughts of a supportive attachment figure can influence affect (Allen et al., 1991; Edens et al., 1992; Kamarck et al., 1990).

Taking these results together, we found that exposure to an attachment figure decreases craving, increases positive affect and decreases negative affect. It is not known how the effects of an attachment figure photo on craving and on affect are related to each other. One possibility is that seeing a photo of an attachment figure influences affect and craving through separate processes. A second possibility is that seeing an attachment photo directly influences affect, which in turn influences craving. Previous work has shown that negative mood increases craving in both people who are trying to quit smoking and those not trying to quit. Furthermore, these effects may be stronger in women (Perkins, Karelitz, Giedgowd, & Conklin, 2013). Positive affect may also be associated with lower craving, although the results are inconsistent (Doran, Cook,
McChargue, Myers, & Spring, 2008; Drobes & Tiffany, 1997; Veilleux, Conrad, & Kassel, 2010). Future work determining if the effects of craving and affect are independent or if affect serves as a mediator may help build a better model of smoking maintenance.

FIGURE 5-8. Mean craving for personal smoking, personal non-smoking, standard smoking and standard nonsmoking.


It is important to consider what meaning the subjects assigned to the photos. Other studies have tested the importance of looking at a person who is or is not a stranger, or around whom the subject does or does not smoke (Conklin et al., 2013) (Figure 5-8). In the current study, the intended contrast was between seeing a person who is or is not an attachment figure. We included two comparison conditions. A comparison of responses to photos of strangers tests for the effects of familiarity. Previous studies have found that people react differently, with respect to skin conductance and heart rate, to photos of familiar people than to photos of strangers.
(Conklin et al., 2013). A comparison between the attachment figure and non-attachment figure tests for the effect of a specific relationship role. Our results suggest that the effects of an attachment figure photo on craving and affect were specific to this interpersonal role and not a response to familiarity.

This study focused on the effects of an attachment figure on craving. Because of this, the design was limited to studying people who had attachment figures. Specifically, the WHOTO survey tool allowed us to screen for people with “full-blown” attachment figures who fulfill all three functions of an attachment figure: proximity, safe haven and secure base (Hazan & Zeifman, 1994). In addition to not meeting the minimum requirement for nicotine dependence, not having an attachment figure was a common reason that potential participants were excluded. Potential participants would very often list multiple people in response to various items of the WHOTO questionnaire (and, therefore, not qualify as having a single person who serves as a full-blown attachment figure). Some people could not list a person who fulfilled any of the three functions of an attachment figure. People who listed “God”, “the internet” and “Dr. Phil” as sources or support were also excluded. This exclusion criteria may have resulted in the cohort being biased towards lower attachment insecurity because people with very high attachment anxiety and attachment avoidance tend to have difficulty building and maintaining close relationships (Collins & Feeney, 2000; Feeney & Collins, 2001).

The WHOTO screening tool that was used in this study allowed us to ensure that each participant had a full-blown attachment figure. This may have allowed us to stimulate a large effect with the picture of an attachment figure. Previous research has typically focused on partners and social support, but has not adopted the attachment perspective, and therefore has not assessed whether the partners who participate fulfill attachment functions (Eisenberger et al., 2011; Master, Eisenberger, & Taylor, 2009; Montoya et al., 2004; Younger, Aron, Parke, Chatterjee, & Mackey, 2010). As such, some partners may be included in these studies who are not the primary source of safe haven, secure base and proximity-seeking functions.

From the three functions of an attachment figure, the function of safe haven may be the most important for affect regulation. The safe haven function deals directly with safety, which is fundamental to soothing and comfort. This is supported by Eisenberger’s work showing that seeing an attachment figure photo reduces the frightening experience of physical pain, with the
attachment figure photo acting as a safety signal. Eisenberger and her colleagues showed that exposure to an attachment figure photo resulted in lower pain ratings as well as reduced pain-related neural activity. This study also reported that exposure to an attachment figure photo resulted in greater activity in the ventromedial prefrontal cortex, which is a brain area that is related to safety signaling and reducing distress or threat (Eisenberger et al., 2011). Furthermore, greater activity in the ventromedial prefrontal cortex was associated with longer relationship length. Longer relationship length is may be an indicator of relationship satisfaction and commitment. Partners in long-term relationships are thought to have shown commitment and responsiveness over time and may signal greater safety.

In addition to a bias towards secure attachment, there are two potential confounding variables that we considered. Conklin tested photos of people in terms of conditioned cues. Their data supported their hypothesis that seeing photos of people around whom a person smokes leads to higher craving than seeing photos of people around whom a person does not smoke (Conklin et al., 2013). In our cohort, 83% of participants smoked around their attachment figure, which left the group who did not smoke around their attachment figure too small (n = 6) to test this potential influence on craving between the two groups. However, we tested if the smoking status of the attachment figure influenced craving when exposed to photos of that attachment figure. We found that there was no significant difference in craving between participants whose attachment figures were current smokers and participants whose attachment figures were not current smokers.

Unexpectedly, our results indicated that subjects reported less craving upon seeing photos of strangers than at baseline. It is not clear what explains this difference. Possibly, photos of strangers are more meaningful than intended. We considered if social desirability motivation or the attractiveness of persons whose photos are taken from the Internet could be relevant. In the smoking literature, stimuli that elicit shame have been considered as a possible motivators for smoking cessation (Brown-Johnson & Prochaska, 2015). In the case of the current experiment, it is possible that exposure to a stranger elicits a feeling of shame (perhaps a result of contemporary attitudes toward smoking) that leads some subjects to report less craving (whether or not they actually experience craving). However, this study does not provide data to test this speculation.
There are limitations to this study that must be kept in mind when interpreting the results. First, this study focused on variables that are proximal to smoking behaviour, but actual smoking behaviour was not studied. Second, self-report tools were used to collect information about subjects, and to measure experimental reports of affect and craving. However, similar results obtained with two different measures of craving suggest these reports were valid. Third, the majority of participants were men. As such, the results may not be generalizable to women. Fourth, the Modified Mini Screening was used to screen for mental illness, which may be less sensitive than other methods, such as the Structured Clinical Interview for DSM-5. Fifth, while there is a tool to determine a person’s attachment figure, there is currently no validated tool to identify a non-attachment figure. This leaves some uncertainty about the meaning of the non-attachment figure photo for subjects. Sixth, the headshots used for strangers were found on the Internet. Because the images were collected from the Internet, these photos were often of attractive people, which might bias responses.

A final caution concerns the possibility of ceiling effects. Participants were instructed to abstain from smoking for at least 6 hours based on our adopted protocol (Conklin et al., 2013). It was necessary to ensure that craving would be present at baseline in order to test if the attachment photo condition could decrease craving. As a result, there was a potential that ceiling effects could limit increases in craving when these participants were exposed to cigarette cues. The results suggest that this may not have occurred since 51% of participants reported increased craving in response to cigarette cues, which is comparable to the literature. Furthermore, Shiffman et al reported that time since last cigarette had no main effect on cue reactivity when they tested the effects of six cues (cigarettes, positive and negative affect, alcohol, smoking prohibitions, and neutral cues) on cravings (Shiffman et al., 2013). A period of abstinence of at least 6 hours may have biased the comparison of the effect sizes of the attachment figure photo and cigarette cues toward the attachment photo condition. Nevertheless, these results show that exposure to attachment figures (or their photos) may play a role in modifying craving.

In summary, our study demonstrates that a photo of an attachment figure decreases craving and that the size of the effect is comparable to that of cigarette cues. To our knowledge, there is no previous work that has shown an effect of attachment figures on craving. These findings provide a stimulus for further research studying the influence of an attachment figure on smoking behaviour. Future directions may include testing how a photo of an attachment figure influences
actual smoking behaviour. Furthermore, knowledge of how the presence of an attachment figure influences smoking behaviour may be useful in the design of cessation therapies. Perhaps it would be helpful for a person to recruit his or her attachment figure to participate in the cessation process. This could include having the attachment figure accompany the person to cessation sessions or being available for support in other ways. Taken together with previous research demonstrating that attachment insecurity traits are associated with current smoking (Ahrens et al., 2012; Kassel et al., 2007; Le et al., 2016), these results suggest that attachment theory deserves further attention in understanding motivations to smoke.
Chapter 6
General Discussion

6 Overview

6.1 Summary of research aims and findings

The overarching goal of this thesis was to study the associations between attachment phenomena and alcohol and tobacco use. The results from this work suggest that attachment anxiety plays a role in the use of both of these substances.

This research consists of two studies. In Study 1, key findings indicate that:

1. Childhood adversity, attachment anxiety and attachment avoidance may be determinants of harmful drinking

2. Attachment anxiety is a plausible mediator between childhood adversity and harmful drinking

3. Sex does not moderate the relationship between attachment insecurity and harmful drinking in the mediation above

4. Attachment anxiety and psychological distress act as parallel mediators between childhood adversity and harmful drinking

5. Only attachment anxiety, not childhood adversity, nor attachment avoidance were associated with the number of drinks consumed

6. Attachment anxiety may mediate between childhood adversity and number of drinks consumed

7. Childhood adversity and attachment anxiety may be determinants of current smoking in women, and

8. Attachment anxiety is a plausible mediator between childhood adversity and current smoking in women.
After examining these results, Study 2 was designed to further investigate how attachment phenomena influence tobacco use, with the focus on two factors proximal to smoking behaviour, craving and affect. While the first study focused on attachment insecurity as a trait, the second study took a dynamic perspective, studying how the presence of an attachment figure influences smoking. By using an experimental design, Study 2 allowed an assessment of how attachment phenomena may cause or ameliorate craving and associated affect.

The results of Study 2 indicated that:

1. Craving in response to cigarette cues is greater than craving in response to neutral cues,
2. Craving in response to an attachment figure photo is less than craving in response to neutral photo (non-attachment figure),
3. The size of the effect of an attachment figure photo on craving is similar to the size of the effect of cigarette cues, but in the opposite direction.

Collectively, these findings provide insight into the determinants of alcohol and tobacco use. There are two themes that arise from this work. The first theme revolves around two interpersonal factors, childhood adversity and attachment insecurity, and their influence on substance use. The second theme is that the presence of an attachment figure may play an important role in craving and affect in smokers.

6.2 Study 1

6.2.1 Attachment insecurity, childhood adversity and alcohol and tobacco use

In Study 1, the aim was to investigate childhood adversity and attachment insecurity as two interpersonal determinants of alcohol and tobacco use. Our results indicated that childhood adversity and attachment anxiety were associated with both alcohol and tobacco use. Of the two dimensions of attachment insecurity, attachment anxiety, but not attachment avoidance, was associated with substance use. In addition, there were inconsistent sex differences. Attachment anxiety plausibly mediated between childhood adversity and current smoking in women only. However, attachment anxiety was a statistical mediator between childhood adversity and alcohol
use in both men and women. These differences in these results may be due to varying statistical analyses and deserve further study. In the future, it would be beneficial to further test these relationships with other drug use and as well as other risk behaviours such as risky sexual behaviour or seat belt use/nonuse to test the generalizability of these results.

Our study also contributed to the literature by studying sex differences in the associations between childhood adversity, attachment insecurity and tobacco use, by suggesting that attachment anxiety potentially mediates the relationship between childhood adversity and alcohol and tobacco use, and by studying these variables in a single Canadian adult population.

### 6.2.2 The role of sex

We assessed the role of sex in our study. In terms of the background characteristics of our participants, there were no sex differences in education, self-rated health, or reason for attending the appointment, which was as expected. There were sex differences in the distribution of ethnic backgrounds. Contrary to previous work, there were no significant sex differences in individual categories of adversity. That is, the prevalence of childhood sexual abuse and physical abuse was similar in men and women. Generally, in our study, abuse (emotional, physical, and sexual) was reported by more women than men (Table 4-2). Furthermore, there were no sex differences in terms of smoking status. However, there were sex differences in the amount of alcohol consumed (number of drinks over a month) and harmful drinking in our cohort. Men drank more alcoholic drinks and there were almost twice as many men as women who endorsed hazardous drinking (Table 3-2). These findings are generally consistent with the literature that men and women differ in drinking patterns. Still, recent studies have suggested this gap in drinking behaviour has narrowed (Greenfield, Back, Lawson, & Brady, 2010; Keyes et al., 2010). There was no sex difference in attachment anxiety or attachment avoidance.

Previous work has explored sex differences in the associations between childhood adversity and substance use. Our study indicates that sex may play a role in some of these behaviours. For instance, in our cohort, childhood adversity was associated with ever smoking (starting to smoke) in both men and women. However, childhood adversity was associated with current smoking in women, but not in men. This result is similar to the results of previous work. One study highlighted sex differences in the relationships between specific adversities and ever smoking or current smoking. In particular, experiencing physical abuse and parental divorce was
associated with higher odds of ever smoking in men. In women, sexual abuse and verbal abuse increased the odds of ever smoking. Living in a household with drug abuse as well as parental divorce was associated with higher odds of current smoking in both men and women (Fuller-Thomson et al., 2013). These results indicate that overall, childhood adversity is associated to smoking in both men and women, but that perhaps certain adversities may have a greater influence on smoking in either men or women.

In the current work, there were sex differences in the association between childhood adversity and hazardous drinking, but not between childhood adversity and the number of drinks consumed (Table 3-3). A number of studies have found, as we did, that the association between childhood adversity and alcohol use is stronger in women than in men (Khoury et al., 2010; Widom et al., 2007; Widom, Ireland, & Glynn, 1995). In addition, there has been research reporting that the association between childhood adversity and drug use is significant in women but not men (Widom et al., 1999; Wilson & Widom, 2008).

Our study was the first to explore potential sex differences in the relationship between attachment insecurity and substance use. No other studies have reported on this. Our findings suggest that for both men and women neither dimension of attachment insecurity was associated to ever smoking (starting to smoke). However, attachment anxiety was associated with current smoking in women. Contrary to our results, Ahrens and colleagues found that attachment avoidance, but not attachment anxiety, was associated with current smoking in women. Ahren’s research did not study men and so could not test sex differences (Ahrens et al., 2012). Ahren’s study also differed from ours by using a different survey tool that to measure attachment insecurity. Two tools were used, the Relationship Scales Questionnaire and The Relationship Questionnaire, which were also combined to yield another score. Originally, the scores yielded 4 categories of attachment insecurity. However, these categorical scores were converted into two dimensions of attachment anxiety and attachment avoidance. The relationship between attachment and smoking was also studied by Kassel, who reported that attachment anxiety was associated to frequency of smoking (Kassel et al., 2007). We found that attachment anxiety was associated with hazardous drinking in both men and women, which was in contrast to our hypothesis.

In the broader literature investigating attachment and health, attachment insecurity, in general,
has been consistently associated with a number of health outcomes but findings are often inconsistent as to which dimension of attachment insecurity is associated with specific health behaviours (Caplan et al., 2014; Maunder, Nolan, Park, James, & Newton, 2015; Tasca & Balfour, 2014).

In general, we found that both childhood adversity and attachment anxiety were associated with both tobacco and alcohol use. However, our results suggested that there may be different determinants of substance use for men and women. For instance, childhood adversity was not associated with current smoking in men, but it was in women. Furthermore, in women, the determinants of current smoking included attachment anxiety. Since attachment anxiety was not related to ever smoking (starting to smoke) in women, this suggests that attachment anxiety may contribute to women continuing to smoke once they have started, or may make it harder to quit. Similarly, in women hazardous drinking may also be a consequence of childhood adversity and attachment anxiety. In men, childhood adversity is not related to hazardous drinking, even though attachment anxiety is.

One model postulates that women with a history of abuse and neglect drink to cope with negative emotions. This idea is consistent with some general models of drinking behaviour. For instance, tension reduction theory predicts that people drink to decrease negative affect (Conger, 1956). Similarly, the literature generally supports drinking alcohol as a response to stressors (Pohorecky, 1991). While these processes may occur in women, our results suggested that childhood adversity and attachment insecurity were usually not found to be associated with drinking or smoking in men. Some work has suggested that men use substances in a different context than women. For instance, men score higher than women on measures of sensation-seeking, and impulsivity. These variables are consistently associated with alcohol use and problems in men, but less consistently so in women (Nolen-Hoeksema, 2004). Differences in the variables that drive men and women to use substances are important as this knowledge may be valuable in understanding the mechanisms that underlie these relationships and in stimulating the development of new and more effective prevention strategies and cessation therapies.

This thesis work built on previous research by studying sex differences in the relationships of these variables, rather than in the variables themselves. Studying sex differences in the individual variables allows one to estimate the prevalence of such factors in men and women, which may be
useful. For instance, it has been found that when women use alcohol, they are more likely to suffer from physical and sexual assault than men (Nolen-Hoeksema, 2004). Using this information, advertisements may target women to encourage them to travel with a friend. However, studying sex differences in the associations between the variables allows one to potentially study the variations in mechanisms that drive these behaviours.

6.2.3 Mediation

A mediation relationship implies a directional effect where the independent variable causes change in the mediator, then the mediator causes change to the dependent variable (Baron & Kenny, 1986). Our study was limited in its ability to test for the presence of a mediation relationship due to the cross-sectional design. Instead, we tested for the plausibility of attachment insecurity mediating between childhood adversity and adult substance.

A key reason for studying a mediation relationship is because it allows us to elucidate a potential mechanism that underlies a pathway. While an association between childhood adversity and substance use has been established, we were interested in studying a potential mechanism of this relationship. Pragmatically, experiences of childhood adversity cannot be altered after the fact. The goal of Study 1 was to identify a variable that may be a consequence of childhood adversity and that could potentially be targeted to facilitate change. This study was the first to test attachment insecurity as a potential mediator between the relationships between childhood adversity and alcohol and tobacco use.

Attachment insecurity is temporally closer to childhood adversity than substance use. One of the reasons that studying attachment insecurity is important is because it may influence a multitude of variables, some of which are more proximal to smoking. Attachment insecurity is currently not a widely appreciated determinant of substance use.

Our results indicate that attachment anxiety was a potential mediator between childhood adversity and harmful drinking in both men and women. Furthermore, attachment anxiety may mediate between childhood adversity and current smoking in women, but not in men. Our study only assessed one potential mechanism between childhood adversity and substance use, but there are many other factors and associations that may influence substance use.
6.2.4 Cohort Studied

There are various ways that this study’s cohort improved on previous work. This is the first time that childhood adversity, attachment insecurity and substance use were studied together in one single sample. Previously, work has only investigated the bivariate relationships between these three variables (Ahrens et al., 2012; Brennan & Shaver, 1995; Cooper et al., 1998; Kassel et al., 2007; McNally et al., 2003). Furthermore, the majority of previous samples consisted of high school and university students. People in that age range are at the point where they may be transferring their attachment relationships from their parents to their friends or partners (Fraley & Davis, 1997). In addition, youth and young adults may differ from the general adult population with respect to both attachment insecurity and substance use, which limits the generalizability of previous research. One study focused on an adult HMO population, but only studied women (Ahrens et al., 2012). Another study compared sex differences in a cohort derived from the Centers for Disease Control and Prevention’s 2010 Brief Risk Factor Surveillance Survey. This public data file compiled results from a cross-sectional telephone survey managed by state health departments (Fuller-Thomson et al., 2013). The current study extends the literature both by surveying an adult population of males and females and by recruiting this sample from a primary care setting. Since primary care patients seek treatment and health care, they are an ideal population to target for substance use interventions. Furthermore, this study surveyed a population who were not selected for having experienced adversity or for substance abuse. The purpose of recruiting a representative sample of from primary care clinic was to determine the relationship between risk factors and aspects of substance use in primary care patients in general, rather than in higher-risk groups. The participation rate, at eighty-four percent of consecutive patients attending the clinic, was excellent and provided confidence that the sample was representative of the clinic population.

One of the concerns raised by our study cohort is that participants reported higher socioeconomic status and education compared to the rest of the Canadian population. As a result, our findings may not be generalizable beyond this clinic. However, despite higher socioeconomic status, the prevalence of childhood adversity and of substance use in our cohort was comparable to the general Canadian population. For instance, the prevalence of sexual abuse was 13% in our cohort, which was similar to what is observed in the rest of Canada (10%) (Afifi et al., 2014). Furthermore, the prevalence of harmful drinking was similar between our cohort (18%) and the
Canadian population (14%) as well (Canadian Centre on Substance Abuse, 2004). The prevalence of adversity in our study is also comparable to that of the ACE study, which surveyed people in a San Diego HMO clinic (Felitti et al., 1998). Furthermore, the distribution of the number of categories of childhood adversity in our cohort was similar compared to that of the ACE Study. That is, a similar percentage of people have no adversity, one category of adversity, two categories of adversity and so on (Figure 3-8). People in health maintenance organizations are typically middle class and have stable jobs. Our study highlights a possible misconception that childhood adversity and substance use only exist in communities of low socioeconomic status (Daniel et al., 2009; Galea & Vlahov, 2002; Wiles et al., 2007). While our study is not designed to focus on such relationships, perhaps these findings should stimulate further study to clarify the influence of socioeconomic status on substance use.

6.2.5 Applications of these results

Research is still needed to determine if and how attachment insecurity may influence choice of interventions for substance use problems. For instance, people with attachment avoidance often prefer to maintain self-reliance and maximize interpersonal space. However, is it true that people with high attachment avoidance would actually prefer (and benefit from) interventions that maintain this self-reliance, such as information pamphlets, self-help manuals, medications and receiving text messages to their cellular phones? Moreover, high attachment anxiety is characterized by a preoccupation with rejection and abandonment. However, it is not known if people with high attachment anxiety would actually prefer (and benefit from) therapies that incorporate relational elements that emphasis social support. How attachment influences the preference of therapies needs to be established before further applications can be suggested. With that in mind, there are two main ways to apply such knowledge. First, the most practical way is to personalize interventions based on attachment patterns. Second, strategies to reduce attachment insecurity may complement other standard treatments.

Our results indicated that two interpersonal factors, childhood adversity and attachment insecurity, are associated with alcohol and tobacco use. Since many interventions to reduce harmful drinking and promote smoking cessation do not have an interpersonal focus, it is important to consider how this information could be applied. Although it has been recognized that there are high rates of trauma among people with addictions (Cohen, Dickow, & Horner, 2003; Khoury et al., 2010). Brown and colleagues noted that historically, addiction treatment
programs have preferred not to address trauma because of a concern with potentially aggravating trauma symptoms. However, not addressing the trauma could possibly lead to other negative outcomes, such as treatment drop-out (Brown et al., 2013). Trauma-informed care for addictions takes into account the role and impact of trauma on people’s life. It aims to deliver services in a way that avoids triggering trauma memories or causing unintentional re-traumatization (Gatz & Brounstein, 2007; Herman, 1992). This has resulted in positive changes in addictions treatment (Brown et al., 2013).

Introducing attachment theory into a model of addiction opens possibilities for novel, attachment-informed approaches to substance use. These research findings build on trauma-informed care by identifying attachment insecurity as a variable that could influence efforts to intervene in harmful substance use. Clinicians treating people with a history of childhood adversity may benefit from assessing for attachment insecurity. Based on our research, attachment anxiety is associated with the number of drinks consumed, harmful drinking and current smoking. A number of characteristics of attachment anxiety may inform treatment. Attachment anxiety is associated with greater support seeking, ineffective coping strategies and interpersonal difficulty (Mikulincer, Florian, & Weller, 1993; Ognibene & Collins, 1998). Perhaps tailoring substance abuse intervention to attachment anxiety, by providing therapies that emphasize relationship support within individual or group therapy may improve outcomes and reduce attrition rates among patients with a history of adversity. People with substance use disorders are also likely to report depressive symptoms so perhaps improving depression outcomes will also help with substance use behaviors. Clinicians treating people with childhood adversity may consider substance abuse as potentially a consequence of childhood adversity and attachment insecurity.

While little is known about how attachment patterns would influence an individual’s preference of cessation therapies, or likelihood to succeed with one cessation strategy or another, there is information from other domains that may be relevant. For example, attachment patterns have been studied as a variable that facilitates personalization of primary care, especially with respect to diabetes management. Primary care patients with preoccupied attachment style (high attachment anxiety and low attachment avoidance) had significantly more health visits and reported significantly more physical symptoms than patients secure attachment style (low
attachment anxiety and low attachment avoidance) (Ciechanowski, 2002). Patients with diabetes who have preoccupied attachment may also receive more testing and care related to their diabetes. Because of their support-seeking attachment style, these patients may be more likely to try to please significant others and health care professionals. Recommendations for physicians to adapt care to this interpersonal style have emphasized providing reliably scheduled support, not rushing interactions, teaching anxiety reduction skills, and using active listening to enhance the coherence of communication (Maunder & Hunter, 2015). Perhaps smokers with high attachment anxiety who are trying to quit may benefit from cessation therapies that occur in the context of a patient-professional relationship with a strong sense of alliance, or by interventions that emphasize interpersonal interaction and continuity, such as group therapy.

Furthermore, people with high attachment anxiety tend to rely on others for support and to lack confidence and self-efficacy when facing challenges independently. They may be motivated by a desire for acceptance and so may be prone to accommodate to or try to please partners (Mikulincer, 1998). Perhaps including partners in cessation therapy may boost their effectiveness. This may also help because people with attachment anxiety feel more secure when in the presence of a partner, which can enhance learning (Maunder & Hunter, 2015). Finally, since people with high attachment anxiety may report more symptoms, they will probably be more likely to report withdrawal symptoms. Teaching techniques to better deal with withdrawal symptoms might enhance their sense of self-efficacy. Our results suggest that this personalization may be most applicable in people with attachment anxiety who have a history of adversity who are trying to quit smoking.

In patients with diabetes, dismissing attachment style (high attachment avoidance and low attachment anxiety) is associated with poor self-management (Ciechanowski et al., 2004). People with this attachment style were less adherent with diet, exercise, foot care, and medications. They viewed the patient-provider relationship less favorably as compared with patients with a secure attachment style. Indeed, a biological measure of diabetic control (HbA1c) indicated poorer glycemic control in people with this attachment style (Ciechanowski et al., 2004). Recommendations for physicians to adapt care to people with high attachment avoidance have emphasized respecting the patient’s need for independence, adopting a collaborative/negotiating type of relationship (rather than emphasizing support), disconfirming negative expectations and mistrust, and bearing in mind the unexpressed insecure feelings which may lie under avoidant
behavior (Maunder & Hunter, 2015). Perhaps smokers with high attachment avoidance may be more successful with treatments that emphasize independence, that provide effective self-management skills or that rely on pharmacological treatment. People with this interpersonal style may prefer interventions that don’t require the smoker to attend as many sessions or in which the treating health care provider focuses on practical and instrumental strategies.

The second approach aims to address substance use problems by way of trying to reduce attachment anxiety. Although attachment insecurity has trait-like stability it can be modified with sustained effort, for example in psychotherapy (Ravitz & McBride, 2007). However, since reducing insecurity through psychotherapy is often slow, effortful, and costly, it may be impractical as a method to stop smoking. Psychological interventions that target attachment anxiety may be indicated for some individuals with childhood adversity. Psychotherapy may help victims of childhood abuse to increase attachment security and adopt more effective methods of coping. As an example of how this has worked in other conditions, people with binge eating disorders participated in sixteen sessions of Group Psychodynamic Interpersonal Psychotherapy, which focuses on changing relationship patterns and affect regulation. Reductions in attachment anxiety and attachment avoidance were associated with fewer interpersonal problems twelve months after treatment. Reduction in attachment anxiety was also associated with decreased depression symptoms (Maxwell, Tasca, Ritchie, Balfour, & Bissada, 2014). In another study, people with borderline disorder participated in twelve months of transference-focused psychotherapy, were more likely to endorse secure patterns of attachment than those who participated in dialectical behavior therapy, or a modified psychodynamic supportive psychotherapy (Levy et al., 2006). Travis and colleagues also measured attachment pre- and post-dynamic therapy. They reported that after treatments, a number of patients reported secure attachment instead of insecure attachment (Travis et al., 2001). Finally, one study reported sustained long-term changes in attachment post-therapy. In this study, twenty percent of patients improved from insecure to secure attachment after participating in group psychotherapy and this effect was stable at a one year follow-up (Kirchmann et al., 2012). Even though efforts to alter attachment patterns are timely and expensive, it may be a worthwhile consideration, especially bearing in mind the long-term health care costs associated with substance use. Furthermore, positive changes in attachment insecurity may not only impact substance use, but other qualities of life as well.
6.2.6 Limitations

A number of limitations of Study 1 have been described and discussed in the previous chapters (3 & 4). In addition to those discussed, it is important to note that previous literature is inconsistent about which dimension of attachment insecurity is associated with alcohol and tobacco use. The source of this limitation may lie in the measurement tools. First, the tools used to measure attachment insecurity and other relevant constructs (anxiety, depression, various aspects of health) are often self-report measures and so share common method variance that may falsely increase associations. Second, measures of attachment anxiety and psychological distress may overlap at the item level, increasing spurious associations. For instance, items of the ECR-S probe “worry about being abandoned” which may overlap with other more general types of worry (Wei et al., 2007). However, in our research, we have found that attachment anxiety and psychological distress may act as independent mediators between childhood adversity and harmful drinking (Figure 3-6), which suggests that they measured distinct constructs. Third, attachment avoidance is associated with suppressing expressions of need, which may interfere with accurate measurement of various types of distress. For example, people with high attachment avoidance typically endorse less need for support. However, it is not clear whether they actually have less need for support or if they under-report this need. In a similar manner, people with high attachment avoidance may under-report problems associated with alcohol use, for example. Fourth, attachment anxiety and attachment avoidance co-occur and may interact. Each dimension of attachment is understood to be an adaptation to underlying feelings of insecurity. In this regard, it may be more reliable to study the degree of attachment insecurity (in general), than to focus on the specific relationships between the separate dimensions of insecurity (attachment anxiety and attachment avoidance) and substance abuse (Maunder & Hunter, 2001). Unfortunately, there is no established valid measure of the degree of attachment insecurity (in general).

Attachment researchers disagree about the validity of self-report measures of attachment, as was used in our studies, compared to observational attachment measures, and the meaning of what they measure (Ravitz et al., 2010). As mentioned in the introduction, attachment may be conceptualized as (observed) “states of mind with respect to attachment” or as (self-reported) beliefs and preferences. Compared to observational methods, self-report attachment measures focus on conscious appraisals of attachment preferences and behaviours and are weakly
correlated with the results of observational measures. While some attachment researchers suggest that this indicates the limited validity of self-report measures, others disagree. Indeed, an empirical review suggested convergent validity between self-report attachment measures and results obtained with experimental manipulations such as implicit priming techniques and with behavioural observations (Shaver & Mikulincer, 2004). While these measures are distinct from “states of mind with respect to attachment”, they still provide information that is theoretically consistent with attachment theory. Furthermore self-report measures of adult attachment consistently confirm links between attachment and health outcomes that are predicted theoretically (Maunder & Hunter, 2008). Another advantage of the self-report attachment measure used in this study is that it identifies conscious decisions and preferences, which are relevant to adapting interventions to be more relationship-focused.

A major limitation of Study 1 was its cross-sectional design. We surveyed our key study variables at one point in time. Longitudinal work is necessary in order to make any conclusions about mediation relationships. Support for a causal interpretation of our mediation analysis depends on evidence from other sources that attachment measured at one point in time in adulthood gives presumptive evidence of the same pattern of attachment earlier in life. Longitudinal studies have followed individuals from infancy into early adulthood and have studied attachment patterns over time. Comparing infant attachment patterns, assessed with the Strange Situation, to early adult patterns, assessed with the Adult Attachment Interview, there is evidence attachment security can remain stable over decades. Furthermore, changes from attachment security to insecurity appear to be associated with negative events in the family environment, such as parental divorce, loss of a parent, life-threatening disease (parent or self). Two studies reported that the majority of their participants maintained the same attachment pattern over time (Hamilton, 2000; Waters et al., 2000b). Waters and colleagues noted that changes in attachment patterns were associated with the occurrence of negative life events. Hamilton also reported that these negative life events was associated with the maintenance of attachment insecurity or with the transition from secure to insecure patterns. In both of these studies, exposure to these negative life events was moderate.

Another study investigated attachment patterns from infancy to early adulthood, but focused on a high-risk cohort, characterized by high levels of stress and low levels of support (Weinfield, Sroufe, & Egeland, 2000) found a different result. In this cohort, the majority of mothers were
young (aged between 12-34, mean age of 20), 40% had not completed high school, and were earning incomes at or below the poverty level. As a result, negative life events were much more frequent and more severe than two other studies. Most participants in this study did not maintain the same attachment classifications. The change in attachment patterns was associated with specific factors, such as maternal depression, which negatively influences caregiver availability and responsiveness. Participants who were insecure as infants and insecure as adults were more likely to have experienced childhood adversity than those who were insecure as infants and then secure as adults.

In summary, evidence from longitudinal research provides support for substantial stability of attachment patterns over time, but also for changes in patterns of attachment under some conditions. A causal interpretation of the mediation analyses in Study 1 assumes conditions of stability. In order to test these mediation relationships, it would be optimal to conduct a similar longitudinal study in order to tease out the timing of events (childhood adversity, attachment insecurity, substances use). Such a study would be able to determine if childhood adversity precedes attachment insecurity, and if attachment insecurity precedes substance use problems, which would increases confidence in causal conclusions. However, the relationships are complex, may be bidirectional and may change over time. For instance, substance use may exacerbate attachment insecurity as well as the reverse. Similarly, children with attachment insecurity may be more prone to experience childhood adversity. Establishing causality requires investigations from multiple perspectives using various methodologies.

6.3 Study 2

6.3.1 Attachment figure and smoking
In Study 2, there were three aims. The first aim was to test the influence of cigarette cues on craving and affect in smokers. The second aim was to test the influence of an attachment figure on craving and affect. The third aim was to compare the size of the effect in these two stimuli. Our findings suggested that, as expected, exposure to cigarette cues increased craving. Further, exposure to an attachment figure photo decreased craving. Finally, the size of the effect of cigarette cues on craving was similar to that of an attachment figure photo, but in the opposite direction. These findings extended the current literature by introducing attachment theory as an
important supplemental framework to understanding craving, by introducing an attachment figure as a stimulus that influences craving and by supporting previous work suggesting that cues can act in an inhibitory way (Conklin et al., 2013).

6.3.2 Attachment as a new perspective

Factors that influence craving have been understood in terms of physiological systems (e.g. nicotine dependence), conditioning theory (e.g. cigarette cues) and stress relief (Childs & de Wit, 2010). While understanding these perspectives has led to much progress in reducing the prevalence of smoking, the prevalence of smoking has remained at about 15% (Jamal et al., 2016). Therefore, it is still important to identify potential new factors that may influence craving.

In order to help people who want to quit smoking, it’s important to study smoking from various viewpoints. Our work provides a novel and complementary framework to understand factors that influence smoking. Currently, cue reactivity is framed in terms of conditioning theory. This large body of work shows how certain stimuli, which are associated with smoking, can increase craving. Our work suggests that an attachment figure can influence craving as well. An attachment relationship is a dynamic process between two individuals. Changes in this relationship can influence felt security, the ability to explore surrounding and positive and negative affect. As we have found here, these relationships also influence craving in smokers. This suggests that in addition to conditioning, other dynamic processes may also influence craving. Studying smoking in the context of attachment theory may provide a new perspective which may help us better understand the complex mechanisms that drive smoking behaviour.

6.3.3 People as cues

Cue reactivity research has involved cues related to smoking, such as the sight or smell or cigarettes and lighters (Niaura et al., 1988). While the variety of cues have expanded to include environments (Conklin, 2006) and people (Conklin et al., 2013), this area of research is still new. In 2013, Conklin et al published work suggesting that people can serve as cues to smoke (Conklin et al., 2013). This work demonstrated that seeing photos of people around whom the participant smokes resulted in higher craving compared to seeing photos around of people around whom the subject did not smoke. Classical conditioning was used to explain these results.

In our work, we used attachment theory to hypothesize that seeing a photo of an attachment figure would decrease craving. Our findings supported our hypothesis and indicated that
exposure to an attachment figure photo not only decreased craving compared to baseline but also when compared to a photo of a non-attachment figure. The latter difference indicates that there is something unique about seeing a photo of an attachment figure. These findings are consistent with evidence from other domains that indicates that the effects of support from an attachment figure cannot be substituted for by support from non-attachment figures (Stroebe, Stroebe, Abakoumkin, & Schut, 1996a). This thesis work furthered the literature by investigating the effect a person, specifically an attachment figure, on craving and supported previous work on the influence of an attachment figure on affect.

We also hypothesized that seeing a photo of an attachment figure would decrease negative affect and increase positive affect. Our results in smokers were in line with previous work studying the influence of attachment figures on affect. That is, seeing photos of attachment figures decreased negative affect (Allen et al., 1991; Edens et al., 1992). There is, however, less consistent evidence that seeing photos of attachment figures increase positive affect (Gerstel & Gross, 1984). It is possible that affect and craving are linked in a mediation relationship. That is, it is possible that seeing a photo of an attachment figure decreases negative affect and that in turn influences craving. Our study was not designed to study such relationships, but future research may explore this question.

6.3.4 Cues that inhibit craving

The premise of cue reactivity research is that certain stimuli increase craving. For smoking cessation, smokers are encouraged to take note of what factors increase their craving such as time of day, what they’re doing, who they’re with, where they are and how they’re feeling. Smokers typically name coffee, meals, alcohol, stress and seeing other smokers as common triggers. In our work, we studied a stimulus which we hypothesized would decrease craving.

Conklin et al reported participants’ craving when they were exposed to photos of people around whom they smoked, and when they were exposed to photos around whom they did not smoke (Conklin et al., 2013). However, they did not report on baseline cravings. Without baseline craving, it is difficult to conclude if exposure to the photos truly had an inhibitory effect on craving. Our results compared baseline craving to craving after other photo exposures (non-attachment figure, strangers) to assess the effects of these photo exposures. Our findings indicated that the neutral photo cue was that of a non-attachment figure, and not the strangers.
Moreover, a photo of an attachment figure decreased craving compared to baseline, and non-attachment figure photo (neutral cue). Furthermore, this effect appears to be independent of cigarette cue reactivity, that is, people who react to cigarette cues are no more likely to react to attachment figure photos than would be expected by chance and vice versa. This indicates that they are independent phenomena. The influence of an attachment figure on craving is important as it builds on the model of smoking. Currently, in terms of cue reactivity, the model consists of mainly cues that are directly associated with smoking, and as such understanding of these effects rest of conditioning theory (Niaura et al., 1988). Our results add an additional element to this model by suggesting that perhaps dynamic interpersonal processes may also contribute to changes in craving.

6.3.5 Cue Reactivity Considerations

The ultimate goal of this research was to study the influence of the presence of an attachment figure on smoking behaviour. As a foray into this research, we first tested how a photo of an attachment figure would influence craving. Changes in craving have been studied with cue-reactivity. In a series of experiments, Conklin and colleagues tested the influence of images of cigarettes, environments, and people on craving and mood (Conklin et al., 2008; 2010; 2013; Perkins et al., 2013). In all of these procedures, participants were instructed to abstain for a minimum of 6 hours before their research sessions. In each of their publications, they were able to survey craving in response to their cues of interest. There is currently no research on the influence of the presence of attachment figures on addictions. Thus, we adopted Conklin’s protocol because this group’s work most closely resembles the relationships we intended to study, the influence of photos of people on craving. Importantly, their protocol has been used with other smoking related images as well and has yielded results.

In Study 2, our main hypothesis asserts that seeing a photo of an attachment figure would decrease craving. Implementing a six-hour abstinence period favoured the detection of a decrease in craving by priming higher baseline craving. Our results supported this choice in study design; in response to a photo of an attachment figure, cravings were lower in comparison to baseline condition and a non-attachment figure photo. In addition, with the same procedure we were able to detect increases in craving when participants were exposed to cigarette cues (participant’s own cigarette and lighter). Hence, this deprivation period was able to capture both
increases and decreases in craving and was an optimal period for the hypotheses we wanted to test. Moreover, the order of cues was randomized in our study for both of the experiment (cigarette cues vs neutral cue, and photo exposures), which helped to prevent order effects. Furthermore, we had used a neutral cue in our study to compare craving with the cigarette cue.

As research into the influence of an attachment figure (and other people photo exposures) on craving is still very novel, it was useful to include baseline craving. In theory, a neutral cue should be something that is closely matched to the cue of interest, different only in a specific characteristic that is the focus of study. In our study, technically, the neutral cues could be photos of strangers matched to the attachment figure and non-attachment figure. Operationally, these photos of people were matched by approximate age, hair color, background and sex. In theory, every physical characteristic was identical to the attachment figure or non-attachment figure. There were no significant differences in craving, negative affect, and positive affect after exposure to the stranger matched attachment photo or stranger matched non-attachment figure photo. These two study conditions were then collapsed into one group, strangers. Contrary to our expectations, cravings in response to stranger photos were similar to cravings in response to an attachment figure.

We note that the photos we used from the Internet for matches were often professional headshots. Thus, these headshots may have been of models or other professionals (i.e. company head shots), who are more attractive than average. Research has found that people make judgments of attractiveness, trustworthiness, likeability and competence that are extrapolated from facial appearances in as little as 100ms to novel faces (Willis & Todorov, 2006). Studies have suggested that attractive people are thought to be more trustworthy (Solnick & Schweitzer, 1999; Wilson & Eckel, 2006). Perhaps the participants perceived these strangers attractive and in turn as people they could trust and equated them with their attachment figure. Perhaps, as a result, their responses to the photos of strangers were similar to the responses to the photos of the strangers (decreased craving). However, we also report that seeing photos of strangers did not result in our participants feeling more positive affect nor less negative affect than they did when they were exposed to attachment figure photos (Table 5-5). In this regard, the stranger photos acted as a neutral cue in terms of its influence on affect. It is important to note that people photos appeared to have specific effects (increase, decrease) on specific outcomes (craving, affect) and
must be tested before they can be used as neutral cues. Ultimately, our findings suggested that these stranger photos may have been more meaningful than intended.

In our study, craving during the baseline condition of sitting and relaxing and looking at a photo of a non-attachment figure (Table 5-4) were similar. These results indicate that instead of the stranger photos acting as neutral cues, the non-attachment photo worked better in this role. It would be expected that a neutral cue would not elicit any reaction. In this regard, our use of the definition of a non-attachment figure as “Someone you know, but would never go to for help or support” appeared satisfactory to identify someone relatively neutral. It was not predicted \textit{a priori} that a non-attachment figure would be neutral, but it was demonstrated empirically that this was the case. Our results indicate that matched “strangers” may not be as neutral a cue as was expected. It would be worthwhile exploring what specifically about strangers could influence substance use.

Conceptually, it is valuable to compare craving after exposure to an attachment figure with craving after exposure to the stranger matched to the attachment figure (if this had truly been a neutral cue). If there were a difference, this would indicate that there is an effect of an attachment figure compared to a “neutral cue”. Still, it is possible that the participant reported changes in craving solely because of familiarity with the person. That is why we also included a photo of a non-attachment figure, a person who is also known to the participant. If there is difference in craving when participants are exposed to photos of an attachment figure compared to the non-attachment figure, we can conclude that perhaps the reaction is not only due to familiarity, but that there it may be due to the specific effects of the attachment figure. There are other factors that could influence a person’s craving as well, such as other properties (physical appearance, personal relationships to that individual) associated with the individuals in the photos. In this case, we also assessed if the smoking status of the attachment figure would be associated with cravings, but this was not the case. However, there are numerous other elements that may influence craving that may be related to the individuals in the photos.

6.3.6 Limitations

Several limitations of Study 2 were discussed in Chapter 5. As mentioned, there is no validated tool for a non-attachment figure. It would be helpful to have a standardized tool to identify such a person. In one study, a non-attachment figure was anyone who was not a romantic partner.
(Stroebe, Stroebe, Abakoumkin, & Schut, 1996b). In our study, we found that in terms of smoking, non-attachment figures that were included in the study acted as a neutral cue when it came to their effect on craving, positive affect and negative affect (similar to baseline craving).

In order to identify an attachment figure, the participants were asked to name people who served all three functions of attachment figures. In our sample, many smokers were excluded because they did not have someone in their life who qualified as a “full blown” attachment figure. The people who could not name an attachment figure not only lacked support from an attachment figure, but appeared to not have much general support. However, some individuals may have had various people who fulfilled individual attachment functions. This inclusion criterion may have selected people with higher attachment security and excluded potential participants with higher attachment insecurity. However, it is unclear even if a participant is able to identify a “full blown” attachment figure, that the participant is able to use the attachment figure effectively. That is, are they able seek support, experience its benefits, and reciprocate with caregiving?

Attachment is a dynamic process that exists between two individuals. However, in our study, we were limited to only measuring one perspective of this dynamic relationship. It would be helpful to study how two people’s attachment patterns and behaviours interact and how it could influence craving. The attachment perspective of addiction essentially suggests that people may use substances to deal with the insecurity they feel in relationships. When individuals feel secure in their relationships, they report more satisfaction and tend to behave in ways that enhances the relationships (Mikulincer & Shaver, 2007). However, people who are insecure and unsatisfied in their relationships may need to find alternative ways to achieve this security. A key component of attachment security is being able to use an attachment figure as a safe haven and secure base. An individual’s attachment style influences their caregiving and support seeking.

In order to appreciate the safe haven and secure functions, partners need to be comfortable with being close and intimate with one another. They need to be unafraid of being abandoned or rejected (Collins, Guichard, Ford, & Feeney, 2006). These characteristics reflect the two dimensions that make up attachment security: low avoidance of intimacy and low anxiety about abandonment (Brennan et al., 1998). People who are comfortable with intimacy find it easy being close to others, and believe that they are able to depend on others. On the other hand, people who are uncomfortable with intimacy have trouble trusting others and tend to avoid
closeness and intimacy in relationships. People who are anxious about being abandoned worry that others will reject them and will often question their own self-worth. In contrast, people who are not anxious about being abandoned are not preoccupied with rejection. Research supports the premise that attachment anxiety and attachment avoidance dimensions can affect caregiving and support seeking processes.

Effective caregiving consists of being able to identify the care seeking, to be responsive, and to provide what was actually requested (Ainsworth, Blehar, & Wall, 1978; Bowlby, 1969). Collins and colleagues have reported that sensitive caregivers receive cues from their partners and provide support that is in line with what the partner is seeking. Insensitive caregivers, on the other hand, are not attuned to their partners’ signals, which may result in them acting neglectful or intrusive. Another component of effective caregiving is being responsive, in a way that allows the partner to feel understood and cared for (Collins et al., 2006).

It is unclear how attachment anxiety influences caregiving. Some studies have suggested that with individuals higher anxiety may engage in compulsive caregiving (Kunce & Shaver, 1994). On the other hand, other studies have indicated that more anxious individuals provide less caregiving. One study reported that not only did people with high attachment anxiety provide less support, they were less responsive, and exhibited more negative caregiving behaviors (Collins & Feeney, 2000). In another study of romantic partners, Feeney and Collins manipulated caregivers’ perception of how much distress the partner was in while engaging in a challenging task (Feeney & Collins, 2001). While caregivers with high attachment anxiety provided support to their partner, it was not in sync with the level of support that was sought by their partner. More specifically, caregivers with high attachment anxiety did not moderate the amount of emotional support they gave. They provided the same amount of support regardless of whether the partners’ needs were low or high. Current research indicates that attachment anxiety interferes with peoples’ capacity to be effective caregivers. Attachment avoidance, on the other hand, is associated with unresponsive caregiving that may be controlling in nature. An avoidant person’s caregiving depends on the support-seeking conditions. For instance, under low support-seeking condition, attachment avoidance was actually associated with increased instrumental support. Feeney and Collins reported that people with attachment avoidance provided the least support when their partner needed the most support (Feeney & Collins, 2001).
Effective support seeking consists of precisely communicating one’s needs to one’s partner and then being open to using the support that is provided. Attachment security as well as high attachment anxiety are related to greater support seeking (Mikulincer et al., 1993; Ognibene & Collins, 1998; Simpson, Rholes, & Nelligan, 1992), while attachment avoidance is related to less support seeking (Collins & Feeney, 2000; Fraley & Shaver, 1998; Mikulincer et al., 1993; Simpson et al., 1992). Both attachment avoidance and attachment anxiety are associated with negative perceptions of support. That is, people who are insecure tend to view the support provided as insufficient or in a negative manner (Collins & Feeney, 2004).

One hundred couples were studied by Davila and Kashy to assess daily support experiences and attachment security over a two week period (Davila & Kashy, 2009). Secure individuals (low attachment avoidance and attachment low anxiety) reported that partners sought more support and reported providing more support to partners. These results suggested that attachment security allows people to identify their partners’ needs and respond to them. Secure individuals also sought out more support, perceived getting more support, as well as felt more felt support. This implies that attachment security allows people to feel comfortable sharing their needs with their partners and are able to accept the support that is provided. Their findings also suggested that high attachment avoidance was associated with less support-seeking. Moreover, this association was bidirectional. That is, attachment avoidance influences support seeking, but support-seeking also influences attachment avoidance. Additionally, people with partners who have high attachment anxiety reported that their partners as sought more support, which is consistent with the idea that anxious individuals are needy and engage in high levels of proximity seeking.

By understanding how attachment patterns influence how people use their attachment figure in caregiving and support-seeking situations, perhaps we will be able to gain insight into how attachment patterns may influence substance use. Our research indicated that attachment anxiety is associated with both harmful drinking and current smoking. As one example of the complex interactions that may occur, it is possible that people with high attachment anxiety are too concerned with attaining support for themselves and so are unable to provide support for their partner. As a result of this ineffective caregiving, their partner may turn to other avenues for support, which puts further strain on the relationship. Strain in the relationship, in this example, further increases the person’s attachment anxiety, leading to the use of substances to modulate feelings of insecurity. From the perspective of support-seeking, people with high attachment
anxiety may be ineffective in expressing their needs as well as be worried that they do not
deserve the support that is being provided. In addition, they may view the support as insufficient
and unsatisfying and may in turn seek out other ways of comfort such as through substance use.
Studying the interaction between two individuals’ attachment styles may present a more
complete model of the influence of attachment phenomena on substance use.

Based on the results obtained from Study 1, it would have been optimal if we were able to study
how sex may moderate the influence of attachment figure cues on craving and affect. Another
limitation from Study 2 was that the majority of participants were men. Research has shown that
women’s smoking behaviour is less dependent on nicotine, and more influenced by
environmental cues (Perkins, 1996). Furthermore, acute negative mood situations may increase
cravings more in women than in men (Perkins et al., 2013). Future studies would aim to recruit
more female participants in order to study potential sex differences.

6.3.7 Potential applications

Study 2 was designed to build on the knowledge from Study 1, which found that attachment
anxiety is associated with current smoking. As mentioned, Study 1’s application focuses on
screening for attachment styles to personalize treatment.

In Study 2, we found that seeing a photo of an attachment figure decreases craving, decreases
negative affect and increases positive affect in smokers. This knowledge could be applied in
designing new coping tools. For instance, when smokers feel the urge to smoke, perhaps
accessing a photo of the attachment figure may be helpful in controlling their craving. This could
be easily done with smart phones. Another way to implement this information could be by
encouraging smokers to imagine their attachment figure when they feel the urge the smoke. The
effectiveness of guided imagery in terms of smoking cessation has been explored (Wynd, 2005).
However, in this case the imagery focuses on health promoting activities such as smoking
cessation, good nutrition and exercise. Perhaps imagining an attachment figure and a positive
interaction with this attachment figure could help in suppressing craving. Finally, perhaps
smokers can recruit their attachment figure to play an active role in their cessation process, such
as attending therapy sessions, or supporting them in other ways.
Chapter 7
Conclusions and Implications

7 Overview

7.1 Conclusion

The overall findings of this research suggest that childhood adversity and attachment anxiety may be contributors to adult alcohol and tobacco use. More specifically, our results identify a potential mechanism for the relationship between childhood adversity and substance use, in that attachment insecurity may mediate this relationship. Attachment theory presents as a valuable supplemental framework to study the effects of childhood adversity and determinants of substance use. With further research, these findings may have important clinical implications for people with substance use problems, and especially those who have experienced childhood adversity.

The major aim in this work was to study two interpersonal factors that may influence substance use. From this work, we were able to suggest a model, which addresses a component of addiction comprising of two psychosocial determinants. In general, these results reinforced previous work that demonstrated the relationship between childhood adversity and substance use. While previous work has investigated these relationships and have reported on them, they did not study sex differences. This work advanced the literature by studying sex differences in the associations between the three variables as well as the potential mediation relationship. Overall, this study observed sex differences in the association between attachment insecurity and harmful drinking, which may have implications in prevention and cessation strategies. Our results did not support sex as a moderator between attachment insecurity and harmful drinking.
**Figure 7-1. Study 1: Summary of results.** Attachment anxiety is a plausible mediator between childhood adversity and harmful drinking, and current smoking. Childhood adversity and attachment anxiety are identified as determinants of alcohol and tobacco in a cross-sectional survey study of primary care patients (N=348).

The key findings from Study 2 demonstrated that a photo of an attachment figure decreases craving and that the size of the effect is comparable to that of cigarette cues, but in the opposite direction. This work supported previous work that the presence of an attachment figure decreases negative affect. We also tested the effects of cigarette cues in this cohort and found that our results are comparable to previous studies. In this way, we were able to be confident in our results on the influence of an attachment figure on craving and affect. The hypothesis that an attachment figure photo affects craving in the context of smoking is completely novel. This work extends research on people serving as stimuli to influence craving by introducing the role of the attachment figure. Furthermore, this study hypothesized that this stimulus would decrease craving, which is also novel. The results of this study assert that it may be valuable to study smoking in the context of attachment theory in order to further examine factors that smoking incentives.
Figure 7.2. Study 2: Summary of results. In a series of experiments (N=38), cigarette cues increased craving. Attachment figure photos decreased craving, decreased negative affect and increased positive affect. The size of the effect of cigarette cues and attachment figure photos on craving are similar, but in the opposite direction.

7.2 Research Implications

There are several implications of this thesis work. The findings of this work, indicating that attachment insecurity may be associated with substance use, and that attachment theory provides a new perspective to understanding cue reactivity, have the potential to influence both theoretical models and clinical applications in the future. Much more research is needed in the area of attachment and substance use.

This thesis may influence theoretical models of substance use in two ways. First, our results suggest that attachment theory may provide a useful supplemental approach to understanding substance use. That is, substance use may be considered a consequence of childhood adversity and subsequently, high attachment insecurity. Attachment insecurity, characterized by feelings of insecurity, influences a multitude of other variables such as coping, depression and anxiety, body
image concerns, that are associated with substance use. We have modeled two aspects of addiction that complement other models. Our first model focuses on psychosocial determinants of addiction that are not currently well known or established. The model adds to current work by suggesting a new pathway in which experiencing childhood adversity may lead to adult substance abuse by way of high attachment insecurity. There has been a large body of research on the association between childhood adversity and adult addictions and explanations of the association. For instance, experiencing childhood adversity changes the brain (Shonkoff et al., 2011). In families where there is childhood adversity, the parents may have also addiction issues, and so the risk of substance use may be passed on genetically (Ducci & Goldman, 2008; Nestler, 2000). Unfortunately, these biological factors cannot be targeted for therapy at the moment. However, the knowledge that attachment patterns may influence substance-using adults with childhood adversity may allow for personalization of therapies based on attachment patterns. This knowledge may be implemented widely. For example, clients seeking to quit could fill out a survey to in order to identify their attachment patterns. Using that information, more appropriate cessation therapies or supplemental therapies can be applied. Much more research is needed to study how attachment insecurity may influence what kind of therapies people prefer and how these therapies may benefit each individual.

Second, attachment theory, as first described by John Bowlby, focused on a relationship between a child and an attachment figure. This interaction between these two individuals encompasses biological, psychological and emotional processes. The child physically depends on the parent for support in terms of safety and sustenance as part of the safe haven construct. Furthermore, the child relies on the parents for psychological and emotional support. Through repeated experiences, the child develops mental processes that promote trust and reliance on the parent. Just as attachment theory encompasses a multi-pathway variable approach, perhaps attachment theory will encourage a broader perspective on addiction that will include a multi-path model of addiction to include biological, sociological and psychological concepts. In West’s summary of addictions, he discusses a variety of theories, evidence and limitations. For instance, he summarized that the biological theory focuses on the pain reward pathway system in the brain. There is substantial evidence about the importance of the midbrain dopamine pathway in natural and pharmacological reward. However, he notes “the exclusive focus on brain reward pathways and executive control functions omits consideration of other psychological processes that have so far been described only at a more abstract level”. Moreover, “most of the research supporting the
theory has been undertaken using somewhat simplistic models of addictive behaviours in non-human species of doubtful relevance to humans” (West, 2013). West also notes that most modern theories of addiction integrate components of various theories. This amalgamation better illustrates the complexity of addiction.

In Study 2, we proposed a supplemental way to study and understand cue reactivity. Cue reactivity has been typically explained by a theory of addiction involving conditioning theory. It postulates people can acquire addictive behaviour patterns through repeating pairings of cues, response and reinforcements (Hyman, Malenka, & Nestler, 2006). However, treatments that promote recovery though cue-exposure techniques have not proved successful (Conklin & Tiffany, 2002). Additionally, this theory does not account for any role of self-conscious intentions, desires, or beliefs that have been acquired through experience (Vuchinich & Heather, 2016).

Our model of cue reactivity takes into account the dynamic processes between two people. While learning theory may explain a component of cue reactivity, incorporating attachment theory may help us get beyond the automatic or conditioning mechanisms, and include how conscious or unconscious beliefs and expectations may influence addiction as well. Attachment theory posits how recurrent experiences between people influence expectations, preferences and beliefs of behaviours in relationships, collectively termed attachment patterns. Attachment patterns influence how a person responds when safety or security is threatened. However, instances where safety or security is threatened, such as with childhood adversity, also influence attachment patterns. The results of this work suggest that attachment patterns also influence substance use. Research has shown that people are more likely to use or abuse substances when they have experiences childhood adversity. Perhaps using substances is a coping mechanism in response to threatened feelings of safety and security, such as in adverse childhood experiences.

In Study 2, seeing a photo of an attachment figure decreased craving, decreased negative affect and increased positive affect. Additionally, Eisenberger et al observed that an attachment figure photo appears to alleviate concerns about threat or distress (Eisenberger et al., 2011). Somehow, this reduction in threat signals is associated with a decrease in craving. While this thesis research did not explore this relationship, it would be important to decipher the mechanism responsible for this response. Studying these changes in cravings in the context of attachment theory allows
us to integrate how evolving interactions in attachment relationships may influence factors associated with smoking (craving and affect).

This work may be of interest for a variety of people including substance users themselves, and those responsible for designing cessation therapies. For instance, learning about the various determinants of substance use, including childhood adversity and attachment insecurity, may help smokers be more aware of their own behaviour and in turn help them with their choices. With this knowledge, perhaps some smokers may become more cognizant of why they are using substances. Other potential future implications of this work may involve changes to cessation therapies.
Chapter 8  
Future Directions

8 Overview

8.1 Future Directions

These two studies extended the current body of work into attachment insecurity and substance use. The results of this work have also yielded important questions to investigate in the future.

In order to further test the potential mediation relationship between childhood adversity, attachment insecurity and substance use, a large-scale longitudinal study may be useful. The design would be similar to previous studies such as Waters’, where attachment patterns would be assessed at twelve months, early adulthood (Waters et al., 2000b) and middle adulthood. Adversity and substance use would also be documented. To improve on that study, a comparison group that is matched on age, sex, background and socioeconomic background would be included. Longitudinal studies have their own advantages and disadvantages. The effects of childhood adversity could be studied prospectively and would not be limited by retrospective recall. We would be able to study the variables of interest over a longer interval. This would allow us to establish the timing of events (e.g. when adversity occurred, when participants started using substances). Because of this, there would be more confidence in the results from the mediation analyses. However, one disadvantage is that longitudinal studies usually suffer from high attrition rates in addition to the investments of time, cost and labour. However, as part of studying childhood adversity, conducting experiments is not an option to elucidate such relationships. Since several existing longitudinal cohorts have followed children into adulthood measuring variables that are related to those of interest in this thesis, it is possible that measuring substance use outcomes in the adult members of these cohorts would allow the mediation hypothesis to be tested longitudinally.

This thesis work found some similarity in the relationships between attachment insecurity and alcohol and tobacco use. It would be interesting to expand this research to study other drug use such as marijuana, as well as other addictive behaviours such as over-eating. Furthermore, one study has investigated the relationship between attachment insecurity and risky health behaviours, which included seat-belt use and risky sexual behaviours in women (Ahrens et al.,
Studying these behaviours and their relationships to attachment insecurity may vary in each sex would be helpful in clarifying the mechanisms that drive them.

In order to expand on this area of research, two issues need to be addressed in terms of the definition of attachment figure and non-attachment figure. In our study, we used Hazan and Zeifman’s definition of an attachment figure (Hazan & Zeifman, 1994). Each participant had to suggest one individual who fulfilled all three functions of an attachment figure. During the screening process, it was common for potential participants to delegate attachment functions to different people in their social circle. Deciphering which function of attachment is most relevant to craving and smoking behaviour would be beneficial to developing any additional or supplemental behaviour modification techniques. Of the three functions of an attachment figure (safe haven, secure base and proximity), safe haven would probably be the most important function as it deals directly with safety and survival. However, research needs to be done in order to test this hypothesis. Along the same lines, the “non-attachment figure” idea is currently rather vague and there is a lack of a standardized definition. A clear definition of a non-attachment figure needs be established. In our work, we defined a non-attachment figure as “someone a person knows, but would never go to for help or support”. In Study 2, this definition appeared to be satisfactory as it elicited craving, negative affect and positive affect that was in line with baseline conditions. However, more research needs to establish whether these effects are similar for other outcomes.

This work tested the size of the effect of a photo of an attachment figure on craving and affect. It would be beneficial to build on this work by testing the size of the effect of the actual presence of an attachment figure as well as the size of the effect of an imagined attachment figure on craving and affect. One possibility is that the results might show that physical proximity to the attachment figure (actual presence) would have the strongest effect on craving, then a photo and then an imagined attachment figure. Another possibility is that the results would show that all three exposures of an attachment figure would have the same effect size. Research of this nature will provide important information, which will be valuable in the design of cessation therapies.

In one study, participants received thermal stimulations during which time they were also exposed to seven study conditions 1) holding hand of partner 2) holding hand of male stranger (the experimenter), 3) holding an object (squeeze ball), 4) viewing a partner photo, 5) viewing a
photos of stranger (matched to partner), 6) viewing a photos of an object (a chair) and 7) viewing fixation crosshair (no manipulation). The results indicate that photos of partners had a stronger effect on the reduction of pain ratings than actual handholding. Furthermore, actual hand holding of strangers resulted in more pain compared to seeing photos of strangers (similar to holding an object compared to seeing photo of an object) (Master et al., 2009).

Figure 8-1. Pain ratings for various conditions.


One of the next possible steps would to test the effects of the attachment figure photo and cigarette cue together in a similar fashion as Eisenbeger’s study (Eisenberger et al., 2011). The experiment could consist of a design in which participants would handle their cigarette cues. At
the same time, participants would be exposed to photos of an attachment figure, a non-attachment figure or a stranger. This way, the additive effects an attachment figure photo and cigarette cues could be tested. This procedure would also improve the ecological validity of our investigation because people who smoke often smoke with their attachment figures.

In order to study the neural mechanisms of attachment phenomena, an imaging study may be conducted. One possibility would be to adapt Eisenberger’s protocol to test our own hypotheses that viewing photos of an attachment figure would alleviate cigarette cravings. Participants would complete a functional MRI scan, during which time they would handle smoking cues while being exposed to photos of an attachment figure, non-attachment figure, strangers and neutral object. We could test if 1) viewing an attachment figure (vs other photos) is associated with increased activity in the ventromedial prefrontal cortex (a neural region associated with safety signaling) and 2) viewing an attachment figure photo (vs other photos) would reduce activity in pain-related neural regions. Eisenberger and colleagues focused on the dorsal anterior cingulate cortex as this region is associated with cardiovascular responses to stress (Critchley, 2003; Critchley, Corfield, Chandler, Mathias, & Dolan, 2000) and bilateral anterior insula, which is associated with the unpleasantness of physical pain (Rainville, 2002).

Furthermore, while our results suggest that the photo of an attachment figure influences craving and affect, these results do not show the effect on actual smoking behaviour. A sensible next step would be to test if photos affect actual smoking behaviour, in a laboratory where participants may smoke when they are exposed to different cues, such as photos of people or the presence of different people.

Since there were consistent sex differences in our cross-sectional study, it would be useful to study how sex differences may influence craving and affect, and additionally, smoking behaviour, in response to photo exposures. Women are more likely to be influenced by external cues and negative mood while men are more likely to influenced by nicotine dependence (Perkins, 1996; Perkins et al., 2013). Assessing if and how men and women differ in their use of their attachment figures to modulate craving and affect could potentially influence future interventions.

The scope of research into the influence of attachment phenomena on substance use is still very limited. In general, there are potential contributions in this area that may significantly improve
the robustness of the research. Study design may incorporate a longitudinal design as well as an expansion of cues such as assessing the influence of an actual presence of an attachment figure. Refinement of the definition of the attachment figure and non-attachment figure would improve the potential for further study of attachment from a dynamic perspective. Over the last 6 years of this thesis work, not much novel research has been published on the influence of attachment on addiction. The results of this thesis demonstrate that there is potential for many exciting discoveries in this line of research.
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