

**CLIENT CHARACTERISTICS AND EXPERIENCES IN THREE METHADONE
MAINTAINANCE THERAPY MODELS: A STEP TOWARD TREATMENT
MATCHING**

by

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ABSTRACT

Methadone Maintenance Therapy (MMT) is the most common form of substitution therapy for opioid use disorder in New Brunswick. Results from systematic reviews indicate that MMT is a cost-effective treatment and is associated with improved outcomes. Although methadone dispensation is the primary component of MMT, several aspects of these programs differ depending on the treatment model. This variation has not been the focus of empirical research. The current study used a mixed-method design to assess client characteristics and experiences in three MMT treatment delivery models: 1) comprehensive programs which combine methadone treatment with mandatory physician appointments and counselling, 2) low-threshold-high-tolerance (LTHT) programs which focus on stabilization on methadone and offer primary healthcare services, and 3) fee-for-service methadone programs which are run by community pharmacies and where the dispensation of methadone is the core component. Seventy participants were recruited from five treatment sites in Saint John, New Brunswick and grouped based on model of care: Comprehensive program ($n = 21$), LTHT program ($n = 26$), and fee-for-service program ($n = 23$). Self-report questionnaires were used to collect data on demographics, substance use, personality, and treatment readiness. A semi-structured interview examining client history, progress in treatment, perception of treatment programs, and ancillary services was administered to a subset of these participants ($n = 31$). A series of one-way ANOVA tests examined group differences in substance use, personality, and treatment readiness. Results indicated that participants in the fee-for-service group reported higher levels of substance use severity and polysubstance use than participants in the comprehensive and LTHT groups. Content analysis was performed on interview data to assess the frequency of relevant themes in

the qualitative data. The most prominent themes included: wanting supportive staff; wanting more structured counselling; and, desiring more consistency/organization of services. These findings have important implications for the implementation of MMT, as this study suggests that fee-for-service models of MMT may not be as effective in reducing substance use as more traditional service delivery models. In addition, the availability and quality of mental health services should be reviewed and integration between addiction services and mental health services should be emphasized.

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Client Characteristics and Experiences in Three Methadone Maintenance Therapy
(MMT) Models: A Step Toward Treatment Matching

Overview

In North America, substance misuse is a major public health concern (Fischer, Kurdyak, Goldner, Tyndall, & Rehm, 2016; Fischer, Varatharajan, Shield, Rehm, & Jones, 2018; Rehm et al., 2009), with Substance Use Disorders (SUDs) amongst the most common mental disorder diagnoses (American Psychiatric Association [APA], 2013; Pearson, Janz, & Ali, 2013). Furthermore, over the last decade, the Canadian consumption of prescription analgesics has risen by 200% (World Health Organization, 2013). These drugs, which belong to the opioids class, are designed to relieve pain but have a high potential for abuse as they can produce euphoria and alleviate emotional symptoms (Degenhardt & Hall, 2012; Martin, Hurley, & Taber, 2007). In Canada, prevalence rates for any opioid use range between 10%-14% (Health Canada, 2014; Statistics Canada, 2017), but prescription opioid use for non-medical purposes is more prevalent in certain regions than others. For example, a 2005 study reported that 92% of illicit opioid use involved prescription opioids used for non-medical purposes in Saint John, New Brunswick (Christie, Murugesan, Manzer, O'Shaughnessey, & Webster, 2013). However, more recent data is needed to assess the current level of non-medical prescription opioid use in this region.

With the rise of opioid misuse, the demand for opioid-related substance use treatment has also substantially increased (Eibl, Morin, Leinonen, & Marsh, 2017; Fischer, Nakamura, Rush, Rehm, & Urbanoski, 2010). Methadone Maintenance Therapy (MMT) is one of the most common forms of substitution therapy for opioid use disorder.

In MMT, the illicit opioid of abuse, which is often a short-acting drug, is replaced with controlled doses of Methadone, a long-lasting opioid agonist, taken once a day (Viswanath, Chand, Benegal, & Murthy, 2012). Results from systematic reviews indicate that MMT is a cost-effective treatment and is associated with retention in treatment, reduction in illicit opioid use, reduced mortality, and improved social functioning while in treatment (Barnett, 2008; Bart, 2012; Bruneau et al., 2018; Fischer, Cruz, & Rehm, 2006; Mattick, Kimber, Breen, & Davoli, 2014; New Brunswick Addiction Services, 2009; Viswanath et al., 2012; West, O'Neal, & Graham, 2000). Although methadone dispensation is the primary component of MMT, these programs often include a number of additional services which differ depending on the program model.

Specifically, comprehensive programs adhere to a biopsychosocial model of MMT by combining pharmacological treatment with services that address the psychological and social problems associated with opioid misuse; however, MMT is a long-term therapy and the demand for MMT far exceeds the capacity in Canada (Christie et al., 2013). This reality has spurred the development of low-threshold, high-tolerance (LTHT) MMT programs, which aim to eliminate barriers that limit access and focus on keeping clients in treatment. Although a number of variables distinguish comprehensive programs from LTHT programs (e.g., duration in treatment, individualization of treatment, psychosocial intervention), both treatment delivery models have established effectiveness (Christie et al., 2013; Kourounisa et al., 2016; Simoens, Matheson, Bond, Inkster, & Ludbrook, 2005). A more recent model of MMT is fee-for-service methadone dispensation through community pharmacies or private clinics, but no research has focused on establishing the effectiveness of this treatment model.

A number of factors, such as age, severity of substance use, and nature of mental health issues, have been associated with prognosis in MMT (Brooner et al., 2013; Jaremko, Sterling, & Van Bockstaele, 2015; Keyser-Marcus et al., 2015; Proctor et al., 2015; Veilleux, Colvin, Anderson, York, & Heinz, 2012). In addition, over the last two decades, research has confirmed that there is considerable heterogeneity in substance misusers, which may affect treatment responsivity (Bohnert et al., 2013; Brands et al., 2008; Hien, Nunes, Levin, & Fraser, 2000). Thus, understanding which specific client characteristics are associated with success in different MMT programs may allow them to better target the treatment needs of their clients by tailoring their services to meet these unique needs. The current study aims to elucidate these variations.

Substance Misuse

Defining SUDs

In the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV-TR; American Psychiatric Association [APA], 2000), SUD was comprised of two general diagnoses: substance abuse and substance dependence, the latter of which was considered the more severe diagnosis (APA, 2000). These two diagnoses were based on research suggesting that a “dependence syndrome” formed an independent dimension relative to the social and interpersonal consequences of substance abuse (Hasin et al., 2013). This dichotomous approach caused numerous problems in the diagnosis of SUDs. For example, the reliability and validity of the abuse diagnosis were found to be much lower than for dependence using this model, and many diagnoses of substance abuse were based on the presence of only one DSM-IV-TR criterion, the minimum diagnostic threshold for substance abuse.

An additional issue with the DSM-IV classification of SUDs is that data reduction analysis demonstrated that substance abuse and dependence form one factor or two highly correlated factors, suggesting that researchers and clinicians should shift away from a dichotomous taxonomy, and move towards a dimensional model of SUDs (Gillespie, Neale, Prescott, Aggen, & Kendler, 2007; Krueger et al., 2004). Thus, this dichotomous categorization was revised in the fifth edition of the DSM (DSM-5; APA, 2013); substance-related disorders were collapsed into a single diagnostic category measured on a spectrum ranging from mild to severe. In the DSM-5, SUDs encompass 10 different classes of drugs: alcohol; caffeine; cannabis; hallucinogens; inhalants; opioids; sedatives, hypnotics and anxiolytics; stimulants; tobacco; and other substances. With regard to other addictive behaviours, the DSM-5 also includes gambling disorder, but due to insufficient peer-reviewed evidence to identify these behaviours as mental disorders, does not include “sex addiction”, “exercise addiction”, or “shopping addiction”. Similar criteria must be met for various SUDs; to obtain a SUD diagnosis, an individual must meet at least two out of 11 criteria which reflect cognitive, behavioural, and physiological symptoms. A SUD is categorized as mild in the presence of two or three symptoms, moderate with four or five symptoms, and severe with six or more symptoms. The diagnosis of a SUD can be applied to all 10 classes mentioned above, with the exception of caffeine.

The criteria for SUDs in the DSM-5 are captured across 11 symptoms, which are:

- 1) A substance is often taken in larger amounts or over a longer period than was intended;
- 2) There is a persistent desire or unsuccessful efforts to cut down or control substance use;
- 3) A great deal of time is spent in activities necessary to obtain a substance, use a

substance, or recover from its effects; 4) Craving, or a strong desire or urge to use a substance; 5) Recurrent substance use resulting in a failure to fulfill major role obligations at work, school, or home; 6) Continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of substance use; 7) Important social, occupational, or recreational activities are given up or reduced because of substance use; 8) Recurrent substance use in situations in which it is physically hazardous; 9) Substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by substance use; 10) Tolerance, as defined by either of the following: a) A need for markedly increased amounts of a substance to achieve intoxication or desired effect; b) A markedly diminished effect with continued use of the same amount of a substance; and, 11) Withdrawal, as manifested by either of the following: a) The characteristic withdrawal syndrome for a specific drug, and/or b) The substance (or a closely related substance) is taken to relieve or avoid withdrawal symptoms. Significant withdrawal has not been documented in humans after repeated use of phencyclidine, other hallucinogens, and inhalants; therefore, this criterion is not included for these substances (APA, 2013).

With regard to the treatment of SUDs, the authors of the DSM-5 (APA, 2013) concluded that empirically-supported interventions for DSM-IV substance dependence diagnoses are applicable for DSM-5 diagnoses of alcohol, cocaine, cannabis, and opioid use disorder of at least moderate severity. Moreover, pharmaceutical interventions (e.g., Naltrexone, Methadone) indicated for treating DSM-IV alcohol and opioid use disorders may be considered for DSM-5 moderate to severe alcohol or opioid use disorder

(Compton, Dawson, Goldstein, & Grant, 2013; Peer et al., 2013). An advantage of the DSM-5 unitary model of SUDs is its ability to capture mild SUD more consistently due to the fact that only 2 criteria are needed for diagnosis, rather than 3, as was the cut-off for a diagnosis of dependence. This modification has, however, not had a large impact on prevalence rates for SUDs overall (Peer et al., 2013).

Prevalence of SUDs

Research suggests that the lifetime prevalence of SUDs in Canada is approximately 21%, indicating that one in five Canadians will suffer from a SUD during their lifetime (Pearson et al., 2013). An alcohol use disorder is the most common SUD with an estimated lifetime prevalence of 18% (Pearson et al., 2013). Results from The Canadian Tobacco, Alcohol and Drug Survey (CTADS; Statistics Canada, 2017) have provided useful information about substance use in the general population of Canadian youths and adults. One notable finding from that survey concerns overall past year use of psychoactive pharmaceutical drugs (e.g., opioids, stimulants, and sedatives), which were reported by 22% of Canadian adults. Due to the fact that psychoactive pharmaceuticals are often prescribed by health professionals, participants were asked whether these drugs were used for legitimate conditions (e.g., mood disorder, ADHD, chronic pain) or for recreational purposes such as “the feeling it caused” or “to get high”, which was considered to indicate misuse of the substance. Opioids (i.e., hydromorphone, morphine, oxycodone, and codeine) were the most commonly misused pharmaceuticals, with a past year prevalence rate of 13% in adults (CTADS; Statistics Canada, 2017). Overall, it is estimated that approximately six million Canadians met criteria for SUDs in 2013, which is almost twice the prevalence of mood disorders (3.5 million; Statistics Canada, 2013;

Pearson et al., 2013). Hence, SUDs is one of the most prevalent mental health disorders in Canada. Furthermore, the consequences of substance misuse are prolific and present a substantial burden to the individual and society (APA, 2000; Jarl et al., 2008; Rehm et al., 2009; Smetanin et al., 2011).

Costs of SUDs

Substance misuse is associated with a number of health-related consequences. Common physical health problems include chronic conditions, such as heart disease and diabetes, and infectious diseases, such as human immunodeficiency virus (HIV) and hepatitis C virus (HCV; APA, 2000; Smetanin et al., 2011). The prevalence of co-occurring mental health conditions (i.e., depression, anxiety) in individuals who use substances is also high (Conrod & Stewart, 2005; Eibl et al., 2017). The potential for death due to fatal accident or overdose is also high; in fact, approximately 21% of all deaths per year in Canada are directly linked to substance use (Smetanin et al., 2011; Statistics Canada, 2015). Moreover, as it is associated with increased use of health care services, social services, increased criminal behaviour, and decreased work productivity, substance misuse can have a significant impact on quality of life. (Jarl et al., 2008). In addition to the individual's burden, there are substantial societal costs associated with substance misuse. In 2014, the annual economic cost of substance misuse in Canada was approximately \$40 billion, which includes expenses such as those associated with health care, incarcerations, and stolen or damaged property (Canadian Substance Use Costs and Harms Scientific Working Group, 2018).

Opioid Use Disorder (OUD)

Opioids include derivatives from the opium poppy (e.g., heroin and morphine), their synthetic counterparts (e.g., methadone, fentanyl), and semi-synthetic counterparts (e.g., hydromorphone; Degenhardt & Hall, 2012; Martin et al., 2007). Opioids are narcotic drugs that relieve pain and can produce euphoria. In high doses, opioids can cause coma and respiratory depression (Degenhardt & Hall, 2012; Martin et al., 2007). Prescription opioid analgesics (e.g., oxycodone) are commonly prescribed for the treatment and management of moderate to severe pain conditions (e.g., cancer pain, chronic pain; Griffin et al., 2016; Vest, Reynolds, & Tragesser, 2016). Opioids are classified as Schedule 1 drugs under the Controlled Drugs and Substances Act (CDSA), which means they are legal when prescribed by a licenced practitioner and used as prescribed (Canadian Centre on Substance Abuse, 2015). Given the psychoactive effects of opioids (i.e., euphoria, stress dampening), there is considerable potential for opioid misuse (Canadian Centre on Substance Abuse, 2015; Kosten & George, 2002; Martin et al., 2007). Misuse can involve borrowing or stealing medications, intentionally using higher-than-recommended doses, hoarding medications, tampering with medication or altering route of delivery, using opioids in conjunction with alcohol or other medications, and purchasing opioids illegally (Canadian Centre on Substance Abuse, 2015).

Opioids act by triggering reward pathways in the brain, which are implicated in both positive and negative reinforcement of behaviour (Contet, Kieffer, & Befort, 2004; Kosten & George, 2002; Navratilova et al., 2012; Smith, Fetsko, Xu, & Wang, 2002; Zubieta et al., 2001). When an opioid is introduced into the blood stream and subsequently enters the brain, the chemicals attach to mu opioid receptors on opioid

sensitive neurons. Mu opioid receptor activation is essential to mediate the rewarding properties of opioids (Contet et al., 2004; Kosten & George, 2002). Specifically, the activation of mu opioid receptors directly inhibits the ascending pathways for pain stimuli in the central nervous system, resulting in dampened pain perception, which negatively reinforces the use of opioids. Furthermore, when opioids stimulate the mu opioid receptors in the brain, cells in the ventral tegmental area produce the neurotransmitter dopamine and release it into the nucleus accumbens, which activates incentive motivation and perceived reward associated with the stimulus. A feedback loop is initiated through the prefrontal cortex which balances the drive for reward with the avoidance of actions that may cause harm. In individuals with Opioid Use Disorder (OUD), this feedback loop may be compromised (Kosten & George, 2002; Lutz & Kieffer, 2013).

Although genetic vulnerability to OUD has been established (Bart, 2012), repeated exposure to the substance will inevitably result in progressive adaptation of the brain to the availability of opioids (Kosten & George, 2002; Lutz & Kieffer, 2013). Repeated opioid use may alter baseline levels of dopamine in the nucleus accumbens such that naturally rewarding activities no longer result in dopamine release when opioids are absent (Kosten & George, 2002). Moreover, the brain's reward systems may become hypersensitive to drugs and drug-associated stimuli increasing the incentive salience of the substance, leading to progressively compulsive patterns of drug-seeking and drug-taking behaviour (Robinson & Berridge, 1993; 2001).

Pain avoidance or pleasure seeking may be the initial purpose for repeated opioid use; however, a compulsion to use opioids can build over time and exceed the basic drive for pain relief or pleasure. For example, opioid dependence can promote sustained drug-

taking behaviour in the absence of any subjective hedonic effects (Robinson & Berridge, 1993; Robinson & Berridge, 2001). This compulsion is the cornerstone of OUD and is the result of drug tolerance, physiological dependence, and cravings (Kosten & George, 2002; Stimmel & Kreek, 2000). Tolerance occurs with repeated exposure to increasing doses of opioids. Development of tolerance involves down regulation in the number of opioid receptors in the brain in order to adapt to the high level of opioids present. This results in a need to take escalating doses of the drug to perceive the narcotic effect, which can lead to opioid dependence and withdrawal effects when opioids are not present or taken in large enough quantities (Kosten & George, 2002).

Opioid withdrawal is one of the most potent factors influencing OUD (Kosten & George, 2002). The locus coeruleus is a region at the base of the brain where neurons produce the neurotransmitter noradrenaline, which stimulates wakefulness, breathing, blood pressure, and alertness (Kosten & George, 2002; Stimmel & Kreek, 2000). Opioids attach to mu opioid receptors in the locus coeruleus and suppress the release of noradrenaline, resulting in drowsiness, slowed response, and low blood pressure; all side effects of opioid use. With repeated use, neurons in the locus coeruleus adjust so that normal amounts of noradrenaline are released when opioids are present. When opioids are absent, the neurons produce excessive amounts of noradrenaline, leading to anxiety, jitters, muscle cramps, and diarrhea, which are all significantly aversive symptoms of opioid withdrawal syndrome (Kosten & George, 2002; Stimmel & Kreek, 2000).

Prevalence of OUD

There is an estimated 15-39 million opioid users worldwide, of whom approximately 23% will develop OUD (Degenhart & Hall, 2012; Hser, Evans, Grella,

Ling, & Anglin, 2015). In Canada, prevalence rates for any opioid use range between 10%-14% (Health Canada, 2014; Statistics Canada, 2017). Over the past century, opioid use in Canada has consisted predominately of heroin, but in recent decades this has changed with the availability of legally prescribed and illegally diverted prescription opioids such as hydromorphone (Dilaudid™), oxycodone (Oxycotin™), codeine (Codeine™), meperidone (Demerol™), morphine (MS-Conten™), and hydrocodone (Vicodin™; Fischer et al., 2006; Fischer, Rehm, Patra, & Cruz, 2006; Hser et al., 2015). Due to the illicit nature of non-prescription opioid use, obtaining an accurate estimation of use is often challenging; however, the prevalence of recreational prescription opioid use is estimated to be higher than for any illicit drug (Fischer, Lusted, Roerecke, Taylor, & Rehm, 2012; Fischer, Murphy, Rudzinski, & MacPherson, 2016). Although definitions of non-medical prescription opioid use vary across studies, an estimated 2-8% of adults reported past year non-medical prescription opioid use (Fischer & Argento, 2012; Fischer et al., 2016; Fischer, Rehm, Goldman, & Popova, 2008; Shield, Jones, Rehm, & Fischer, 2013; Statistics Canada, 2017).

Fisher and colleagues (2018) estimated annual prescription opioid misuse at 3.1% and prescription OUD at 1.2% of Canadian adults. Other reviews have resulted in similar estimates (Minozzi et al., 2013), with several recent national reports indicating similar rates of prescription drugs use among illicit opioid users (Fisher et al., 2016). Moreover, an increasing proportion (25-30%) of overdose deaths have been related to prescription opioids (Fischer et al., 2016). Canada has ranked as the largest per capita consumer of prescription opioids after the US (Kennedy et al., 2016) and is the leading consumer of hydromorphone (Fischer et al., 2006; Gomes et al., 2017). Although prescription

analgesic misuse has increased steadily in Canada, smaller communities such as in the Maritimes, have experienced disproportionate challenges related to their use and misuse. For example, in Saint John, New Brunswick 92% of illicit opioid use involved the use of prescription opioids for non-medical purposes, and there is little reason to believe this rate has declined since then (Christie et al., 2013).

Costs of OUD

Individual costs. Opioid misuse comes with considerable physical and mental health risks. There are four general types of adverse health effects related to opioid misuse: Acute effects of intoxication (accidental injury/violence); acute toxic effects (overdose); development of dependence; and adverse health effects of sustained use (chronic disease and viral infection; Degenhardt & Hall, 2012). Research has shown that opioid users have mortality rates that are 6 to 20 times greater (1-4% annually) than that of the general population and 20-30% of opioid users experience non-fatal overdoses each year (Amato et al., 2005; Fischer et al., 2006; Hser et al., 2015). In 2016, there were an estimated 2,816 opioid-related overdose deaths in Canada and opioid poisonings resulted in an average of 16 hospitalizations a day, a 53% increase over the last decade (Canadian Institute for Health Information, 2017). Furthermore, in Saint John, New Brunswick, the age adjusted rate of hospitalizations due to opioid poisoning, per 100,000 population, was 26.3%, which is the third highest rate in census metropolis areas in Canada (Canadian Institute for Health Information, 2017). OUD is considered the largest contributor to the global burden of disease attributable to illicit drug use and dependence (Degenhardt et al., 2013; Hser et al., 2015; Orpana, et al., 2018). For example, there is a higher prevalence of human immunodeficiency virus (HIV; 10%-35%) and hepatitis C

virus (HCV; 40%-90%; Degenhardt & Hall, 2012) in opioid misusers. Moreover, illicit opioid users account for 75% of new cases of HCV and 30% of new HIV infections in Canada (Fischer et al., 2006; Fischer et al., 2005). In a recent sample of Atlantic Canadian opiate users, 50% reported a concurrent diagnosis of HCV (Morrison, 2017).

In addition to numerous physical health hazards, there is an increased prevalence of mental health problems and psychiatric disorders (40-80%) among illicit opioid misusers, with mood disorders being most common (Degenhardt & Hall, 2012; Fischer et al., 2006; Fischer et al., 2005; Hser et al., 2015; Huang et al., 2006; Priester, et al., 2016; Strain, 2002). A meta-analysis by Fischer et al. (2012) reported markedly high levels of mental health problems and pain symptoms in non-medical prescription opioid users. Thirty-two percent (32%) of users reported some form of mental health issues, with depressive disorders being the most common (17%), and 48% reporting chronic pain. These prevalence estimates for depression and pain were 2 to 3 times higher than in the general population (Fischer et al., 2012). More recently, in an Atlantic Canadian sample, Morrison (2017) reported that 50% of current opioid users had an Axis I disorder based on DSM-IV-TR classification, with the most prevalent diagnoses being depressive conditions (34.6%) and anxiety disorders (25%). Although opioid misuse and mental health problems are frequently reported concurrently, it is not clear whether mental health problems precede opioid misuse or if they are a consequence of sustained drug misuse (Wall et al., 2000). Regardless of the causal path, co-morbid mental health problems are a significant consideration in opioid misuse given that depression can lead to increased health risks such as needle sharing, overdose, and greater quantity and frequency of drug use (Fischer et al., 2006; Hser et al., 2015; Jones et al., 2002).

Socioeconomic costs. Opioid misuse can have a significant impact at a societal level and illicit opioid users are commonly characterized by social marginalization. Recent Canadian statistics indicate that individuals experiencing hospitalizations due to opioid poisonings had lower levels of income and education, and higher levels of unemployment (Carriere, Garner, and Sanmartin, 2018). Furthermore, in Ontario, individuals in lower-income neighbourhoods experienced substantially higher rates of opioid-related harms than those in higher-income neighbourhoods (Cairncross et al., 2018). Recently, the overall annual cost of opioid misuse in Canada was estimated to be \$3.5 billion (Canadian Substance Use Costs and Harms Scientific Working Group, 2018). Hence, there is a substantial burden associated with illicit opioid use, both to the individual and to society. Therefore, it is pertinent to examine evidence-based treatment strategies for individuals with OUD.

OUD Treatment

Efforts to effectively treat OUD have resulted in the development of diverse treatment options, including psychosocial interventions, detoxification programs, opioid substitution therapy, and multidimensional programs (Dutra et al., 2008; Hser et al., 2015; Kourounis et al., 2016; Marsch & Dallery, 2012). Among the most significant treatment outcomes studied have been retention in treatment, the elimination or reduction of illicit opioid use, reduction in criminal activity, and improved social functioning (Bart, 2012; Clark et al., 2002; Van den Brink & Hassen, 2006; McCambridge et al., 2007; Viswanath et al., 2012). Any form of treatment for OUD should address these key elements; however, research has demonstrated that some interventions are more effective than others in promoting successful outcomes (Connery, 2015; Mayet, Farrel, Ferri,

Amato, & Davoli, 2014; Veilleux et al., 2012). The treatment options most commonly compared in the literature include: psychosocial interventions, abstinence-based treatments, and opiate agonist maintenance treatments.

Psychosocial Interventions

Psychosocial interventions for OUD are common and many of these interventions focus on addiction counselling and cognitive behavioural-based therapies. OUD counselling generally involves individual or group sessions with a trained therapist, who may be a recovered substance user, and typically aims to address thoughts and behaviours that contribute to, or sustain, substance use (Dugosh et al., 2016; Hagman, 1994). Common among cognitive behavioural approaches are contingency management interventions, which involve offering rewards or incentives to encourage specific behavioral goals and treatments that concentrate on relapse prevention. Relapse prevention focuses on targeting an individual's triggers for substance use and developing coping skills to adapt the individual's response to these triggers (Dugosh, et al., 2016; Mayet et al., 2014; Simpson et al., 1997; Veilleux et al., 2012).

Overall, systematic reviews have indicated poor outcomes in opioid misusing patients who are provided only psychosocial interventions (Mayet et al., 2014; Veilleux et al., 2012). For example, in one study, 80% of clients returned to opioid use within two years of intensive residential treatment (Bart, 2012). Greater empirical support has been established for combining psychosocial interventions with pharmacotherapies to treat comorbid or underlying problems associated with substance use (Amato et al., 2011a; Dugosh, et al., 2016; Dutra et al., 2008; van den Brink & Hassen, 2006). In a 2008 review assessing the impact of psychosocial interventions in the treatment of SUDs, seven

studies examined opioid use exclusively (Dutra et al., 2008). Psychosocial interventions included contingency management, relapse prevention, cognitive behavioral therapy, and combinations of these treatments. Among these treatments, contingency management resulted in the lowest attrition rate (29.4%) over a 12-week treatment period. With the combination of psychosocial and pharmacological components of treatment, approximately 36% of opioid users achieved abstinence during the same period; however, this difference was not statistically significant (Dutra et al., 2008).

A review by Amato et al. (2011a) found that contingency management, community reinforcement, individual psychotherapy, and family therapy were associated with higher rates of abstinence, treatment compliance, and treatment completion compared to pharmacotherapy alone. However, in a subsequent review, these authors noted that the only benefit of adding psychosocial treatment to pharmacological interventions was an increase in abstinence rates at follow-up, suggesting that counselling may help maintain gains over time (Amato et al., 2011b). It is important to note that, in empirical research, follow-up periods are often limited to less than one year, which is not ideal in a population with high attrition and relapse rates (Hser et al., 2015). Furthermore, there is great heterogeneity in the type of psychosocial interventions offered across studies, rendering it difficult to isolate efficacious treatment components or the best combination of psychosocial and pharmacological interventions (Dugosh, et al., 2016). Most treatment programs have some combination of medication and psychosocial support available, so it is often difficult to clearly compare psychosocial interventions to combined treatment (Dugosh, et al., 2016; Mayet et al., 2014).

Abstinence-Based Interventions

The abstinence-based approach to OUD necessitates the complete removal of opioids from an individual's system. Opioid detoxification can be very challenging, as withdrawal from opioids often includes aversive symptoms, including irritability, anxiety, chills, nausea, diarrhea, sweating, bone and muscle weakness, and insomnia (Hassanian-Moghaddam, Afzali, & Pooya, 2014; Veilleux et al., 2012). In fact, illicit opioid users report fear of the substantial physiological effects of withdrawal as a primary motive for sustained opioid use (Dunn, Saulsgiver, Miller, Nuzzo & Sigmon, 2015; Murphy, Bentall, & Owen, 1989; O'Brien, Childress, Ehrman, & Robbins, 1998; Voelker, 2018). During treatment, opioid detoxification is implemented in a controlled and systematic manner to minimize discomfort; however, due to the intensity of opioid withdrawal symptoms and the extent of neurological changes associated with long-term opioid use, detoxification alone has shown little success and is associated with poor retention rates (Mattick, Breen, Kimber, & Davoli, 2009; Mayet et al., 2014; McCambridge et al., 2007; Veilleux et al., 2012). Furthermore, loss of tolerance through opioid detoxification can lead to fatal overdoses in the event of subsequent opioid use (Degenhardt, Larney, Kimber, Farrell, & Hall, 2015; Digiusto, Shakeshaft, Ritter, O'Brien, Mattick, 2004; Strang et al., 2005). Detoxification should be considered a first step in treatment, and should include ongoing relapse prevention treatments, including psychosocial and pharmacological interventions (Collins, Kleber, Whittington, & Heitler, 2005; Hser et al., 2015; O'Conner, 2005).

One such pharmacological adjunct is naltrexone, a semi-synthetic opioid antagonist that blocks the opioid receptors in the brain, blocking the effects of exogenous

opioids, and precipitates withdrawal in opioid dependent individuals (Bart, 2012; O'Connor, 2005). Naltrexone is often administered orally in tablet form, but can be administered intramuscularly for extended release (Bart, 2012). Given that naltrexone blocks opioid receptors, rather than activating them, it initiates withdrawal symptoms. Therefore, difficulties with adherence and retention have been reported in naltrexone treatment (Bart, 2012; Bartu, Freeman, Gawthorne, Allsop, & Quigley, 2002). Early studies on the efficacy of naltrexone in the treatment of OUD reported attrition rates from 38-69% (Hollister, Schwin, & Kasper, 1977; Hulse & Basso, 1999; Scifan & Marra, 1990). Similar studies reported retention rates at less than 20% after six months of naltrexone treatment (Hollister et al., 1977; Judson, Carney, & Goldstein, 1981). More recent studies have reported similar retention rates ranging between 20-25% (Bartu et al., 2002). Collins et al. (2005) found that among patients given naltrexone and psychotherapy treatment after a detoxification program, only 11% were retained for 12-weeks and provided no more than 2 positive urine samples. Moreover, Minozzi et al. (2011) reported that oral naltrexone, with or without psychotherapy, was no better than placebo or no pharmacological treatment with regard to retention and substance use. As a consequence of the rapid tolerance that develops when opioids are used, as well as the effects of opioid withdrawal syndrome (Degenhardt et al., 2015; Digiusto et al., 2004; Hassanian-Moghaddam et al., 2014; Strang et al., 2005; Veilleux et al., 2012), complete abstinence is challenging for many opioid dependent individuals. These suboptimal outcomes associated with traditional substance use interventions have led to an approach that focuses less on absolute abstinence and more on reducing the harms associated with illicit drug use (Viswanath et al., 2012).

Opioid Agonist Maintenance Treatment

OUD is considered a chronic relapsing condition (Hser et al., 2015; Viswanath et al., 2012); therefore, a harm reduction intervention is not considered a cure for OUD, but rather, reflects a long-term care approach to treatment. Opiate agonist maintenance treatment, or substitution therapy, is a harm reduction intervention for OUD in which the primary objectives are reducing the intensity and frequency of relapse, limiting overdose risk, reducing criminal activity, limiting HIV infection, and promoting psychosocial adjustment (Bruneau et al., 2018; Veilleux et al., 2012; Viswanath et al., 2012). In substitution therapy, illicit opioids, which are often short-acting opioids, are replaced with controlled doses of a medically safe, long-lasting opioid agonist (Bruneau et al., 2018; Viswanath et al., 2012). Opioid agonists bind to the opioid receptors in the brain and exert effects similar to endogenous opioids, resulting in reduced cravings and prevention of withdrawal symptoms. Furthermore, in appropriate dosage, opioid agonists prevent euphoria when illicit opioids are administered by maintaining a tolerance threshold sufficiently high enough to block the euphoric effect of subsequent opioid use (Bart, 2012; Mattick et al., 2009; Stimmel & Kreek, 2000; Veilleux et al., 2012). Substitution therapy is a corrective approach and it is often necessary for patients to remain on opioid agonists for indefinite periods of time; however, patients can spend less time partaking in drug-related activities and may return to being productive members of society (Health Canada, 2008; Joseph, Stancliff, & Langrod, 2000; Mattick et al., 2014). The two most commonly recommended opioid agonists for the treatment of OUD are methadone and buprenorphine (Bruneau et al., 2018; WHO, 2009). Results from systematic reviews indicate that substitution treatment with either methadone or

buprenorphine is associated with retention in treatment, reduction in illicit opioid use, reduced mortality, and improved social functioning while in treatment (Amato et al., 2005; Bart, 2012; Connery, 2015; Viswanath, Chand, Benegal, & Murthy, 2012).

Methadone is a synthetic opioid agonist that binds to opioid receptors in the brain and decreases the effects of subsequent opioid use (Bart, 2012; Connery, 2015). The elimination half-life of methadone is approximately 34-36 hours and it is administered daily, generally in liquid form. Methadone exerts a stable and continuous influence on opioid receptors, which alleviates craving, without producing the euphoria associated with illicit opioids (Jospeh, Stancliff, & Langrod, 2000; Kosten & George, 2002; Viswanath et al., 2012). Higher doses of methadone more effectively block the euphoria if short-acting opioids are used; however, respiratory depression can occur if methadone is administered in a dose that greatly exceeds the patient's level of tolerance (Bart, 2012; Mattick et al., 2009; Stimmel & Kreek, 2000). These effects can be reversed with the administration of an opioid antagonist, such as naloxone (Wagner, Bovet, Haynes, Joshua, & Davidson, 2016; Walley et al., 2013). The greatest risk of toxicity occurs in the beginning phases of methadone treatment, before a stable dose is achieved, and when used in conjunction with other medications that affect respiration, such as benzodiazepines (Viswanath et al., 2012).

Buprenorphine is a semi-synthetic partial opioid agonist administered sublingually (under the tongue; Bart, 2012; Connery, 2015). The elimination half-life of buprenorphine is approximately 37 hours and is administered daily or on alternate days (Bart, 2012; Jones, 2004). Buprenorphine is considered a safe opioid agonist treatment, as there is minimal risk of respiratory depression due to its partial agonistic properties (Bart,

2012; Bruneau et al., 2018; Connery, 2015; Viswanath et al., 2012; West, O'Neal, & Graham, 2000), but overdose and death can occur if buprenorphine is administered by rapid delivery through injection or used in combination with other drugs that affect respiration, such as benzodiazepines (Bart, 2012). For this reason, Buprenorphine is usually combined with naloxone (SuboxoneTM), a semi-synthetic opioid antagonist, to prevent buprenorphine diversion (i.e., injecting the drug to get high). Buprenorphine has good sublingual bioavailability and naloxone has good intravenous bioavailability; therefore, the antagonist is inactive if SuboxoneTM is taken orally, but is activated by injecting the drug, triggering unwanted withdrawal symptoms (Bart, 2012; Bruneau et al., 2018; Hassanian-Moghaddam et al., 2014; Viswanath et al., 2012).

Comparative reviews have indicated that both methadone and buprenorphine are associated with higher abstinence and retention rates compared to no-treatment controls; however, methadone is associated with superior treatment retention (Amato et al., 2005; Barnett, 2008; Connery, 2015; Van den Brink & Hassen, 2006; Mattick et al., 2014; Viswanath et al., 2012). A meta-analysis comparing methadone and buprenorphine indicated reduced substance use in patients undergoing methadone treatment, with urinalysis as the measured outcome (West et al., 2000). Furthermore, Amato et al. (2005) showed that MMT was better at reducing heroin use than no treatment (37% vs 87%, respectively), and slightly better than buprenorphine maintenance treatment at high doses (19% vs 23%, respectively). Moreover, a recent review (Connery, 2015) assessed opioid abstinence rates in opioid maintenance treatment, and indicated that methadone had higher abstinence rates (60%) than placebo/detoxification controls (6-30%, respectively); whereas abstinence rates for buprenorphine fell between these two forms of treatments

(20-60%). Perreault et al. (2015) reported that MMT had higher retention rates than buprenorphine maintenance treatment at flexible doses (63% vs 53%, respectively), and higher doses of methadone resulted in superior retention.

Buprenorphine is considered a safer medication than methadone, as the risks of toxicity are lower, but these toxicity effects are not as easily reversed if they do occur (Bruneau et al., 2018; Viswanath et al., 2012). Moreover, the risk of diversion is higher for buprenorphine, if not combined with naloxone, as the drug can be dissolved and injected (Joseph et al, 2000; Viswanath et al., 2012). Methadone, however, is considered more cost-effective (\$30/month) than treatment with buprenorphine (\$200/month; Barnett, 2008; Viswanath et al., 2012). In addition to the cost savings associated with methadone medication, comprehensive reviews have shown that MMT is associated with a reduction in criminal activity and many of the cost savings associated with the treatment of OUD are related to this decline (Krebs, Kerr, Montaner, Wood, & Nosyk, 2014; Prendergast, Podus, Chang, & Urada, 2002; Schwartz et al., 2014). The majority of MMT clients reduce or stop their purchase and use of illicit drugs, and the stability associated with treatment allows clients to find legitimate employment (New Brunswick Addiction Services, 2009).

Overall, the main differences between methadone and buprenorphine include: dosage (daily vs alternate day dosing), abuse potential (buprenorphine alone can be diverted and taken intravenously), cost (methadone is more cost-effective), safety (toxicity risk is lower with buprenorphine), and effectiveness (methadone is somewhat more effective in terms of retention and abstinence). In Canada, buprenorphine is now recommended as the first option for opioid agonist therapy, given its safety profile

(Bruneau et al., 2018); however, methadone remains the most common intervention in many provinces, given its cost-effectiveness (Barnett, 2008; Bruneau et al., 2018; Fischer et al., 2006; Van den Brink & Hassen, 2006; Mattick et al., 2014; Viswanath et al., 2012; West et al., 2000).

Methadone Maintenance Treatment (MMT) Models in Canada

History of MMT in Canada

Methadone was originally synthesized in Germany during World War II as a potent analgesic and was first used in opioid detoxification during the 1940s. It was not until the 1960s that the initial MMT programs were established in North America (Joseph et al., 2000). The first MMT program in Canada was developed by psychiatrist Robert Halliday in British Columbia (Health Canada, 2002). By the late 1960s, methadone treatment was recognized as an appropriate and effective treatment for OUD across the country; however, treatment remained highly restricted in Canada until the mid-1990s (Fischer, 2000; Health Canada, 2002). In 1995, federal control of MMT programs was transferred to provincial governments, which increased MMT availability and utilization across Canada (Eibl et al., 2017; Fischer, 2000; Fischer et al., 2016; Strike, Urbanoski, Fischer, Marsh, & Millson, 2005). As a result, the number of patients enrolled in MMT across Canada between 1999-2010 increased from 12,000 to 50,000, and all provinces reported active opioid management treatment programs by 2010 (Luce & Strike, 2011). In Canada, there are two streams of MMT, which operate in parallel. Provincially funded MMT clinics generally offer ancillary and/or primary care services, in addition to MMT. Conversely, private fee-for-service MMT is provided through pharmacies and individual or group organizations, and do not require the provision of supplementary services (Eibl,

et al., 2017; Luce & Strike, 2011). Although MMT programs vary in approaches to treatment and availability of ancillary services, they all include the administration of methadone and have controlled dispensing policies.

MMT Dispensation Policies

Methadone is a controlled substance in Canada and each province has its own licensing body that regulates methadone prescription (Bruneau et al., 2018; Zaric, Brennan, Varenbut, & Daiter, 2012). The administration of methadone generally begins with an induction phase, during which clients receive initial doses of methadone ranging from 10-30mg. Methadone doses are gradually increased until the client has reached their optimal dose; this process is called stabilization. An optimal dose should relieve withdrawal symptoms, block the euphoria from short acting opioids, and reduce drug cravings without sedation or other significant side effects (Bruneau et al., 2018; Health Canada, 2002; New Brunswick Addiction Services, 2009). The optimal dose for the majority of clients can be established within two to six weeks and is usually between 60 and 120mg (CAMH, 2004; New Brunswick Addiction Services, 2009). Once the optimal dose is reached, further adjustment should not be necessary. It is important to note that MMT begins with the administration of low doses of methadone which may be below the client's tolerance level. Consequently, many clients will "top up" their dose with illicit opioids during this initial stage to combat withdrawal symptoms, and accommodations are made for this reality (New Brunswick Addiction Services, 2009).

After stabilization, clients may qualify for methadone "carries", meaning that they can take home a designated number of doses rather than coming to the clinic/pharmacy every day for supervised dispensation (Health Canada, 2002; New Brunswick Addiction

Services, 2009). To qualify for carries, clients generally must have: established clinical stability (achieved an optimal dose, demonstrated responsibility for the medication and used it as prescribed, regularly attended program requirements); spent an appropriate amount of time in treatment (more than three months); and displayed the ability to safely store medication (established stable living conditions, own a locked box to secure carries). Carries are generally not awarded to individuals known to be using other substances regularly or sporadically (e.g., benzodiazepines; New Brunswick Addiction Services, 2009). Although methadone dispensation is the primary component of MMT, programs often include a number of additional services which differ depending on the treatment delivery model. In Canada, there are three general models of MMT that reflect different levels of treatment intensity: comprehensive programs, low-threshold programs, and methadone only programs.

Comprehensive MMT Program Model

In Canada, the oldest model of service delivery for provincially funded MMT clinics is the comprehensive methadone treatment program (Luce & Strike, 2011). Comprehensive programs adhere to a biopsychosocial model of MMT by combining pharmacological treatment with services that address the psychological and social problems associated with OUD. Clients are provided access to counselling services that may include: crisis intervention, case management, individual/group therapy, vocational counselling, substance use counselling, and health counselling. Comprehensive programs generally have mandatory physician appointments, random urine screening, and have stricter policies relating to involuntary discharge (New Brunswick Addiction Services, 2009). Prospective clients are given a thorough assessment to determine eligibility for

MMT, which is based on predetermined admission criteria. For example, clients need to meet the DSM-5 criteria for OUD and many programs have age restrictions for MMT (i.e., 18 years of age or older; Health Canada, 2002). Clients who meet these criteria (i.e., DSM-5 diagnosis, age) are admitted into the program, whereas those who do not are provided with a referral to another program (other treatment options or admission to in-patient Addiction Services, as appropriate; Health Canada, 2002; New Brunswick Addiction Services, 2009).

Comprehensive programs often divide treatment into stages, with specific goals associated with each stage of treatment. For example, the first stage of treatment may consist of induction and stabilization, in which the goal is to achieve an optimal dose of methadone for the client. This phase generally consists of weekly physician appointments, group and/or individual counseling, and weekly/random urine screening. An induction/stabilization phase should be a minimum of six weeks in duration; however, stabilization usually takes approximately 18 months from the time the client begins treatment (New Brunswick Addiction Services, 2009). The second phase of treatment may consist of a transitional stage, during which clients can learn how to manage acute withdrawal from non-opioid substances and focus on motivation for recovery. This phase usually consists of physician appointments every two weeks, group and/or individual counseling, weekly/random drug screening, and access to community resources. A transition phase should last a minimum of six weeks. Finally, the last component of treatment may include a community phase. The goal of this phase is to develop short-term stability, understand the impact of addiction, learn stress management skills, and develop a long-term recovery plan. This phase generally consists of physician

appointments every three to four weeks, possible methadone carries, ongoing assessment, group and/or individual counselling, weekly/random drug screening, support, evaluation, and access to community resources (New Brunswick Addiction Services, 2009). These services are provided as long as the client remains in the MMT program (Health Canada, 2002; New Brunswick Addiction Services, 2009).

Given the widely varying experiences, expectations, and needs of individuals entering MMT, it is difficult to determine an optimal duration of treatment for all clients; many clients remain in MMT for several years or indefinitely. The duration of MMT should be based on individual need rather than pre-determined time limits; patients should continue in MMT for as long as they continue to benefit from treatment (Health Canada, 2002). Early studies showed that clients leaving MMT have higher relapse rates than those who remain in treatment (Dole & Joseph, 1978; Stimmel, Goldberg, Rotkopt, & Cohen, 1977). For example, Dole and Joseph (1978) reported that only 10% of individuals remaining in MMT reported illicit opioid use, whereas 70% of clients who had left treatment experienced relapse. Furthermore, only 20% of those who had left treatment had done so after completing an MMT program and successfully weaning off methadone. Individuals who dropped out of treatment prematurely, or who were involuntarily discharged, had poorer outcomes. Death rates, especially overdose, are also high among patients who are unfavorably discharged or drop out of methadone treatment (Zanis & Woody, 1998). More recently, Gossop, Marsden, Stewart, and Treacy (2001) compared MMT with methadone-reduction treatment, which is a medium-term, abstinence-oriented substitution therapy. Patients in methadone reduction treatment were less likely to remain in treatment compared to patients in maintenance treatment, and

more rapid methadone reduction was associated with reduced abstinence from illicit opioids. For a client to attempt methadone termination, they should be socially stable, have supportive relationships with non-drug users, have discovered alternative ways of dealing with drug use triggers, and be confident and motivated to achieve abstinence. If treatment termination is advised, then tapering off methadone should be done as slowly as possible. If relapse occurs after tapering, then clients should be offered re-entry into the program (New Brunswick Addiction Services, 2009).

In the initial stage of the program, clients are allowed a period of adjustment in order for stabilization to take place and this is usually around three months. During this time, accommodations for continued or sporadic drug use may be made. After the adjustment period, involuntary discharge may occur if there is a continued failure to meet conditions and expectations of the program. Reasons for involuntary discharge can include: unexcused missed appointments; producing urine screens that contain cocaine, narcotics, or benzodiazepines; tampering with urine specimens; acting violently (physically or verbally); taking part in illegal activities; missing more than three methadone doses; and soliciting or selling illegal drugs on the clinic premises (New Brunswick Addiction Services, 2009). Given the stricter admission criteria and discharge policies that are common to comprehensive MMT programs, many opioid users remained untreated (Fischer et al., 2006). For example, in 2006, it was reported that only 20-30% of estimated Canadian illicit opioid users received MMT at any given time (Fischer et al., 2006). Furthermore, comprehensive programs have shown high attrition rates. For example, a recent review of long-term cohort studies reported average attrition rates of 20-30% in methadone treated samples (excluding mortality; Hser et al., 2015). Moreover,

a 2011 assessment of a comprehensive MMT program in Saint John, New Brunswick, found an attrition rate of 43% between the time of intake and a 1-year follow-up, with main reasons for discharge being non-compliance and voluntary discharge prior to treatment completion (Burbridge, 2012).

Low-Threshold/High Tolerance (LTHT) MMT Program Model

In response to the high attrition rates and the limited capacity of comprehensive programs (resulting in waitlists for entry into treatment; Christie et al., 2013), a newer provincially funded treatment delivery model, low threshold high tolerance (LTHT) MMT, has emerged. In this model, “low threshold” refers to the elimination of barriers that limit access to treatment; clients do not require a doctor’s referral (i.e., self-referred) and intake assessments are minimized. The term, “high tolerance” refers to the program’s focus on keeping clients in treatment. LTHT programs do not have mandated counselling and urine tests are scheduled rather than random (Christie et al., 2013; Kourounis et al., 2016). Stabilization on methadone is the core component of LTHT programs and dispensation is supervised at a clinic or an approved pharmacy. Moreover, psychosocial services are made available to clients, but they are not mandatory (Christie et al., 2013; Kourounis, et al., 2016).

LTHT programs generally have more lenient discharge policies than comprehensive programs and there is no involuntary discharge policy for illicit drug use (Christie et al., 2013; Finch, Groves, Feinmann, & Farmer, 1995; Torrens, Castillo, & Perez-Sola, 1996). Involuntarily discharge is usually only implemented for violent behaviour, persistent non-attendance to regular reviews of progress, and drug trafficking on clinic/pharmacy premises (Finch et al., 1995; Torrens et al., 1996). Research suggests

that this approach may be most useful for clients who are considered difficult to manage (e.g., psychiatric history, polysubstance use) or who have had previous failures in both outpatient and inpatient treatment (Finch et al., 1995; Perreault, et al., 2015). It may seem counterintuitive that complex clients, who should, in theory, require more services, may respond better to LTHT treatment programs. One explanation is that, for these clients, abstinence may not be a realistic goal initially; hence, they may not be willing to take part in comprehensive programs that stress abstinence from all illicit drug use (Perreault, et al., 2015). Many LTHT programs still provide access or referrals to psychosocial interventions; therefore, complex clients may only struggle with the policies of comprehensive MMT clinics and may still benefit from ancillary services (Perreault, et al., 2015). It may be that by allowing for more flexibility, complex clients can progress in their recovery. Furthermore, LTHT programs have demonstrated success in treatment retention and illicit opioid use. For example, a preliminary assessment of a LTHT MMT program in Saint John, New Brunswick reported a 1-year retention rate of 95% and 67% of clients achieved abstinence from illicit opioids (Christie et al., 2013).

Fee-for-Service MMT Program Model

Finally, some programs offer fee-for-service methadone dispensation through community pharmacies or private practice/clinics. Fee-for-service programs do not require the provision of any supplementary services or psychosocial components (Eibl, et al., 2017). Given that this service is a newer form of methadone dispensation, a gap exists in the literature with respect to this mode of delivery and its effectiveness. A comparable model of MMT delivery is interim methadone treatment, offered to patients in the United States who are on a waitlist for a comprehensive program. Interim methadone treatment

involves only the dispensation of daily methadone and emergency services (Sigmon, 2015). A recent review indicated that interim MMT results in improved outcomes on measures of illicit opioid use, retention, criminality, and likelihood of entry into comprehensive MMT compared to waitlist controls (Sigmon, 2015). Furthermore, randomized control trials have shown that interim methadone maintenance treatment resulted in lower rates of positive urine tests than waitlist controls (Schwartz et al., 2006; Schwartz, Jaffe, Highfield, Callaman, & O'Grady, 2007).

Evidence suggests that all three MMT delivery models produce favorable outcomes; however, it remains unclear which model represents the optimal clinical framework for addressing the diversity of individuals with OUD. It would be beneficial to directly compare client characteristics experiences in these three levels of MMT delivery, as this knowledge would inform treatment policies and promote better matching of clients to the most efficacious interventions for their needs and characteristics (Kourounis et al., 2016). New Brunswick, Canada, is uniquely situated in that the province offers all three of these MMT program options, often delivered concurrently in the same region.

MMT Programs in New Brunswick

In the province of New Brunswick, Canada, rates of opioid misuse rose rapidly in the early 21st century. For example, in 2002-2003, 484 drug-addicted individuals indicated opioids as their drug of choice and this number more than tripled to 1,470 individuals within one year (New Brunswick Addiction Services, 2009). This increase in opioid misuse spurred the development of New Brunswick's first four provincially funded comprehensive MMT programs (Moncton, Miramichi, Fredericton, and Saint

John) in 2005 (Luce & Strike, 2011). In 2009, the first LTHT methadone clinic opened in Saint John, New Brunswick, in response to the limited capacity and strict admission/retention criteria of the existing comprehensive program. Currently, there are 11 provincially funded methadone clinics in New Brunswick communities (Fredericton, Miramichi, Moncton, Perth-Andover, St. Stephen, Welshpool, Woodstock, and Saint John), which all fall under the jurisdiction of the Addictions and Mental Health Services branch of Horizon Health Network and which follow the guidelines put forth in Health Canada's (2008) *Best Practices for MMT*. More recently, the Canadian Research Initiative in Substance Misuse (CRISM) developed a set of guidelines which will provide healthcare professionals with more recent evidence-based recommendations for treating OUD (Bruneau et al., 2018). New Brunswick also has several private MMT clinics and pharmacies, which provide methadone on a fee-for-service basis.

Regardless of the treatment model, the main goal of MMT is to reduce the harms associated with illicit drug use and provide access/referral to services that may facilitate improvements in social functioning and quality of life (Bart, 2012; Van den Brink & Hassen, 2006; New Brunswick Addiction Services, 2009; Viswanath et al., 2012). MMT has demonstrated success in a number of important outcome measures; however, given the heterogeneity of substance users, some clients experience greater treatment success than others. Therefore, it is also important to consider variables that may predict successful MMT outcomes, as this would enable MMT programs to better target the treatment needs of different individuals within their programs (Perreault et al., 2015).

Predictors of Positive MMT Outcomes

There has been ample research examining predictors of MMT outcomes; however, findings have been inconsistent. For example, there is no clear pattern of

association between predictor variables and treatment retention, which is a primary outcome for most MMT assessments (Perreault et al., 2015). Furthermore, predictor variables investigated in relation to MMT outcomes are generally socioeconomic or nominal (e.g., age, gender, race, housing status, physical health, substance use, judicial problems, education, methadone dose, and previous treatment), and may have less prognostic value than psychological predictors, such as mental health comorbidity and motivation to change (Perreault et al., 2015; Proctor et al., 2016). Overall, characteristics associated with the treatment model under examination have demonstrated more consistency in the prediction of MMT outcomes than demographic characteristics associated with the client.

Treatment Characteristics

Length of treatment. Longer duration of treatment has been consistently associated with improved outcomes in MMT clients, such as reduced risk of relapse, less criminal activity, and improved social functioning (Corsi, Kwiatkowski, & Booth, 2002; Cox, Allard, Maurais, Haley, & Small, 2013). For example, Gossop et al. (2001) demonstrated that MMT clients who remained in treatment for a full two years were significantly less likely to use illicit opioids than those who left treatment early. Furthermore, Corsi et al. (2002) found that participants who were in treatment one month prior to a follow-up assessment were more likely to report no illegal income (84.6%) compared with those not in treatment (66%).

Methadone dosage. Higher methadone dose also has been consistently linked to improved outcomes in MMT (Corsi et al., 2002). Specifically, average methadone doses of 60mg to 120mg produce better results than lower doses (Kleber, 2008). For instance,

Cox et al. (2013) reported that higher methadone doses were associated with greater retention and abstinence from illicit opioids. Proctor et al. (2015) also demonstrated that higher methadone doses were related to increased retention at 6-, and 12-month follow-up assessments. Furthermore, when methadone doses are insufficient, patients are more likely to engage in ongoing substance use (Taylor, 2015).

Prior experience with methadone. Prior treatment experience has a negative effect on MMT outcomes (Claus, Mannen, & Schicht, 1999; Corsi et al., 2002; Gibson et al., 2008). For example, Corsi et al. (2002) found that first-time treatment seekers, who stay in treatment, report better outcomes than clients who have had numerous treatment attempts. In their study, first time clients reported approximately 60 times fewer heroin injections at follow-up than treatment repeaters, who reported approximately 33 times fewer heroin injections at follow-up. It is possible that clients with less severe symptoms are more successful upon their first experience in MMT, whereas more severe clients may need several attempts at MMT before experiencing significant improvements (Gibson et al., 2008). Alternatively, MMT repeaters may require a different treatment approach, as these clients may be less likely to engage in treatment.

Client Characteristics

Age. A recent review reported that age does not predict recovery in opioid misusers and mortality only increases with age due to the chronicity of opioid use disorder (Hser et al., 2015). In contrast, younger clients reported improved social functioning and were less likely to be prematurely discharged from MMT at 12-month follow-ups (Morrison, 2017; Proctor et al., 2015). Furthermore, Proctor et al. (2016)

reported that clients who were under 35 years of age were more likely to be abstinent at a 12-month follow-up than younger clients.

Gender. A number of studies have shown that gender is not a significant predictor of retention or abstinence (Kelly, O'Grady, Mitchell, Brown, & Schwartz, 2011; Levine et al., 2015; Schiff, Levit, & Moreno, 2007). However, other studies have reported gender differences in these treatment outcomes. For example, being male has been associated with premature discharge and lower rates of abstinence at 12-month follow-ups (Proctor et al., 2015; Proctor et al., 2016). Furthermore, some studies have reported increased uptake and retention in female heroin users in MMT programs (Bach et al., 2015; Deck & Carlson, 2005; Kelly et al., 2011). Although gender is not a consistent predictor of success in MMT programs, gender-specific predictors of success may be important when considering treatment outcomes. For example, females generally experience higher rates of physical and psychological disorders in addition to OUD, and this may complicate treatment and affect treatment outcomes (Bawor et al., 2015).

Poly-substance use. The use of multiple substances among opiate users is common and is related to poorer treatment outcomes (Fischer et al., 2005; Stitzer & Simon, 2006; Veilleux et al., 2012). For example, Proctor et al. (2016) found that 26.4% of clients reported benzodiazepine use at intake to an MMT program, whereas 20.7% reported use of cannabinoids; 10.8% reported cocaine use, and 9.1% reported use of amphetamines. Poly-substance use has been associated with premature discharge in MMT programs (Proctor et al., 2016) and using fewer substances at intake has been linked to improved social functioning (Morrison et al., 2017). Concurrent alcohol use is also common among opioid users and is often perceived as less harmful than other

substances; however, given that alcohol is also a central nervous system depressant, drug potentiation can occur and result in overdose, coma, and death (Taylor, 2015).

Mental health comorbidity. The prevalence of co-morbid psychopathology is also high in individuals with OUD and these disorders complicate OUD treatment, leading to poorer treatment outcomes (Brooner et al., 2013; Chen, Huang, Lin, Wu Chang, & Chang, 2013; Cousins et al., 2011; Jaremko, Sterling, & Van Bockstaele, 2015; Kenna, Nielsen, Mell, Schiesl, & Swift, 2007; Morrison et al., 2017; Priester et al., 2016). In a Canadian sample of prescription opioid users, 28.1% reported self-medicating for feelings of depression and anxiety (Brands, Blake, Sproul, Gourlay, & Busto, 2004). A recent assessment reported that 20-30% of MMT clients reported symptoms of depression, 41% met the diagnostic threshold for post-traumatic stress disorder (PTSD), and 59% met criteria for a personality disorder (Hser et al., 2015). Moreover, Morrison et al. (2017) reported that 34.6% of participants receiving MMT services in Saint John, New Brunswick, Canada met criteria for any depressive disorder and 25% met criteria for any anxiety disorder. Comorbid psychopathology often involves adjunct psychopharmacological treatments (e.g., anti-depressants, anxiolytics) which may further complicate OUD treatment (Veilleux et al., 2012).

Cacciola, Alterman, Rutherford, McKay, and Mulvaney (2001) examined the relationship between comorbid psychiatric disorders (other than SUD) and treatment outcomes in MMT patients. At intake, 75.2% of participants had a current DSM-IV comorbid Axis I or Axis II psychiatric disorder (in addition to SUD) and one third of participants had a combination of Axis I and Axis II diagnoses (in addition to SUD). Individuals with combined Axis I and Axis II disorders generally reported greater

psychological distress, family/social problems, and medical problems at admission and at a 7-month follow-up. Furthermore, at follow-up, patients with combined Axis I and Axis II disorders had the highest attrition rates (34.9%), followed by patients with an Axis II personality disorder (32.8%). Only 17.6% of patients with a single SUD and 17.4% of patients with an additional Axis I disorder left treatment prematurely. Overall, individuals with comorbid mental health conditions tend to be more treatment resistant and have poorer MMT outcomes compared to clients without dual diagnoses (Fulton, Barrett, MacIssac, & Stewart, 2012; Keyser-Marcus et al., 2015; Morrison et al., 2017).

Treatment Readiness. Readiness to change is thought to be a crucial factor in changing substance use behaviour, with greater readiness to change predicting better SUD treatment outcomes (Bertholet, Cheng, Palfai, Samet, & Saitz, 2009; Carpenter, Miele, & Hasin, 2002). The majority of these studies; however, have assessed the impact of readiness to change on alcohol and cigarette use. For example, Myers, van der Westhuizen, Naledi, Stein, and Sorsdahl (2016) examined the relationship between readiness to change and alcohol use behaviour and found that high recognition (acknowledging substance use problem and a need to change) was associated with a reduction in problem alcohol use at 3-months. Research findings have been less consistent with regard to illicit substance misuse, such as OUD (Gossop, Stewart, & Marsden, 2006; Perreault et al., 2015). For instance, Gossop et al. (2006) assessed the relationship between readiness to change and MMT outcomes and found no significant associations between overall readiness for change and use of opiates or stimulants at follow-up; however, taking steps to change (as one facet of treatment readiness) was associated with decreased benzodiazepine use at follow-up. Moreover, Perreault et al.

(2015) investigated the stages of change model in relation to treatment retention in a LTHT MMT program and found no association between stages of change and treatment retention. It was argued that the stages of change model may be more related to treatment response (drug use and at risk behaviours) than treatment retention.

In sum, predicting treatment success is an important factor when considering substance use interventions for clients; however, research is mixed concerning predictors with the most prognostic value. Given that research has demonstrated substantial heterogeneity in substance users, diverse characteristics among opioid users may help explain differential treatment responses in MMT clients. Moreover, given the various MMT treatment models available, some factors may be more effective at predicting success in certain treatment modalities due to the characteristics of the clients it attracts.

Client-Treatment Matching

Identifying distinct groups of substance users may allow for a better understanding of substance misuse etiology and may enhance treatment outcomes by targeting individual needs in substance use interventions. Client-treatment matching strategies have gained popularity in recent decades in response to research supporting heterogeneity in the substance misusing population. For example, Project MATCH was a large multisite clinical trial intended to increase therapeutic impact by appropriately matching clients to alcoholism treatments (Project MATCH Research Group, 1993; 1998). Individuals were matched to specific treatments based on variables such as gender, ethnicity, psychopathology, severity of alcohol dependence, as well as measures of anger, autonomy, religiosity, self-efficacy, and social functioning (Babor & Del Boca, 2003; Miller & Cooney, 1994). However, this trial resulted in only marginally better outcomes

and researchers have posited that the lack of treatment matching effects resulted from having used inappropriate matching variables. Indeed, the project focused on the generic demographic characteristics of participants (e.g., ethnicity, religiosity, etc.) rather than on those variables that contribute to, or maintain, their addiction (i.e., risk factors; Allen et al., 1997; Conrod et al., 2000b; Culter & Fishbain, 2005; San, 1999). Hence, some researchers have sought to elucidate whether treatment matching improved SUD outcomes within the framework of motivation and personality models.

Substance Use Motives and Personality

Individuals use substances for a variety of reasons and motivation for substance use appears to be an important variable in classifying users. Cooper (1994) proposed a four-factor model of drinking motives, which describes reasons for alcohol consumption. This motivational model of drinking has been applied successfully to the use of other substances, such as cigarette and marijuana use (Tate, Pomerleau, & Pomerleau, 1994). Essentially, individuals use substances for both internal and external reasons (source of reward). Internal sources of reward may include positive mood change, whereas external sources of reward may include acceptance from peers. Individuals also may use substances to obtain a positive outcome or to avoid a negative one (valence of outcomes). Four substance use motives are created by combining source of reward and valence of outcomes: coping motives (internal source, avoiding negative outcome); conformity motives (external source, avoiding negative outcome); enhancement motives (internal source, obtaining positive outcome); and social motives (external source, obtaining positive outcome). Enhancement motives are related to increased levels of substance use (Cooper, 1994); however, coping and conformity motives are associated with greater

substance-use related problems, irrespective of substance use quantity (Carey & Correia, 1997; Comeau, Stewart, & Loba, 2001; Cooper, Russell, Skinner, & Windle, 1992).

Within this four-factor model of substance use, coping, enhancement, and conformity motives appear to represent risk factors for heavy and/or problem use (Comeau et al., 2001; Cooper, 1994).

Conrod, Pihl, Stewart, and Dongier (2000a) proposed a typology of substance misuse that incorporates both substance use motives and personality characteristics to explain the heterogeneity of substance using populations. Although this model was originally developed using adult female substance users, this classification system has been validated with adolescent and mixed gender samples (Krank et al., 2011; Woicik, Stewart, Pihl, Conrod, 2009). In this model, four distinct factors emerged which correspond to the personality factors of sensation seeking, impulsivity, anxiety sensitivity, and introversion-hopelessness. These personality factors have been differentially associated with the use of distinct substances and comorbid psychopathology. Sensation seeking, which is characterized by the search for new or varied experiences and feelings, has been associated with increased use of substances for their euphoric and intoxicating effects (Krank et al., 2011). Conrod et al. (2000a) found that substance-using females with a personality profile high in sensation seeking exhibited a preference for alcohol, which may be due to the psychostimulant properties of alcohol that affect sensitivity to reward. The personality factor of impulsivity is characterized by an insufficient ability to delay future reinforcement when faced with situations that may bear positive reinforcement and has been related to increased risk of early-onset substance use problems (Krank et al., 2011; Pulkkinen & Pitanen, 1994).

Conrod et al. (2000a) found that substance-using females who scored higher on impulsivity also exhibited antisocial personality traits and an unconstrained pattern of drug use/misuse.

In contrast to impulsivity and sensation seeking traits, anxiety sensitivity is characterized by an expectation or fear that anxiety will lead to physical illness, social embarrassment, or loss of mental control and has been associated with increased substance use and a higher risk of dependence (Krank et al., 2011; Stewart, 1996; Stewart, Peterson, & Pihl, 1995). Moreover, Conrod et al. (2000a) found that substance-using females with higher levels of anxiety sensitivity reported preferential use of substances with anxiolytic effects, and the highest rates of anxiolytic drug use disorder. Finally, introversion-hopelessness is characterized by sensitivity to punishment related to social and goal-oriented behaviour (Depue & Collins, 1999). Research suggests that individuals higher in interpersonal sensitivity and/or punishment sensitivity prefer substances with analgesic effects (such as alcohol and opioids) because analgesics suppress the inhibitory effects of punishment (Gray, 1982; Krank et al., 2011). Conrod et al. (2000a) found that substance-using females presenting depressive and pessimistic cognitions reported preferential use of substances with analgesic properties and were most prone to opioid misuse. In sum, both anxiety sensitivity and introversion/hopelessness are characterized by substance use for negative reinforcement motives.

Based on their emerging typology, Conrod et al. (2000b) investigated the use of personality matched interventions with female substance misusers. Specifically, these researchers targeted coping skills that were specifically relevant to distinct personality

profiles via cognitive behavioural techniques during two 90-minute intervention sessions. To test the effectiveness of matched interventions for reducing substance misuse, Conrod et al. (2000b) compared the outcomes of clients who were matched to a treatment corresponding to their personality profile (matched), with those who participated in a treatment matched to a different personality profile (mismatched). Both groups were compared to a control condition in which clients were exposed to a general motivational control intervention. Overall, results showed that the proposed intervention was more effective than both the mismatched intervention and the motivational control intervention. The proposed intervention emphasized the development of appropriate coping skills, which resulted in improvement in both substance misuse and co-morbid psychiatric disorders. For example, Conrod et al. (2000b) reported a 23% abstinence rate in the matched treatment group after six months following this brief intervention. This rate was significantly higher than abstinence rates in the mismatched treatment group (11.4%) and the control group (6.4%). These findings have been replicated in diverse samples and extended to other substance use prevention strategies (Conrod, Castellanos, & Mackie, 2008; Conrod, Castellanos-Ryan, & Mackie, 2011; Conrod et al., 2013). Collectively, these findings suggest that substance misusers may benefit from treatment that is targeted more specifically to their individual needs and motivations for use.

Matching Opioid Users to Treatment

The majority of typological models for substance use have focused on alcohol, whereas fewer studies have considered these models for treatment matching in illicit drug users. Given the rise in non-medical prescription opioid use, there has been a growing interest in examining differences among opioid users in particular. For example, Chan,

Gelernter, Oslin, Farrer, and Kranzler (2011) aimed to identify subtypes of opioid users and found five homogenous groups of opioid users differing on opioid-related measures, demographics, and prevalence rates of substance use and psychiatric disorders.

Specifically, *low-level opioid users* were characterized by a low prevalence of OUD and other psychiatric disorders; *moderate opioid users*, were characterized by lower levels of poly-substance use (other than opioids) and psychiatric disorders; *heavy, late-onset opioid users* were characterized by more severe OUD, more intravenous drug use, older age of first use (19 years or older), and less poly-substance use; *heavy, early-onset, highly-comorbid users* were characterized by severe OUD, younger age of first use (under 19 years), more severe psychiatric comorbidity, and higher levels of poly-substance use; and *heavy, early-onset, opioid users* were characterized by the heaviest opioid use, younger age of first use (under 19 years), and moderate poly-substance. This latter group was also most likely to inject drugs and commit criminal offenses associated with opioid use. Although Chan et al.'s study (2011) focused primarily on describing differences among opioid users, it did not focus on etiological factors associated with opioid misuse, which could inform opioid use interventions and treatment responses. Furthermore, their study did not include information on the type of opioids used (i.e., heroin vs prescription opioids). Knowledge of opioid type could have resulted in additional subtypes of opioid users, as numerous studies have found differences between prescription and illicit opioid users (Fischer, Patra, Firestone-Cruz, Gittins, & Rehm, 2008; Green, Black, Grimes-Serrano, Budman, & Butler, 2011; Sigman, 2006).

A comparison between prescription opioid misusers and heroin misusers by Fischer et al. (2008) revealed that prescription opioid users and misusers who also used

heroin were more likely to be older, use benzodiazepines and cocaine, access drop in shelters, and were less likely to use walk in clinics (compared to heroin-only users). Prescription opioid-only misusers were more likely to be white, receive legal income, use drugs by non-injection, have physical health problems, and use private physician services (Fischer et al., 2008). A more recent study comparing prescription opioid and heroin misusers identified four different groups: *heroin-other opioid users* (used heroin and non-prescribed prescription opioids), *other opioid-only users* (used non-prescribed prescription opioids but never heroin), *heroin-only users* (used heroin but not non-prescribed prescription opioids), and *non-opioid drug users* (used drugs but never heroin or non-prescribed prescription opioids). These four groups differed on types of substances used, severity of substance use, and co-morbid psychopathology. For example, *heroin-other opioid users* were more likely to have several SUDs (e.g., cocaine, hallucinogen, sedative, amphetamine, and tranquilizer) compared with these other groups, whereas *heroin-only users* had reduced odds of sedative and tranquilizer use disorders compared with other opioid-only users. Moreover, *non-opioid drug users* exhibited lower rates of all SUDs and lower rates of mental health disorders (e.g., mood, anxiety, pathological gambling, and personality) compared to the opioid-using groups (Wu, Woody, Yang, & Blazer, 2011). Wu et al.'s study further demonstrates diversity among groups of opioid users, which suggests that distinguishing prescription opioid users from heroin users may have implications for opioid use interventions and treatment response.

Other studies have also examined differences within prescription opioid users. For example, Green et al. (2011) described four typologies of legitimate and non-medical

prescription opioid users. The *use as prescribed* group was characterized by older age and lack of problem use. *Prescribed misusers* were characterized by older age, a history of drug abuse, a higher incidence of mental disorders, and were more likely to be female. *Medically healthy abusers* (i.e. users less likely to use opioids by non-medical route of administration) were characterized by younger age, a history of drug use, and more legal problems. Finally, *illicit users* (i.e. users more likely to use opioids by injection) were characterized by younger age, a history of drug abuse, using illicit opioids and other drugs, and were more likely to inject opioids. Although informative, these current typologies focus primarily on demographic characteristics of opioid users and do not take into account the etiological mechanisms or motives associated with use, which may explain group differences and better inform treatment. For example, there is considerable heterogeneity among prescription opioid misusers with regard to opioid use motives. A survey of college students revealed three main motives for non-medical prescription opioid misuse: “pain relief” (63%), “because it gets me high” (31.9%), and “experimentation” (26.8%; McCabe, Cranford, Boyd, & Teter, 2007; Zacny & Lichtor, 2008). Moreover, Rigg and Ibanez (2010) reported the most common motives for misusing prescription opioids were: “to get high”, “to sleep”, and “for anxiety/stress”. It is also important to consider that concurrent pain conditions are common in prescription opioid misusers. For instance, in a Canadian sample of MMT clients, 86% who used illicit prescription opioids exclusively reported their primary reason for starting opioid use was chronic pain management and 62% of clients who started exclusively with illicit prescription opioids reported chronic pain as their primary reason for use (Brands et al., 2004).

These differences among opioid misusers suggest a marked heterogeneity among those with a diagnosis of OUD; these variations could have important implications for treatment (Chan et al., 2011). For instance, Sigman (2006) reported that prescription opioid misusers exhibited a profile of characteristics that predicted a more favorable treatment response, including less severe opioid use and IV drug use as well as greater social stability compared to primary heroin abusers. Furthermore, researchers report that clients who report pain relief as their primary motive for opioid use typically stay in treatment longer and have better outcomes than clients who report other motive for opioid use (Bohnert et al., 2013; Potter et al., 2013).

Some studies have looked at matching opioid users to different types of treatments (e.g., methadone vs buprenorphine; substitution therapy vs. psychosocial intervention; Avants, Margolin, Kosten, Rounsaville, & Schottenfeld, 1998; Fareed, Casarella, Amari, & Drewler, 2009), but treatment matching has not been investigated within different levels of MMT service intensity. Moreover, much like early typological classifications for substance misusers, which were only moderately successful, current opioid user profiles emphasize demographic and environmental factors and may not be reliable classification variables. Typologies that highlight personality factors and substance use motives have shown more promise, as these models focus on factors that precede and maintain substance abusing behaviours (Babor et al., 1992; Conrod et al., 2000b). Certain personality risk factors are related to different motives for substance misuse; therefore, targeting specific motives in prevention and treatment interventions can be of great utility. Matched treatment interventions focusing on these personality factors have been shown to result in superior prevention and treatment outcomes (Conrod

et al., 2008; Conrod et al., 2011; Conrod, Castellanos-Ryan, & Strang, 2010; Conrod et al., 2013; Conrod et al., 2000b). Therefore, it is worth exploring whether the personality risk factors of the individuals in MMT vary based on the service delivery model from which they are receiving services.

The Current Study

The different MMT models available in New Brunswick provide a unique opportunity to investigate whether matching client characteristics with MMT model characteristics improves outcomes. However, we must first understand how the needs of MMT clients affect their response to MMT within different treatment models. The current study used both qualitative and quantitative research methods to address this latter goal, by assessing client characteristics and experiences at five MMT sites in Saint John, New Brunswick. Saint John's Ridgewood Specialized Opiate Treatment Clinic (SOTC) has features common to comprehensive program models, such as mandatory physician appointments to obtain methadone prescriptions. This program, however, has recently adopted a more lenient approach to continued substance use and counselling is no longer mandatory. The Center for Research, Education, and Clinical Care of At-Risk Populations (RECAP) and the Saint John Uptown Methadone Clinic (UMC) at St. Joseph's Health Center follow the LTHT model and also offer a "bare bones" MMT program. In the "bare bones" program clients can be maintained on a dose of 40mg or less of methadone, even if they do not attend meetings or regular physician appointments. Clients must attend a yearly check-up with a nurse practitioner, who faxes methadone prescriptions to the client's pharmacy. Port City Pharmacy and Phoenix Recovery Center Pharmacy are fee-for-service methadone dispensaries, where clients can fill methadone

prescriptions provided by private practitioners. Assessing client characteristics and experiences at these different sites may provide insight into which client and treatment characteristics may be important for client-treatment matching processes. This information can be used as a framework in future evaluations of client-treatment matching programs for MMT in New Brunswick.

The current study also adds to the opioid treatment literature in several ways. First, MMT was developed to treat heroin misuse; however, it is increasingly being used to address the growing problem of disordered prescription opioid use. Even though these substances are pharmacologically similar, clinically relevant differences exist between heroin and prescription opioid misusers (Brands et al., 2004; Fischer et al., 2016; Joseph, Stancliff, & Langrod, 2000). In New Brunswick, there is a disproportionately high rate of non-medical prescription opioid use (Christie et al., 2013). Therefore, general findings concerning MMT outcomes may not be representative of this population. The current study collected information regarding MMT experiences in a largely prescription opioid-misusing population.

Next, there is a lack of qualitative research concerning different MMT models. Some studies have used qualitative methods to examine client experiences in MMT, but focus mainly on perceived stigma and quality of life (De Maeyer et al., 2011; Gourlay, Ricciardelli, & Ridge, 2005; Granerud & Toft, 2015; Sanders, Roose, Lubrano, & Lucan, 2013; Smye, Browne, Varcoe, & Josewsk, 2011). One recent study (Yarborough et al., 2016) used semi-structured interviews to investigate client perceptions of, and preferences for, treatment; however, that study focused primarily on client medication preference (methadone vs. buprenorphine). Qualitatively assessing client experiences in

different MMT programs provides a more in-depth understanding about which programs features are most important for promoting client satisfaction and improving the capacity for meeting client needs, thereby improving retention.

Finally, to my knowledge, there has been no attempt at treatment matching among different MMT programs models. Many treatment options are available, yet due to the chronic relapsing nature of OUD, many users drop out of treatment or return to an opioid dependent-lifestyle, remaining at risk for numerous health consequences (Veilleux et al., 2012). The current study identified factors that differentiate clients in different MMT treatment models, may guide treatment matching techniques, and in turn, improve client outcomes.

Hence, the following hypotheses were addressed in the quantitative portion of the current study:

1. Clients in the MMT programs will differ in terms of substance use severity, such that clients in the comprehensive program will have the lowest level of substance use severity, clients in the methadone only program will have the highest level of substance use severity, and clients in the LTHT program will fall between these two other programs on substance use severity.
2. Clients in these MMT programs will differ in terms of personality risk factors; however, given the dearth of literature exploring this, no specific group differences were predicted.
3. Clients in these MMT programs will differ in terms of treatment readiness, such that clients in the comprehensive program will have the highest level of treatment readiness, clients in the methadone only program will have the lowest level of

treatment readiness, and clients in the LTHT program will fall between these two other models on treatment readiness.

The following research questions guided the qualitative portion of the current study:

1. Are these MMT programs perceived differently by clients? What do clients find most helpful/useful in their MMT program?
2. What ancillary services are available and being used in these MMT programs? What client needs are being met by these services?
3. What barriers are associated with access to treatment in these MMT programs? How can these programs better meet the needs of clients?

Methods

The current study used a mixed methods design to assess client characteristics and experiences in three MMT models of care. Clients were recruited in five separate MMT clinics. A convergent mixed methods design was used, which merges qualitative and quantitative data in order to provide a comprehensive analysis of the above noted research questions and hypotheses. Qualitative and quantitative data was collected simultaneously, analyzed separately, and integrated for overall discussion (Creswell, 2014; Hesse-Biber & Leavy, 2010). The quantitative portion of the current study involved the administration of self-report measures to current MMT clients. These measures assessed substance use severity, personality risk factors, and treatment readiness, which have been found to impact satisfaction and success in SUD treatment programs (Conrod et al., 2013; Krank et al., 2011; Myers et al., 2016; Proctor et al., 2016; Veilleux et al., 2012). The qualitative portion of the current study involved the

administration of semi-structured interviews with current MMT clients in each of the MMT programs. An interpretative phenomenological approach was used for interview development, implementation, and analysis. This approach reflects the lived experiences of individuals and explored individual client experiences in MMT to gain insight into variables that may be central to choosing the most appropriate treatment model for clients (Creswell, 2014; Hesse-Biber & Leavy, 2010). Using a mixed methods design allowed me to develop a detailed view of the use and impact of MMT for individuals, and also generalize findings to the local population of MMT clients (Creswell, 2014).

Participants

Seventy participants were recruited from five MMT clinics in Saint John, New Brunswick. The clinics were grouped based on their general model of care: Comprehensive Program Model (Group A; $n = 21$), LTHT program model (Group B; $n = 26$), and fee-for-service program model (Group C; $n = 23$). To take part in the present study, participants had to be current clients at one of the five MMT sites and must have been in treatment for at least three months to ensure sufficient experience with program features and stabilization on methadone. The sampling procedure was purposive, as the researcher attempted to recruit a gender-balanced sample at each treatment site. However, convenience sampling was used, as the researcher recruited any participants who met the required criteria on a first-come-first served basis until an adequate sample size was achieved. All participants were asked to complete the quantitative portion of the current study and a subset of the sample ($n = 31$) was selected to take part in the qualitative portion. Participants were selected to take part in the interviews on a first-come-first-serve basis until the desired, gender-balanced, sample size was reached. Although there

was a possibility of self-selection bias, it is not overly concerning as the total sample is similar to the subsample in terms of experience with methadone (e.g., number of years in treatment, age; see Table 2). Furthermore, the total sample is demographically and geographically local; therefore, the researchers will not be attempting to generalize findings beyond the local population (Guest, Bunce, & Johnson, 2006; Robinson, 2014).

Although there is no standard rule for determining sample size in qualitative research designs, the general consensus is that a sample should provide enough scope for developing cross-case generalities, while not over-burdening the researcher (Robinson, 2014). Sample sizes should be large enough so that no new information emerges from further qualitative investigation (thematic saturation; Guest et al., 2006; Robinson, 2014). Guest et al. (2006) reported thematic saturation after the analysis of 6 to 12 interviews, whereas Robinson (2014) suggested a sample size of 3 to 16 individuals when using an interpretative phenomenological approach. In the current study, thematic saturation emerged with a sample size of 32 ($n = 9$; $n = 11$; $n = 12$), which is consistent with the aforementioned guidelines.

Furthermore, it is important to note that, given the examination of multiple correlated variables in the quantitative portion of current study, a multivariate analysis of variance (MANOVA) would be optimal for testing these hypotheses. This multivariate analysis would allow for the examination of relationships between the response variables. In addition, using a single analysis to test these variables simultaneously would keep the family error rate equal to $\alpha = .05$. Unfortunately, the sample size required to conduct a MANOVA with adequate statistical power (i.e., $N > 200$) was unrealistic in the context of the current study. Moreover, a minimum sample size of $n = 30$ per group is recommended

to conduct a one-way ANOVA to achieve a statistical power of .80 (Cohen, 1988; Wilson-VanVoorhis & Morgan, 2007), Therefore, the current findings should be interpreted with caution, as there is a greater likelihood of Type I errors in the current analysis.

Materials and Measures

Semi-structured interview (see Appendix A). A semi-structured interview was developed for use with clients in MMT programs who participated in the present study. These interview questions reflect a focus on the client's personal experience with MMT and were guided by the existing research questions. The interview includes five main questions concerning the participant's treatment readiness and progress in MMT treatment, perception of the MMT treatment programs, use of ancillary services, barriers to MMT and factors associated with recovery, and overall MMT experience. This structure allows the interviewer to focus on the specific topic of interest (MMT programs), but can generate information about how each client views their own experience (Gergen, 2014; Hesse-Biber & Leavy, 2010). A *Sony ICDPX370 IC Voice Recorder* was used to record all interviews.

Participant Information Questionnaire (researcher developed; see Appendix B).

This questionnaire contains basic demographic questions related to age, gender, ethnicity, and opioid misuse. The DSM-5 Opioid Use Disorder Checklist was included to assess severity of OUD (APA, 2013). The 11-item checklist includes the DMS-5 diagnostic criteria for opioid use disorder, which are scored dichotomously (Yes/No). OUD can be assessed using a criteria count (from 2 to 11) as an overall indicator of severity, or by using the number of criteria met to indicate mild (2 to 3 criteria), moderate

(4 to 5), and severe (6 or more) OUD (APA, 2013; Hasin et al., 2013). The inter-observer reliability estimate for lifetime DSM-5 OUD diagnosis was .94 and reliability across the different levels of severity (none, mild, moderate, or severe) was .85 (Dennis, Gelernter, Hart, & Kranzler, 2015). In the current study, the DSM-5 checklist showed good internal consistency with a reliability coefficient of .83.

The Addiction Severity Index-Self-Report Form (ASI-Self Report; see Appendix C). The ASI-Self-Report is a self-administered questionnaire adapted from the Addiction Severity Index (ASI) standard interview format (McLellan et al., 1992; Rosen, Hensen, Finney, & Moos, 2000). The ASI-Self-Report assesses domains of functioning related to addiction. In the current study, the following domains were included: alcohol use, drug use, legal problems, and employment problems. Composite scores from the ASI-Self-Report are moderately to highly correlated with composite scores from the interview based format ($r = .59$ to $.87$) and internal consistency estimates are similar across these two formats. The ASI-Self-Report has excellent internal reliability on the alcohol ($\alpha = .91$) and drug ($\alpha = .81$) composite scores, but lower reliability on legal ($\alpha = .58$) and employment ($\alpha = .66$) composite scores (Rosen et al., 2000). For the current study, a composite score was created for indicating substance use severity, by combining total scores for the alcohol and drug use frequency scales. Frequency of use for a list of substances was rated on a 6-point scale ranging from 1 (never use) to 6 (once a day or more). This composite score showed acceptable reliability ($\alpha = .73$). A polysubstance use score was also calculated by summing the total number of substances the participant reported currently using, which could range from 0 to 10. Given the lower reliability of the legal and employment scales, they were not used in subsequent analyses. Single items

from these scales were used to determine: current employment status, enrollment in social assistance programs, and number of past incarcerations.

The Substance Use Risk Profile Scale (SURPS; see Appendix D). The SURPS is a 23-item self-report questionnaire that measures personality risk for substance misuse (Woicik et al., 2009). Each item is rated on a 4-point scale that ranges from 1 (strongly disagree) to 4 (strongly agree). The SURPS has four subscales: hopelessness, anxiety sensitivity, impulsivity, and sensation seeking, which differentially relate to specific motivational patterns for substance misuse. Higher scores on these subscales are indicative of greater endorsement of the respective personality trait. The SURPS has demonstrated good internal consistency for the hopelessness ($\alpha = .80$ to $\alpha = .90$), anxiety sensitivity ($\alpha = .70$ to $\alpha = .80$), impulsivity ($\alpha = .70$), and sensation seeking ($\alpha = .70$ to $\alpha = .80$) subscales. The SURPS subscales are significantly correlated with scores on other theoretically-related personality measures. For example, hopelessness was positively correlated with the Beck Hopelessness Scale, $r = .73$; anxiety sensitivity was positively correlated with the Anxiety Sensitivity Index, $r = .56$; impulsivity was positively correlated with the Eysenck Impulsiveness/Venturesome Inventory impulsivity scale, $r = .62$; and sensation seeking was positively correlated with Zuckerman's Sensation Seeking Scale, $r = .72$, demonstrating good concurrent validity. Moreover, hopelessness was negatively correlated with the NEO-Five Factor Inventory Extraversion scale, $r = -.47$; anxiety sensitivity was negatively correlated with Zuckerman's Sensation Seeking Scale, $r = -.25$; and impulsivity was negatively correlated with the NEO- Five Factor Inventory Conscientiousness scale, $r = -.30$, demonstrating adequate discriminant validity (Woicik et al., 2009). In the current study, the SURPS showed acceptable internal consistency for

the anxiety subscale ($\alpha = .76$), hopelessness subscale ($\alpha = .80$), sensation seeking subscale ($\alpha = .67$), and impulsivity subscale ($\alpha = .64$).

The Stages of Change, Readiness, and Treatment Eagerness Scale: Personal Drug Use Questionnaire (SOCRATES-8D; see Appendix E). The SOCRATES-8D is a 19-item self-report questionnaire that assess participants' readiness to change their substance use behaviours (Miller & Tonigan, 1996). Each item is rated on a 5-point scale that ranges from 1 (strongly disagree) to 5 (strongly agree). The SOCRATES-8D has three independent subscales: recognition, ambivalence, and taking steps. Higher recognition scores reflect greater acknowledgment of problems related to substance use and that change is needed. Higher ambivalence scores indicate greater uncertainty about change. Higher taking steps scores indicate that the individual has begun making positive changes to substance use. The SOCRATES has shown acceptable to excellent internal reliability for the ambivalence subscale ($\alpha = .60$ to $\alpha = .88$), recognition subscale ($\alpha = .85$ to $\alpha = .95$), and the taking steps subscale ($\alpha = .83$ to $\alpha = .96$; Miller & Tonigan, 1996). The SOCRATES has demonstrated good predictive validity by predicting length of stay in treatment and successful completion in substance abuse treatment-seeking samples (Maisto, Chung, Cornelius, & Martin, 2003; Mitchell & Angelone, 2006). In the current study, the SOCRATES showed good reliability for the recognition subscale ($\alpha = .84$) and the taking steps subscale ($\alpha = .82$). However, the ambivalence subscale showed poor internal reliability ($\alpha = .49$) in the current study and was not used in subsequent analyses.

Data Collection Procedure

Initial support for the current project was obtained from clinic managers at the SOTC, UMC, and RECAP. After receiving Human Ethics Research Board approval from

both the University of New Brunswick and the Horizon Health Network, potential participants from the SOTC, UMC, and RECAP were recruited on site by the primary investigator when they came in for their regular appointments with service delivery staff. Clients from Port City Pharmacy and Phoenix Recovery Center Pharmacy were recruited through poster advertisements in the community (e.g., Avenue B Harm Reduction Inc.; local pharmacies), as permission was not obtained to collect data on site. The researcher was provided office space at the SOTC, UMC, RECAP, and AIDS Saint John where participants met individually with the primary investigator to learn more about the study. Participants were informed that the purpose of the study was to assess client characteristics and experiences at different MMT sites in Saint John and were asked to complete a written informed consent form before proceeding with the study (see Appendix F).

During this recruitment process, the researcher explained to clients that participation in this study was entirely voluntary, that services they receive at the MMT clinic would in no way be affected by their decision to participate or not, and that individual responses would not be shared with program staff in a way that could identify them. Once participants were satisfied that they understood the study and had signed an informed consent form, they were asked to complete a package of self-report questionnaires, which took approximately 30-minutes to complete. Participants were also asked if they wanted to participate in a 30-minute interview with the researcher to discuss their experience with MMT programs. Recruitment for the interviews continued until thematic saturation was reached.

Participants were assured that any survey information that they provided would be anonymous, as their consent form was separated from their questionnaires and a random participant number was assigned to their survey package. Clients participating in the interview were informed that the interview would be audio recorded, but that all responses would be kept confidential and any quotes would be anonymized. The researcher explained that the interview recordings would be de-identified during transcription (participant name removed) and that the participant's audio file would be assigned an identification number (corresponding to each participants' survey package) and kept on an encrypted USB device. During the interview, participants were encouraged not to use names and the researcher indicated that they would not use the client's name during the interview. The researcher first piloted the interview with two participants to ensure that the questions and probes targeted the research questions adequately. Furthermore, to control for bias during interviews and transcription, the interviews each followed the same semi-structured format (see Appendix A). Once participants had completed the questionnaires and interview, they were thanked for their contribution. Participants completing only the survey portion of the current study received their choice of a \$10 Irving gift card or a \$10 Tim Horton's gift card as compensation for their time, whereas those completing both the self-report questionnaires and the interview received their choice of a \$10 Irving gift card or a \$10 Tim Horton's gift card for each portion of the study (\$20 dollars total).

Interview Coding Procedure

The audio recorded interviews were transcribed verbatim using professional transcription services from *REV*, an academic Research Transcription Service. All

transcripts were subsequently reviewed and compared to the original audio files to ensure accuracy. Transcriptions of the interviews were uploaded to the qualitative research software package *NVivo* for coding and analysis. In order to perform content analysis on the current qualitative data, a coding frame was developed. A coding frame consists of *main categories* (or dimensions), which are based on the research questions (concept-driven) and *subcategories*, which specify what is said about the main categories (data-driven). The structure of the coding frame is generally up to the researcher and depends on the research questions (Schreier, 2012). The coding procedure started with the segmentation of the interview transcripts. Relevant material in each interview was first highlighted and material was labeled as relevant if it pertained to the research questions (Campbell, Quincy, Osserman, & Pedersen, 2013). Next, a thematic criterion was used for determining units of coding; topic changes signaled the end of one segment and the beginning of another (Schreier, 2012). For each interview, units of coding were indicated by bolded text.

Coding was conducted using a subsumption process. This process is used when the researcher has already selected the main categories (i.e., the research questions). The researcher reads through the segmented material and decides which material is pertinent to the main categories. While assigning subcategory codes to material, the researcher checks to see if the material fits into an existing subcategory. If the material is similar, then it is subsumed to an already existing code. The process continues for each case, creating new subcategories for novel, relevant concepts. The coding frame is revised by combining or expanding subcategories as necessary and final names are assigned to

subcategories for the coding frame (Schreier, 2012). In the current study, three full interviews were used to create the coding frame (one from each MMT program model).

A coding frame is regarded as valid to the extent that the categories adequately represent the concepts in the research questions (Campbell et al., 2013; Schreier, 2012). In order to assess validity, another researcher may develop a coding scheme independently or review the researchers' existing coding frame on a subsample of data (Campbell et al., 2013; Schreier, 2012). In the current study, the coding frame was developed by the primary researcher and was reviewed by Dr. Caroline Brunelle and Dr. Enrico DiTommaso before a final coding frame was established. The coding frame was divided into five main categories/themes and each main category consisted of a number of subcategories.

Interrater Reliability

There is not a lot of guidance in the literature concerning the establishment of reliable coding in semi-structured interview transcripts; however, the general goal is to ensure that a knowledgeable coder can be reasonably confident that a coding scheme would be reproducible by other equally knowledgeable coders (Campbell et al., 2013). This confidence can be achieved by establishing inter-rater reliability, which requires that two or more equally capable coders, operating independently, select the same code for the same unit of text (Campbell et al., 2013; Krippendorff, 2004; Popping, 2010). There is little agreement in terms of how large a subsample size should be for inter-rater coding; however, a common guideline is 10%-20% of the qualitative data set (Campbell et al., 2013; Hodson, 1999). For the current study, a second rater coded 20% of the transcripts

(i.e., 6 interviews; 2 from each MMT model), which were randomly selected from the full sample of interviews.

Interrater reliability was calculated using Krippendorff's Alpha (α), which is commonly used for content analysis (Campbell et al., 2013). Alpha levels can fall between 1.000 (indicating perfect reliability) and .000 (indicating the absence of reliability). Unfortunately, there is no established threshold for a numerically satisfactory level of agreement among coders; however, inter-rater reliability values of 70% to 90% have been considered acceptable (Campbell et al., 2013). For Krippendorff's alpha, values above .800 are generally considered good; values between .667 and .800 are considered fair, and reliability values below .667 should be discarded (Krippendorff, 2004). In the current study, Krippendorff's Alphas were .888 for coding the main categories and .832 for coding the subcategories, indicating good inter-rater reliability using the existing coding frame.

Results

Data Screening

Quantitative analysis on the survey data was conducted using *IBM SPSS Statistics Version 25* software. Initial data conditioning included screening the survey data for accuracy, missing values, and outliers. Prior to conducting these statistical analyses, the data was also assessed for violations of model assumptions. First, the original survey data was compared with the computer file and descriptive statistics were computed. The descriptive statistics were obtained for all measures to determine whether these values were within range and all of the means and standard deviations were plausible. All scores were within the applicable range and all means and standard deviations were reasonable,

given the range of scores. Less than 5% of data was missing in most cases (5.6% for one question only) and this data appeared to be missing randomly. For missing values, pairwise deletion was used for the analyses (Tabachnick & Fidell, 2013).

Univariate outliers are cases with very large standardized scores; specifically, values that are larger than 2.6 standard deviations from the mean ($p < .001$; Tabachnick & Fidell, 2013). Scores on continuous measures were converted to standardized scores using *SPSS descriptives* and outliers were examined using *SPSS frequencies* and *histograms*. There was one case with a value above 2.6 (i.e., 2.7) on the SURPS Hopelessness scale. This outlier was considered continuous with the distribution and the case was retained. Multivariate outliers were assessed by examining Mahalanobis (D^2) values. Multivariate outliers were sought through regression analysis, where D^2 values were saved in the data file. D^2 values were assessed using the Chi Square distribution table with a cut-off D^2 value of 24.322, $p < .001$ (Tabachnick & Fidell, 2013). According to this cut-off, there were no multivariate outliers and D^2 values were continuous for the current data.

In the present data set, normality was assessed with the examination of skewness and kurtosis values, as well as with the inspection of histograms for each variable. Skewness and kurtosis values exceeding ± 1 warrant further investigation. One variable had skewness and kurtosis values that required consideration. The Taking Steps subscale of the SOCRATES had a skewness value of -1.19 and a kurtosis value of 1.75. This variable was not transformed; however, results were interpreted with caution. Normal probability plots and de-trended normal probability plots indicated that a number of variables deviated from a normal distribution. Two subscales of the SOCRATES

(Recognition and Taking Steps) had significant Shapiro-Wilk's values ($p < .001$), indicating departure from a normal distribution. Given that Analysis of Variance (ANOVA) is robust against violations to the assumption of normality, these variables were not transformed. Levene's Test of Equality of Error Variance showed no issues with homogeneity of variance in the present data.

Sample Characteristics

The current sample consisted of 70 participants recruited from five MMT clinics in Saint John, New Brunswick, which were grouped based on model of care. Descriptive statistics were calculated separately for the three groups: Comprehensive program model ($n = 21$), LTHT program model ($n = 26$), and fee-for-service program model ($n = 23$). Descriptive statistics included demographic information from the participant information questionnaire and the ASI-Self-Report questionnaire, which provided data on patterns of substance use, as well as legal and employment problems associated with addiction. A subsample, consisting of 32 participants, was asked to participate in the semi-structured interviews and were also grouped based on their service delivery model: Comprehensive program model ($n = 9$), LTHT program model ($n = 11$), and fee-for-service program model ($n = 12$). The sample characteristics for the subsample were comparable to the sample as a whole (see Tables 1 and 2).

Comprehensive program model. This group consisted of participants ranging in age from 19 to 60 years ($M = 39.38$, $SD = 11.61$). Twelve participants (57.1%) identified as male and 9 participants (42.9%) identified as female. One hundred percent of the subsample identified as white/Caucasian. Forty-eight percent (47.7%) of these participants reported receiving income from employment, whereas 28.6% reported

receiving social assistance. Fifty-two percent (52.4%) of the subsample reported having been incarcerated during their lifetime. Nineteen percent (19%) of these participants had been in their comprehensive MMT program for less than one year, 9.6% had been receiving MMT services for one to four years, and 71.4% had been in their MMT program for more than four years. Fifty-three percent (52.6%) of these participants indicated that their opioid use started with a legitimate prescription from a physician, whereas 47.4% indicated that their opioid use began recreationally. Using the DSM-5 opioid use severity checklist, 4.8% of the subsample were classified as *mild*, 4.8% were classified as *moderate*, and 90.5% were classified as having *severe* OUD. In terms of treatment readiness, the majority (90.5%) of participants were classified in the *taking steps* stage of change.

LTHT program model. Participants in this group ranged in age from 22 to 63 years ($M = 39.03$, $SD = 11.78$). Twelve participants (46.2%) identified as male, whereas 14 (53.8%) identified as female. Eighty-eight percent (88%) of the subsample identified as white/Caucasian. Fifteen percent (15.4%) of LTHT participants reported receiving income from employment, while 46.1% reported receiving social assistance. Fifty-six percent (56%) of this subsample reported having been incarcerated at least once in their lifetime. Eight percent (7.6%) of these participants had been in their current MMT program for less than one year, 38.5% had been in their MMT program for one to four years, and 53.8% had been receiving MMT services for more than four years. Forty-two percent (42.3%) of this subsample indicated that their opioid use started with a legitimate prescription from a physician, whereas 57.7% indicated their opioid use began recreationally. In terms of opioid use severity, none (0%) of the LTHT participants were

classified as *mild*, 3.8% were classified as *moderate*, and 96.2% were classified as having *severe* OUD. In terms of treatment readiness, all of these participants were assessed as being in the *taking steps* stage of change.

Fee-for-service program model. This group consisted of participants ranging in age from 22 to 54 years ($M = 37.96$, $SD = 8.53$). Thirteen participants (56.5%) identified as male and 10 participants (43.5%) identified as female. Ninety-five (95.2%) of fee-for-service participants identified as white/Caucasian. Four percent (4.3%) of the subsample reported receiving income from employment, whereas 82.4% reported receiving social assistance. Seventy-eight percent (78.3%) of these participants reported a previous history of incarceration. Seventeen percent (17.3%) of the subsample reported being in their current MMT program for less than one year, 43.5% had been receiving MMT services for one to four years, and 39.1% had spent more than four years in their current MMT program. Fifty percent (50%) of these participants indicated that they started using opioids due to receiving a medical prescription from a physician, whereas the other half of the sample stated that their opioid use began recreationally. In terms of opioid use severity, all of the fee-for-service participants were classified as *severe*. With regard to treatment readiness, all were classified in the *taking steps* stage of change.

Group Differences in Sample Characteristics

Groups did not significantly differ in age, $F(2, 65) = 0.46$, $p = .633$, $\eta_p^2 = 0.001$ or length of time in treatment, $F(2, 67) = 0.42$, $p = .662$, $\eta_p^2 = 0.001$. A significant association was found between MMT treatment model and employment, $\chi^2(2) = 10.49$, $p = .005$, $\phi_c = 0.43$, such that participants in the comprehensive treatment model were more likely to report receiving income from employment than the other two groups.

Group differences also existed in illicit opioid use, $\chi^2(2) = 8.30, p = .016, \varphi_c = 0.35$, illicit benzodiazepine use, $\chi^2(2) = 8.89, p = .012, \varphi_c = 0.37$, and cocaine use $\chi^2(2) = 10.87, p = .004, \varphi_c = 0.40$, such that participants in the fee-for-service group were more likely to report using opioids (other than prescribed methadone), benzodiazepines (not prescribed), and cocaine in the last 30 days, than the other two groups. Given that gender differences have been reported in rates of SUDs and personality risk factors, a gender balanced sample was sought for the current study. There was no difference in gender split between the groups, as no association was found between MMT treatment model and gender, $\chi^2(2) = 0.79, p = .675, \varphi_c = 0.11$. Overall, females had higher levels of anxiety sensitivity, $t(66) = 3.095, p = .003, d = 0.76$, and males had higher levels of sensation seeking, $t(66) = 2.812, p = .006, d = 0.68$. There were no gender differences in any of the other study variables. See Table 1 for group differences.

Quantitative Survey Analyses

A series of one-way between-subjects analysis of variance (ANOVA) tests were used to examine differences in substance use severity, personality risk factors, and treatment readiness in the three treatment models. The independent variable for each analysis was MMT model, which has three groups: comprehensive, LTHT, and fee-for-service. Time in treatment was not used as a covariate in the present analyses as no differences existed between groups. Given the number of significance tests, alpha was set at .01. Significant main effects were followed up with Games-Howell (G-H) post-hoc tests, with an alpha set at .05. This is a modification of the Tukey HSD and is robust to violations of homogeneity of variance and unequal group sample sizes.

The first hypothesis proposed that groups would differ in levels of substance use severity, such that clients in the comprehensive program would have the lowest level of substance use severity, clients in the methadone only program would have the highest level of substance use severity, and clients in the LTHT program would fall between these two other programs on substance use severity. This hypothesis was partially supported in the current study. The dependent variables for this analysis consisted of substance use severity (sum of ASI alcohol and drug use frequency scale scores) and polysubstance use (sum of ASI number of substances currently used). Substance use severity significantly differed between groups, and this was significant with a medium effect size, $F(2, 65) = 6.83, p = .002, \eta_p^2 = 0.17$. A G-H post-hoc test showed that the fee-for-service group differed from both the comprehensive group ($p = .007, d = 0.83$) and the LTHT group ($p = .030, d = 0.77$), such that participants in the fee-for-service MMT group reported greater severity of substance use ($M = 20.67, SD = 11.32$) than participants in the comprehensive ($M = 10.89, SD = 8.15$) and LTHT ($M = 13.27, SD = 7.49$) groups. Polysubstance use differed significantly between groups, with a medium effect, $F(2, 65) = 5.98, p = .004, \eta_p^2 = 0.16$. A G-H post-hoc test showed that the fee-for-service group differed from both the comprehensive group ($p = .006, d = 1.01$) and the LTHT group ($p = .041, d = 0.76$), such that participants in the fee-for-service MMT group reported greater levels of polysubstance use ($M = 4.43, SD = 2.25$) than participants in the comprehensive ($M = 2.37, SD = 1.80$) and LTHT ($M = 2.88, SD = 2.05$) groups. No statistically significant differences emerged between clients in the comprehensive and LTHT groups (see Table 3 and 4).

Hypotheses two and three were not supported in the current study. The second hypothesis predicted that clients in these MMT programs would differ in terms of personality risk factors; however, no statistically significant group differences emerged in SURPS hopelessness subscale scores ($p = .380$), SURPS anxiety sensitivity subscale scores ($p = .424$), SURPS impulsivity subscale scores ($p = .119$), and SURPS sensation seeking subscale scores ($p = .480$; see Table 4). The third hypothesis predicted that clients in these three treatment models would differ in terms of treatment readiness, such that clients in the comprehensive program would have the highest level of treatment readiness, clients in the methadone only program would have the lowest level of treatment readiness, and clients in the LTHT program would fall between these two other models on treatment readiness. The majority of participants across all three groups were classified in the *taking steps* stage of change on the SOCRATES (see Table 3). Given this limited amount of variability, treatment readiness scores were not included as a variable in the analyses.

Qualitative Content Analysis

Content Analysis is a method for systematically assessing the meaning of qualitative material. This work is done by classifying instances (i.e. frequencies) of the categories of a coding frame (Schreier, 2012). The current coding frame consisted of five main categories (themes). The coding frame for the qualitative interviews was uploaded to the software *NVivo 12 Plus*, and this software calculated which categories and subcategories were coded most frequently in the data. Please see Table 6 for the coding frame.

Comprehensive model themes. In the comprehensive program, *positive clinic perception* accounted for 29% of codes in the transcripts and was the most frequently coded main category theme. In addition, I identified the most prominent subcategories within each main theme, with values representing the proportion of the codes in that category belonging to a particular subtheme. The most frequently coded subcategories within *positive clinic perception* were: *supportive staff* (54%), *offering counselling/mental health services* (20%), *good balance of rules* (13%), and *short wait-list* (9%). The most frequently coded subcategories within *negative clinic perception* were: *negative attitudes toward staff* (29%), *inconvenient location* (26%), *too strict* (15%), and *no personalization of programs* (12%). The most frequently coded subcategories within *positive methadone perception* were: *stability/normality* (16%), *reduces opiate use* (16%), *positive family impact* (16%), and *saves lives* (13%). The most frequently coded subcategories within *negative methadone perception* were: *unsuccessful attempts with MMT* (24%), *replacement drug* (24%), *fear of withdrawal* (16%), and *start dose too low* (12%). The most frequently coded subcategories within the *patient history* section of the interview were: *voluntary treatment* (22%), *opiate prescription* (22%), *readiness for treatment* (16%), and *multiple treatment attempts other than MMT* (16%). Please see Table 7 for coding frequencies.

LTHT model themes. In the LTHT program, *positive clinic perception* accounted for 34% of codes in the transcript, comprising the most frequently coded main category. The most frequently coded subcategories within *positive clinic perception* were: *supportive staff* (46%), *counselling/mental health services* (7%), *good balance of rules* (7%), and *convenient location* (7%). The most frequently coded subcategories

within *negative clinic perception* were: *need for more organization* (16%), *too strict* (8%), *need for better mental health services*, (8%) and *negative attitudes toward staff* (6%). The most frequently coded subcategories within *positive methadone perception* were: *reduces opiate use* (43%), *saves lives* (20%), *positive family impact* (17%), and *reduces crime* (13%). The most frequently coded subcategories within *negative methadone perception* were: *unsuccessful attempts with MMT* (16%), *methadone is too long-term* (16%), *replacement drug* (13%), and *physical side effects* (13%). The most frequently coded subcategories within *patient history* were: *recreational/self-medication* (20%), *opiate prescription* (20%), *voluntary treatment* (13%), and *polysubstance use* (13%). Please see Table 8 for coding frequencies.

Fee-for-service model themes. In the fee-for-service program, *positive clinic perception* was also the most frequently coded main category, accounting for 29% of codes in the transcript. The most frequently coded subcategories within *positive clinic perception* were: *supportive staff* (64%), *counselling/mental health services* (20%), *short wait-list* (9%), and *referral to other services* (9%). The most frequently coded subcategories within *negative clinic perception* were: *need for more organization* (39%), *need for more programs* (33%), *negative attitudes toward staff* (14%), and *inconvenient hours* (14%). The most frequently coded subcategories within *positive methadone perception* were: *reduces opiate use* (29%), *stability/normality* (9%), *reduces crime* (4%), and *positive social impact* (2%). The most frequently coded subcategories within *negative methadone perception* were: *replacement drug* (34%), *does not help with other drugs* (24%), *too long-term* (24%), and *unsuccessful attempts with MMT* (14%). The most frequently coded subcategories within *patient history* were: *voluntary treatment*

(22%), *crime/incarceration* (18%), *opiate prescription* (18%), and *mental health* issues (14%). Please see Table 9 for coding frequencies.

Three sets of research questions guided the classification of main categories in the coding frame for the content analysis. These questions were addressed by investigating the prominent categories and subcategories coded in the current data. A number of similarities and differences between clients' perspectives in the three MMT models emerged.

Clinic perception. The first research question explored what clients found most helpful/useful in their MMT program. Overall, *positive clinic perception* was the most prominent theme for all three groups, indicating that clients across all three program models are generally satisfied with their MMT clinic. Within this main theme, the majority of clients from all three groups reported that having a supportive staff was the most helpful aspect of their MMT program, other than receiving methadone. This subtheme included staff being labeled as friendly, caring, fair, non-judgmental, and trustworthy. For example, participants said: "They care more about your health here"; "I find they are always available"; and "I have always felt respected and safe".

Methadone Perception. The dispensation of methadone was, understandably, reported as the most helpful aspect of the MMT programs; however, participants had both positive and negative views about the substance. Participants in the comprehensive group reported more positive statements about methadone than negative ones. Regaining stability and normality, reducing illicit opioid use, and positive family impact were the most frequently reported positive aspects of taking methadone. For example, participants said: "I just got my life back", "Since I've been on this, I've been employed for a long

time and family and friends like me again”, and “It’s given me my life back”. With regard to negative perceptions about methadone, participants in the comprehensive program reported having unsuccessful MMT treatment in the past. For example, one participant said: “It didn't work for me the first time”, whereas another said: “I took [methadone] already and it never [...] I always relapsed”. Furthermore, participants expressed a fear of going off methadone. For example, participants said: “I’m terrified to get off it” and “I’m scared, you go through withdrawal-it doesn’t matter how slow you come down, it’s going to hurt, and I’m scared”.

The most positive aspect of taking methadone reported by participants in the LTHT group was that it reduces opioid use and saves lives. For example, one participant said: “Thank God I got on it because I would probably be dead today”. The most negative aspects of methadone for LTHT participants were unsuccessful MMT treatment in the past and the perception that methadone is just a replacement drug. For example, participants said: “It’s pretty much trading one drug for another”, “I’m still an addict”, and “You’re depending on something again, but that’s not illegal”.

A reduction in illicit opioid use was also the most common positive aspect of methadone reported by participants in the fee-for-service group. The most common negative aspects of receiving methadone reported by fee-for-service clients were: the perception that methadone is just a replacement drug; that methadone treatment is too long term; and methadone does not help with other substances that they misuse. For example, participants said: “I find they keep you on it too long” and “It’s just so hard to get off it”. Participants also mentioned that taking methadone can increase the severity associated with the use of other substances. For example: participants said: “You go on

methadone, then if you have crack or cocaine, you're gonna end up way worse" and "You're missing your best friend [opioids]. I hadn't touched crack in 12 years, and boom, I got addicted to that again."

Utilization of ancillary services. The second research question explored what ancillary services were available and being used by participants in these MMT programs. Counselling services were reported as the most commonly used service other than methadone dispensation in all three models of MMT. For example, one participant in the comprehensive program said: "One of the women I spoke to here really helped me through a lot and between the methadone and the meetings and speaking with my counsellor, it really changed my life". Moreover, if clients' counselling needs were not being met at their MMT clinic, participants reported that staff was helpful in referring clients to outside resources. For example, a participant in the fee-for-service group said: "If they can't do it here, they will direct you to someone who can".

There were, however, participants who reported a lack of ancillary services available at their clinic. Many LTHT clients reported that they would like to have access to better mental health services. For example, one participant said: "It would be nice if they could get a counsellor in maybe once a month, maybe twice a month", and another said: "There should be a psychiatrist". Furthermore, many participants in the fee-for-service programs reported that they would like access to more programs and resources at the clinic. For example, one participant said: "They just give you your drink, and, 'see ya'", and another said: "There's nothing really, other than the drink they offer you".

Barriers to accessing treatment. The third research question explored what barriers were associated with access to treatment in these MMT programs and how these

programs can better meet the needs of clients. The groups differed on what aspects they thought the clinics could improve upon. Many participants in the comprehensive group reported too much staff turn-over as the biggest drawback of the clinic. For example, one participant said: “You can’t get comfortable with the people here because they’re switched with different workers all the time”. Participants in the comprehensive group also reported that the location of the clinic was inconvenient (i.e., the clinic is located 10km from the city center). For example, one participant said: “I don’t have a vehicle, so it’s kind of tough getting here”, and another said: “It’ll be nicer when it is closer to town” (i.e., the clinic was relocated to the city center in 2019).

Several participants in both the LTHT and fee-for service groups reported that a lack of organization and consistency are the biggest draw-backs of the clinics. This subtheme included codes relating to lack of communication between clients and staff, as well as a lack of communication among staff. For example, one participant from the fee-for-service group said: “You don't know when the doctor is going to be there. And there's two different doctors so you don't ever know”, whereas another stated: “I went there crying one day and then the doctor told them to- three of them over there- to ask me personally on a daily basis when I see them, how things are going and none of them do”. The subcategory also included codes related to a lack of program structure, and lack of consistency in rule implementation (i.e., allowing some clients to have carries or special permissions, while denying others who are similarly qualified). For example, participants said: “The program rules-I think they need to apply them more consistently”; “They change the rules day by day”.

Patient history. Participants were also asked to share their personal history related to substance use and past treatment experiences. Perhaps not surprisingly, participants in all three groups frequently reported having received prescriptions for opioids from a physician in the past, which led to subsequent misuse. For example, one participant said: “My doctor prescribed the drugs for years and years and years”, and another said: “I was quite heavy into prescription drugs, a lot prescribed by my doctor for back pain”. Interestingly, participants in the LTHT group mentioned recreational opioid use and polysubstance use more frequently than the other groups. For example, a participant stated: “It was just, I had a headache one day, and then a friend just said, ‘here’ and I felt good off of one”, and another said: “It started with a friend telling me that it would make me feel better. I used to work at the [omitted], changing transport truck tires.” One participant said: “I was doing everything, like, anything. But it was usually pills”.

Participants in the fee-for-service group mentioned crime/incarceration related to substance use more frequently than the other groups. One participant stated: “I was actually stealing from that job to help buy Dilaudids”, and another stated: “I actually, uh, went to prison when I was 19 and started doing pills inside”. Fee-for-service clients also mentioned having problems with their mental health more frequently than clients in the other two groups. For example, participants stated: “I suffer from bipolar [disorder] and things can happen that I'm not even aware of”, “I've been diagnosed with borderline personality disorder”, and “I have really bad anxiety and um, and panic disorders... a psychiatrist, actually, diagnosed me with those disorders”.

Participants in all three groups acknowledged a need for treatment and stated that their entry into treatment was voluntary. For example, one participant stated: “I went on

my own. Nobody made me. It was just, like, right after Christmas and nobody even knew and I just said, I gotta go. I have to do something”, and another said: “I figured it would be best for me to get on that.” Participants in the comprehensive group, however, reported a readiness for treatment and multiple treatment attempts before MMT more frequently than the other groups. One participant said: “I felt I was quite ready, which doesn't mean I didn't have failures, but I felt that I was ... I wanted, I truly wanted to do something about it”. Another participant stated: “I mean sometimes that Band-Aid is needed when I tried to get off opioids so many times by myself, you know what I mean”, while another said: “I've been in detox probably six or seven times.”

Qualitative Results Summary

Overall, content analysis revealed many similarities in client experiences between the three MMT models. Participants from all groups stressed the importance of a supportive staff and having access to some form of counselling. However, LTHT and fee-for-service clients voiced a need for more formal counselling and programming at their clinics. The dispensation of methadone was, understandably, reported as the most helpful aspect of the MMT programs; however, participants had both positive and negative views about the substance. For example, participants believed that methadone can save lives and restore stability, but that it is too long-term and discontinuing methadone can be very challenging. Further similarities between participant groups include receiving opioid prescriptions in the past and seeking treatment voluntarily. Interesting differences also emerged between client experiences in the three MMT models. Clients in the comprehensive group reported discomfort with frequent staffing changes, whereas LTHT and fee-for-service clients believed their clinics needed more organization to effectively

meet the needs of clients. Finally, groups differed with regard to personal history and characteristics. Although participants in all three groups frequently reported having been prescribed opioids in the past, LTHT clients reported using opioids recreationally or to self-medicate more often than the other two groups. Fee-for-service clients mentioned more criminal activity associated with substance use, as well as greater concerns over mental health issues, which is a challenge given their experience of having less access to mental health services than comprehensive and LTHT clients. Finally, clients in the comprehensive group mentioned more past attempts at MMT and expressed more treatment readiness than the other two groups.

Discussion

The purpose of the current study was to compare client characteristics and experiences in comprehensive, LTHT, and fee-for-service MMT treatment delivery models, using a mixed-methods design. Quantitative survey data explored differences in socio-demographic characteristics, substance use patterns, personality, and treatment readiness across groups. Although some research suggests that client characteristics show little prognostic value in MMT outcomes (Perreault et al., 2015), the current study indicated some interesting differences between clients in different MMT treatment models.

Quantitative Hypotheses

Substance use. With regard to substance use behaviours, it was hypothesized that participants in the three program groups would differ in terms of substance use severity. Substance use severity was assessed with the self-report Addiction Severity Index (ASI-Self Report; McLellan et al., 1992; Rosen et al., 2000), where participants indicated

which how frequently they used different substances in the last 30 days. Polysubstance use was also included in this measure, as participants indicated which substances they used in the last 30 days. The current data showed that clients in the fee-for-service group reported the highest levels of substance use severity and polysubstance use. Specifically, the average substance use severity score for fee-for-service clients was double that of comprehensive clients and nearly double the average score for LTHT clients. Furthermore, a total of 69.6% of participants in the fee-for-service group reported using more than three substances, compared to 15.8% and 26.9% of participants in the comprehensive and LTHT groups respectively. Given that these substances can be used concurrently, the rates of polysubstance use in the fee-for-service is concerning, as polysubstance use has been consistently related to poor treatment outcomes and increased morbidity (Fisher et al., 2005; Morrison et al., 2017; Proctor et al., 2016; Stitzer & Simon, 2006; Veilleux et al., 2012).

Interestingly, qualitative data revealed that LTHT clients mentioned polysubstance use more often in the interviews than clients in the other two groups. Although fee-for-service clients had higher levels of substance use severity and polysubstance use overall, interview data could have captured LTHT clients with more severe substance use problems than were represented by the overall LTHT sample who completed the quantitative portion of the study. A recent study by Morrison et al. (2017) assessed client characteristics at a LTHT clinic in Saint John, New Brunswick and classified a subgroup of participants (32.7%) as high-severity, low treatment responders. These MMT clients were characterized by a higher severity of substance use, among other factors. Additionally, participants in the LTHT group in the current study generally

mentioned polysubstance use in the context of seeking help for other substance use or overcoming polysubstance use, whereas fee-for-service participants usually mentioned polysubstance use as an additional challenge that was not as dangerous or as severe as their opioid use. Therefore, LTHT clients could be more concerned with their polysubstance use and are interested in seeking support for substance use other than opioids more often than fee-for-service clients.

The most commonly used substances, other than opioids, were tobacco, cannabis, alcohol, benzodiazepines, and cocaine. Across all three groups, 91.2% of participants reported consuming tobacco within the last 30 days, 60.3% continued to use cannabis while on methadone, 38.2% used alcohol, 32.4% used benzodiazepines, and 30.9% used cocaine within the last 30 days. These values are similar to those reported in a recent assessment of polysubstance use in LTHT MMT clients (Morrison et al., 2017). Moreover, no group differences were found in levels of tobacco, cannabis, or alcohol use in the current sample. Concurrent opioid and tobacco use is commonly reported in the literature and tobacco cessation rates in opioid dependent individuals are especially low (Miller & Sigmon, 2015; Streck, Heil, Higgins, Bunn, & Sigmon, 2018). Cannabis use is also more common in MMT patients than in the general population (Bawor et al., 2015; Lucas & Walsh, 2017); however, research is mixed with regard to the influence of cannabis use on MMT outcomes (Zielinski et al., 2017). Concurrent alcohol use has been documented frequently in the MMT literature. Although rarely considered dangerous by substance users, alcohol and opioids are both central nervous system depressants, and the consumption of alcohol can increase the risk of overdose, coma, and death when combined with an opioid (Taylor, 2015). Participants in the fee for service group reported

using cocaine more frequently (56.5%) than the comprehensive (21.1%) and LTHT (15.4%) groups. Cocaine increases the metabolism of methadone, particularly when used in large doses; therefore concurrent cocaine users may require larger doses of methadone, which can increase risk of overdose (College of Physicians and Surgeons of Newfoundland and Labrador, 2018).

Concurrent methadone and benzodiazepine use was frequently reported in the current sample and is commonly documented in the literature (Morrison et al., 2017; Proctor et al., 2016). For example, Proctor et al. (2016) found that 26.4% of MMT clients reported benzodiazepine use at intake. In the current sample, fee-for-service clients were more likely to use illicit benzodiazepines than participants in the other two groups, with 54.5% of clients reporting illicit benzodiazepine use in the past 30 days (compared to 11.1% and 28% of comprehensive and LTHT clients, respectively). Opioids and benzodiazepines are both central nervous system depressants; therefore, the interaction between these two drugs can be potentially lethal (Chen et al., 2011; Jones, Mogali, & Comer, 2012; Viswanath et al., 2012). Although some participants in the current sample recognized the dangers of concurrent opioid and benzodiazepine use, others reported using the drugs concurrently regardless of the risk; using them both as prescribed and recreationally.

Comprehensive and LTHT MMT programs discourage the use of benzodiazepines and, except under rare circumstances avoid prescribing them to MMT clients. Based on qualitative findings, it appears that fee-for-service methadone clinics may prescribe benzodiazepines more frequently to clients, which may indicate that concurrent benzodiazepine use may be even higher in fee-for-service clients than

indicated by their self-reported illicit use. Some participants expressed concern over this issue and criticized their MMT doctors for prescribing too many of these anxiolytic drugs. Clients in opioid-substitution therapy may be particularly vulnerable to benzodiazepine use, as the combination of opioids and benzodiazepines may allow individuals to achieve a more potent opioid effect (i.e. a greater high; Jones, Mogali, & Comer, 2012). Given that methadone is administered to avoid the experience of euphoria, individuals may be using benzodiazepines concurrently to achieve this effect (Jones et al., 2012). Another probable explanation is that MMT clients are using benzodiazepines to self-medicate for co-occurring mood and anxiety disorders, as benzodiazepines are often prescribed to treat anxiety disorders (Chen et al., 2011; Veilleux et al., 2012) and clients in the fee-for service group mentioned mental health issues more often than the other two groups. Indeed, mood and anxiety disorders are more prevalent in MMT clients than in the general population (Morrison et al., 2017).

Finally, clients in the fee-for-service group reported the highest levels of current illicit opioid use, with 52.2% of participants reporting using illicit opioids in the last 30 days, compared to 30.8% and 10.5% for LTHT and comprehensive clients, respectively. Participants in the fee-for-service group frequently reported occasional recreational use of opioids in order to supplement a lower dose of methadone. This finding could be because these clients have higher levels of polysubstance use and MMT clinics generally prescribe lower doses of methadone to clients known to use other substances, to reduce the risk of harmful interactions. Given that MMT is a harm reduction intervention, the primary focus is not necessarily cessation of substance use, but is on reducing the harms related to opioid use (i.e., incarceration, overdose, HIV/HCV, etc.; Bruneau et al., 2018;

Veilleux et al., 2012; Viswanath et al., 2012); however, continued illicit opioid use while on methadone can be dangerous, as the risk of overdose increases (Bart, 2012; Mattick et al., 2009; Stimmel & Kreek, 2000; Viswanath et al., 2012). The fact that fee-for-service clients are more likely to continue to use illicit opioids than the other two groups suggests that this treatment delivery model may not be as effective for treating OUD as other treatment modalities. Harm reduction approaches aim to promote psychosocial adjustment (Bruneau et al., 2018; Mattick et al., 2014; Veilleux et al., 2012; Viswanath et al., 2012); however, clients receiving MMT from fee-for-service clinics in the current study showed higher levels of current unemployment, reliance on social assistance programs, past incarcerations, and reported more mental health concerns than the other two groups. This suggests that fee-for-service clients may not be receiving the appropriate resources to assist with psychosocial functioning.

Personality risk factors. The current study also explored personality as a possible individual difference factor in MMT clients. Previous studies have shown that matching substance misusers to interventions that are consistent with personality risk factors and motives for use improves treatment outcomes (Conrod et al., 2000a; Conrod et al., 2013). It was hypothesized that clients in different MMT clinics would differ in terms of personality risk factors; however, no differences emerged in personality risk factors between the three treatment models. The lack of difference in levels of anxiety sensitivity could be due to the fact that all of the participants were past or current opioid users and research has indicated that individuals scoring higher in anxiety sensitivity showed a preference for substances with anxiolytic effects, such as opioids and benzodiazepines (Conrod et al., 2000a; Krank et al., 2011). It is interesting to note that in

the current study there were large differences in levels of hopelessness and impulsivity between groups, with participants in the fee-for-service group showing higher levels of hopelessness and impulsivity than the comprehensive and LTHT groups. It is possible that these effects would have emerged as significant with increased power in the current study. Previous research has shown that higher levels of hopelessness are associated with the use of analgesic substances and opioid misuse in particular (Conrod et al., 2000a; Krank et al., 2011), which is reflected in the higher levels of continued opioid use in fee-for-service clients in the current study. Impulsivity has been associated with an unconstrained pattern of substance use/misuse (Conrod et al., 2000a; Krank et al., 2011) and this is reflected in the increased polysubstance use and substance use severity of fee-for-service clients in the current study, as well as other challenges adding to vulnerability for rule defiant life struggles that adds complexity to their clinical profiles and responsibility needs.

An alternative perspective on the fee-for-service group is that the identified differences that emerged for this group may have more to do with the nature of the clients that choose to access this type of MMT clinic rather than stemming from the fee-for-service treatment model per se. Specifically, this group of MMT clients may have entered the fee-for-serve service program with more severe substance use problems. Despite experiencing similar improvements due to treatment, they may continue to struggle with substance use and psychosocial functioning more so than clients of the other MMT service models because of pre-program vulnerabilities in their functioning. Notably, in addition to increased polysubstance use, fee-for-service clients experienced higher levels of poverty, criminality, and impulsivity, which may reflect underlying

behavioral/emotional dysregulation that makes these clients more vulnerable to risk factors for SUDs and resistant to rules/expectations. For example, Krueger (1999) showed that two higher order dimensions of symptomatology (internalization and externalization) can account for comorbidity in mental disorders. Externalization (expressing distress outward) is strongly associated with SUDS and antisocial behaviour disorders. Individuals scoring high on externalization lack constraint, resulting in a tendency to engage in risky behaviour and to act impulsively. Higher levels of externalization could explain comorbidities present in the fee-for-service group. This underlying dimension of externalization could put fee-for-service clients at risk for a broader range of maladaptive outcomes (e.g., criminality, polysubstance use, etc.), which could affect treatment responsiveness.

In addition, these individual differences could have important implications for treatment. Higher levels of hopelessness and impulsivity, found in the current study, could reflect differences in substance use motives in fee-for-service clients and these clients may benefit from interventions that are targeted more specifically to their needs and motivations for use (Conrod et al., 2000b; Conrod et al., 2013). For example, Conrod et al. (2013) reported improved drinking outcomes at 24-months following a personality-targeted intervention for substance misuse in adolescents. The interventions incorporated components from cognitive behavioral therapy and motivational enhancement therapy that were targeted to specific personality risk factors that indirectly increase substance misuse. For this intervention, behavior regulation strategies were introduced to help participants deal with an experience according to the physical, cognitive, and behavioral components of an emotional response (e.g., getting wound up or not thinking things

through for the impulsivity group and catastrophizing and withdrawing in the hopelessness group). Participants were encouraged to identify and challenge personality-specific cognitive distortions that lead to personality-specific behaviours (e.g., learned helplessness in the hopeless group and aggression in the case of impulsivity). The intended outcomes of the program were observed on all drinking behaviours for the duration of the follow-up period. Schools that offered interventions matched to personality risk factors reported 29% reduced odds of drinking, 43% reduced odds of binge drinking, and 29% reduced odds of problem drinking in high-risk youths, relative to their counterparts in control schools (Conrod et al., 2013). Future studies could assess the impact of personality-based interventions to supplement MMT in individuals with OUD, as these interventions have been found to be effective for reducing use of substances other than alcohol (Conrod et al., 2000).

Treatment readiness. Survey data assessed treatment readiness in MMT clients in the current study. It was hypothesized that clients in different MMT treatment models would differ in terms of treatment readiness, given the different treatment demands of the programs. However, the majority of clients across the three groups were classified in the *taking steps* stage of change, meaning that these clients reported actively making positive changes to their substance use (Miller & Tonigan, 1996). Clients in the three program groups may have reported similar treatment readiness scores because they were all already in treatment and all of the participants were in treatment voluntarily.

Furthermore, although there are program differences between the treatment modalities, all MMT clinics require similar commitments with regard to methadone administration. For example, MMT requires daily administration of methadone at a pharmacy (unless

you qualify for carries), so MMT requires a level of treatment readiness that reflects this commitment (Melnick, Hawke, & De Leon, 2014). Although no differences were found in treatment readiness in the quantitative portion of the study, interview data revealed that treatment readiness was mentioned more often in the comprehensive group. Clients in the comprehensive program who completed the interviews may have been more treatment-motivated than the comprehensive group overall, or this finding could reflect greater openness and motivation to take part in other treatment services offered in the comprehensive programs beyond receiving methadone.

Qualitative Research Questions

MMT clinic perception. Qualitative data was collected to gather more information regarding client experiences at MMT clinics and to identify possible differences in these experiences across MMT treatment models. The first research question examined what clients found most helpful or useful in their MMT program. Staff support was the most prominent theme that emerged from the interview data and this experience was consistent across the three groups. Given the importance of support in substance misuse recovery, it makes sense that having a supportive staff is considered an essential component of treatment, regardless of MMT model (Best et al., 2016; Buckingham, Frings, & Albery, 2013; Day et al., 2013; Dingle, Stark, Cruwys, & Best, 2015). Having positive social support has been linked to a variety of positive health-related outcomes, including decreased substance use (Buckingham et al., 2013; Day et al., 2013; Dingle et al., 2015). In addition, numerous participants mentioned leaving the social group with whom they had formerly used substances and withdrawing from the environment where they had used drugs in the past. Moving away from the social

network in which an individual uses drugs is considered a key factor in obtaining and maintaining recovery from substance misuse; however, individuals may be left feeling isolated if they have not formed new social networks with non-using peers (Best et al., 2016; Day et al., 2013; Dingle et al., 2015). Having a support system at their clinic may help fill this gap and buffer clients from the harmful effects of stress often associated with substance misuse treatment (Best et al., 2016; Dingle et al., 2015).

Many clients have had little contact, or very little positive contact, with healthcare workers in the past, given the stigma they feel when seeking care at hospitals and other clinics (McNeil, Kerr, Pauly, Wood, & Small, 2015; Paquette, Syversten, & Pollini et al., 2018). Interacting with MMT clinic staff may be one of the first positive experiences they have had with healthcare staff. For example, Paquette et al. (2018) conducted qualitative interviews with injection drug users and found that perceived stigma played an important role in participants' experiences with the healthcare system. Participants believed that people who inject drugs receive poorer care from medical professionals because healthcare practitioners did not care about injection drug users' lives. Indeed, research has demonstrated that healthcare workers show less empathy towards people who inject drugs (Paquette et al., 2018; Peckover & Childlaw, 2007). It is encouraging that the majority of participants in the current study felt supported by their clinic staff, as this could reflect a shift toward a more patient-oriented model of care for substance misusers.

Although staff support was the most prominent positive aspect reported by clients, methadone itself was, understandably, frequently reported as the most helpful aspect of MMT programs. Clients in the current study; however, reported both positive and negative experiences related to taking methadone. Participants in all three groups

frequently mentioned a reduction in illicit opioid use as a positive outcome of taking methadone. Reducing illicit opioid use is a primary objective of MMT, therefore, it is encouraging that the majority of participants reported consuming fewer illicit opioids, regardless of MMT model (Bruneau et al., 2018; Veilleux et al., 2012; Viswanath et al., 2012). Another positive aspect of taking methadone, which was consistent across groups, was that taking methadone allows the client to gain a sense of stability and normality in their lives. Improving social functioning is another primary goal of MMT (Amato et al., 2005; Bart, 2012; Connery, 2015; Viswanath et al., 2012), so it makes sense that clients across the three MMT models would report this outcome. It is interesting, however, that fee-for-service clients reported a decrease in illicit opioid use and an increase in social functioning in the interviews while the survey data indicates that many fee-for-service clients are still using illicit opioids and the majority of this group remain unemployed. A possible explanation for this discrepancy in data sources is that these clients in fee-for-service MMT clinics began treatment with higher levels of illicit opioid use and more challenges in psychosocial functioning than clients in the other two groups. Although fee-for-service clients may experience a reduction in their substance use and improvements in day-to-day stability, they appear to still be functioning at a lower level than clients receiving services from the other MMT models.

Negative perceptions of methadone varied across the three MMT treatment models. Clients in the comprehensive group and the LTHT group reported unsuccessful past attempts with MMT as the most prominent negative aspect of taking methadone. This finding is not surprising, as research has shown high attrition rates in comprehensive programs (Burbridge, 2012; Hser et al., 2015). Burbridge (2012) reported a 43% 1-year

attrition rate at a comprehensive MMT program in Saint John, New Brunswick, with the majority of clients being discharged for non-compliance or leaving voluntarily before treatment completion. Research has shown lower attrition rates in LTHT programs (Christie et al., 103). Many LTHT clients who reported unsuccessful attempts with MMT reported that their previous MMT programs were at a comprehensive clinics.

Comprehensive clients also reported a fear of discontinuing methadone, which is not uncommon in MMT clients. For example, Frank et al. (2016) conducted semi-structured interviews to explore patient perspectives on tapering chronic opioid substitution therapy and participants expressed concerns over increased pain associated with opioid tapering and fear of withdrawal. One reason clients in the comprehensive group could be more concerned with the effects of discontinuing methadone is the fact that a large portion of these clients reported failed attempts with MMT in the past. Given their experience with relapse in the past, considering methadone withdrawal may be particularly overwhelming for these individuals.

Clients in the LTHT group and the fee-for-service group frequently mentioned perceiving methadone as “just another drug” or a “legal” way to get drugs, which is consistent with perceptions of methadone found in current literature. Woo et al. (2017) conducted semi-structured interviews with MMT clients and found that 78% experienced stigma due to their MMT treatment. Participants reported others in their lives who believed that receiving MMT was another “way to get high” and that being on methadone meant having “a lack of willpower”. Stereotypes such as these also prevail with health care professionals and in the general population. These stereotypes are often internalized by methadone users and may even deter clients from MMT treatment (Earnshaw, Smith,

& Copenhaver, 2013; Paquette, Syversten, & Pollini, 2018). Furthermore, fee-for-service clients frequently reported that MMT treatment is too long-term. Research shows that longer duration of MMT has been consistently associated with improved outcomes (e.g., reduced risk of relapse, less criminal activity, and improved social functioning; Corsi et al., 2002; Cox et al., 2013; Gossop et al., 2001); however, many clients are encouraged to stay in MMT indefinitely, which clients may find discouraging. Other recent research has demonstrated clients' lack of knowledge around the duration of treatment when being initiated into MMT. Damon et al. (2017) examined MMT client experiences during MMT initiation and found that many clients initiated treatment with the expectation that MMT would be a step towards abstinence from opioids. Clients reported that it was only after starting MMT that they discovered the program was a long-term commitment. Participants who were well informed about MMT and were able to participate in some decision making regarding their treatment, reported more positive views of methadone and MMT (Damon et al., 2017; Trujols et al., 2017).

Ancillary services. The second research question examined which ancillary services are available and being used by clients at these MMT clinics. Participants were asked to comment on what kind of support they receive from their MMT clinic, and counselling was the service mentioned most frequently by clients across all three groups. Interestingly, counselling was mentioned more often in the comprehensive and fee-for-service groups, than in the LTHT group. LTHT clients more frequently referred to services offered by the nurse practitioner and doctor at the clinic, rather than reporting interactions with counsellors; in fact, these clients often expressed a desire for more formal counselling services. Indeed, LTHT clinics focus mainly on primary care services,

while formal counselling, although made available through referral, is not part of the LTHT treatment model (Christie et al., 2013; Kourounis et al., 2016). Moreover, although counselling was mentioned as a service that was used by fee-for-service clients, it was also discussed as a service that could be improved upon. Additionally, fee-for-service clients expressed concern over the lack of additional programming at their MMT clinics. This could further suggest that clients attending fee-for-service clinics are presenting with more complex needs than the other two groups, underscoring the importance of supplementary psychosocial interventions in MMT.

Counselling in substance misuse interventions often include cognitive-behavioural approaches that focus on contingency management and relapse prevention (Dugosh et al., 2016; Mayet et al., 2014; Veilleux et al., 2012); however, it is also beneficial to address underlying problems associated with substance misuse (Amato et al., 2001a; Dugosh et al., 2016; Dutra et al., 2008; Veilleux & Haasen, 2006). Research consistently demonstrates that co-morbid psychopathology is common in individuals with OUD (Hser et al., 2015; Morrison et al., 2017) and these disorders complicate OUD treatment and lead to poorer treatment outcomes (Brooner et al., 2013; Chen et al., 2013; Cousins et al., 2011; Jaremko et al., 2015; Morrison et al., 2017; Priester et al., 2016). Indeed, studies have shown that combining psychosocial interventions with pharmacotherapies results in better treatment outcomes (Amato et al., 2001a; Bruneau et al., 2018; Dugosh et al., 2016; Dutra et al., 2008; Van den Brink & Hassen, 2006). For example, Amato et al. (2011b) found that combining psychosocial and pharmacological interventions lead to increased abstinence rates over time, suggesting that counselling is beneficial for long-term recovery.

Barriers to accessing treatment. The final research question examined aspects of the clinics that clients thought could be improved upon, as well as barriers to accessing treatment. Frequent staff turnover was the problem most frequently discussed in the comprehensive group. Clients stated that it often took them time to develop trust with their MMT staff and that it would be difficult getting comfortable with counsellors because they were frequently replaced. Although the current interviews suggest the availability of more stable staffing at the other two clinics, LTHT and fee-for-service clients criticized those MMT clinics for a lack of organization and consistency in their operations, as well as a lack of communication between clients, staff, and physicians. LTHT and fee-for-service clients commonly mentioned wanting more consistency with the implementation of rules and policies at their clinic. For example, some clients felt that clinic rules were not enforced fairly across clients. Furthermore, many fee-for-service clients mentioned finding it difficult to contact or arrange appointments with the prescribing physician at their clinic. These issues, including staff turnover, poor organization, and ineffective communication can often foster distrust in MMT providers and lead to client uncertainty with their treatment plan.

Clients need to be able to trust their health care providers, as the quality of the relationship between counsellor and client has been shown to be related to substance misuse treatment outcomes (Damon et al., 2017; Miller & Moyers, 2014; Press, Zornberg, Geller, Carrese, & Fingerhood, 2016). For example, the interpersonal skills of counsellors have been associated with better treatment outcomes, with counsellor empathy predicting increased retention of, and decreased substance use in, these clients (Miller & Moyers, 2014; Moyers & Miller, 2013; Norcross & Wampold, 2011). A

counsellor's allegiance to the treatment approach has been shown to affect outcomes (Miller & Moyers, 2014); therefore, MMT staff and counsellors should demonstrate commitment to the harm reduction approach to substance misuse treatment. Recently, Press et al. (2016) conducted interviews with substance misusers about what healthcare provider characteristics contributed to a successful patient-provider relationship. Clients expressed a strong desire to feel understood while in treatment and believed that healthcare providers need to understand the challenges associated with addiction. In addition, clients believed that healthcare providers should emphasize the overall health of their patients and engage them in their own holistic recovery (Press et al., 2016). Fostering positive, trusting relationships between MMT clients and healthcare providers appears to be a crucial factor in client satisfaction with treatment and may also promote more positive treatment outcomes (Damon et al., 2017; Miller & Moyers, 2014; Press et al., 2016). Thus, if done correctly, programs such as fee-for-service and LTHT MMT have the opportunity to informally engage clients during regular methadone dispensation, by building positive relationships with these more complex need clients that build toward recovery via access to advanced care services.

Strengths and Limitations of the Current Study

The current study sought to contribute to the MMT literature in the following ways: 1) to collect information about the MMT experience from a primarily prescription opioid misusing sample; 2) to combine quantitative and qualitative data to obtain a more comprehensive understanding of local MMT services; and 3) to identify factors which could guide treatment matching techniques and improve client outcomes. MMT was developed to treat heroin misuse; however, there are increasingly large numbers of non-

medical prescription opioid misusers seeking MMT treatment. Indeed, in the current sample, the most commonly used opioid was Dilaudid™ (hydromorphone) which is an opioid prescribed for pain management. Furthermore, only half of participants reported ever having a legitimate prescription for the drug. The current sample provides data that may better represent the current population of opioid misusers in Saint John, New Brunswick.

An additional strength of the current study is the use of a mixed-methods design. Although there is a growing body of qualitative literature concerning client experiences in MMT, there remains a lack of literature comparing different MMT treatment delivery models. In the current study, client views on different MMT models were collected via semi-structured interviews, which allowed participants to reflect and expand on their perceptions of MMT. Interview data was used to answer a number of research questions, but also to supplement and inform quantitative findings. For instance, quantitative results suggested that fee-for-service MMT clients may not achieve the same levels of improvement as the other two groups, particularly with regard to substance use; however, interview data revealed that the majority of fee-for-service clients perceived a great improvement in their substance use and psychosocial functioning. Together these findings suggests that clients receiving MMT from fee-for-service clinics may initially present with more severe problems and may not reach the same level of functioning as the other two groups, even with treatment. This points to the importance of measuring both objective and subjective outcomes, for even small gains can represent meaningful recovery for some individuals.

An important limitation of the current study was the exclusive use of self-report data which only represents the clients' experience. The use of self-report data is frequently used in substance misuse research and is often the only feasible way to collect information on illicit substance use (Murphy, Hser, Huang, Brecht, & Herbeck, 2010). Future studies could include more objective measures, such as urinalysis and other clinical data. An additional limitation to consider is the use of convenience sampling in the current study. It is possible that this mode of sampling excluded a portion of MMT clients, which may differ from those represented in this study. Furthermore, fee-for-service clients in the current study were recruited largely from the community, rather than at their MMT clinics. It is possible that the sample recruited for this study represented the fee-for-service clients experiencing more severe problems, as many of these participants were seeking services elsewhere in the community when they were asked to participate in the current study (e.g., Avenue B Harm Reduction Inc.).

Recruitment for the current study took place in a narrow geographical region (a single Atlantic Canadian city), which limits the generalizability of the current findings. Generalizing beyond this geographical region was not, however, a goal of the current study. This mid-sized Atlantic Canadian city was chosen because all three MMT program models are available and offered concurrently. This allowed for a direct comparison of the treatment delivery models within the same population. Finally, it is important to note that the small sample size for the quantitative portion of this study limited the ability to conduct statistical analyses and reduced the generalizability of the current findings. It is possible that a larger sample size would have allowed small and medium effects for personality differences between groups to emerge as statistically significant differences

between MMT groups, which would have offered more information on possible treatment matching factors. Despite these acknowledged limitations, the current study has a number of important implications for MMT treatment.

Current Implications and Future Directions

The current study compared client characteristics and experiences in three MMT treatment delivery models. One of the most striking differences was that participants in the fee-for-service MMT group reported higher levels of current polysubstance use and substance use severity. Specifically, fee-for-service clients reported higher levels of current benzodiazepine use, cocaine use, and illicit opioid use. Although the current study did not include data on past and current mental health problems, measures of personality risk factors, such as hopelessness and anxiety sensitivity have been associated with internalizing disorders (e.g., panic disorder, depressive disorder; Battista, Pencer, McGonnell, Durdle, & Stewart, 2013). Participants in the current study reported similar mean scores on anxiety sensitivity across all three MMT groups, whereas fee-for-service clients scored higher on hopelessness (although this difference was not statistically significant at the $p = .01$ level). Furthermore, data from the qualitative interviews suggests that fee-for-service clients experience more mental health problems and/or a greater severity of mental health problems, than clients in the other two groups. Future studies should use a longitudinal design to appraise the influence and impact on MMT outcomes, such that measures of substance use and mental health symptoms are collected at MMT initiation and at various time points during treatment. This would help clarify whether clients accessing MMT at fee-for-service clinics experience comparable levels of improvement as clients in comprehensive and LTHT MMT clinics.

Consensus emerged among clients in the three MMT treatment models with regard to the importance of experiencing a supportive environment and having access to counselling. Improving access to mental health services and psychosocial interventions is one way that MMT clinics may improve client outcomes. Interview data indicated that MMT clinics generally offer referrals to community mental health services when no formal counselling options are present at the clinic. There is, however, an urgent need for more integration between community healthcare clinics and mental health services in Saint John, New Brunswick. Patients are often placed on unreasonably long wait-lists and can even get lost in the referral process. This challenge results in a lack of mental health services when they are needed most by clients in substance misuse treatment and timely access to them when clients are ready to engage. A report by the Canadian Mental Health Association (CMHA; 2018) stated that, in 2012, an estimated 1.6 million Canadians had unmet mental health-care needs, with counselling being the highest unmet need. Indeed, evidence-based mental health services are under-funded and often have long wait-lists, making them unavailable in a mental health crisis (CMHA, 2018). Generally, it is community mental health services that receive the least amount of funding, leaving family physicians to lead most publicly funded front-line mental health delivery services. In fact, recent reports indicate that up to 80% of Canadians rely on their family physicians for mental health needs; however, most family physicians are not specifically trained to treat mental health concerns (CMHA, 2018). Furthermore, an estimated 14.9% of Canadians do not have a family physician, leaving them without even basic mental healthcare (CMHA, 2018).

Over the last decade, research has demonstrated that higher-threshold approaches to MMT deter treatment enrollment and decrease client retention (Damon et al., 2017). As a result, newer MMT models have gradually moved away from compulsory psychosocial interventions outlined in traditional comprehensive treatment models. Although this change has improved access to MMT, it has also lead to many new clients being enrolled in MMT with limited access to ancillary psychosocial supports (Damon et al., 2017). Given the state of mental health care delivery, it is imperative to consider integrated treatment approaches that are responsive to the psychosocial needs of prospective MMT clients. Therefore, counselling and other psychosocial supports should be available alongside MMT, but should be voluntary to ensure they do not raise the threshold of MMT or dissuade clients from starting the recovery process with expectations they cannot meet (Damon et al., 2017). There is little empirical evidence indicating which psychosocial treatment works best in conjunction with MMT (Dugosh et al., 2016); thus, it is important for future research to focus on identifying the combinations of psychosocial interventions and MMT that are most effective (Dugosh et al., 2016).

Implementing peer support programs could be one cost-effective way to deliver effective counselling services in conjunction with MMT. Peer recovery support is based on peer mentoring from individuals in recovery from substance use disorders to individuals with substance use disorders and is intended to help individuals gain stability and maintain their recovery (Bruneau et al., 2018; Tracy & Wallace, 2016; Reif, et al., 2014). Peer recovery support is a versatile adjunct to treatment, as it can be offered in parallel with other treatment activities and delivered in a variety of settings (Reif, et al.,

2014). Reviews have shown that peer recovery support is related to several benefits, such as improved relationships with treatment providers and social supports, increased satisfaction with treatment, reduced rates of relapse, and increased retention in treatment (Reif et al., 2014; Tracy & Wallace, 2016). Further research could focus on assessing how best to implement peer support recovery and incorporate it into current MMT treatment delivery models (Reif et al., 2014).

Personalization of MMT programs has been suggested as another means of improving MMT effectiveness (Kourounis et al., 2016). Accordingly, the current study aimed to assess whether clients in these distinct MMT models differed on factors that could be used to match clients to the most effective MMT treatment modality. No significant differences emerged; however, descriptive statistics in the current data suggest that participants in the fee-for-service group may have higher levels of impulsivity and this could reflect a difference in substance use motives. However, even if MMT client personality risk factors do not differ between treatment models, future research could assess the implementation of personality-matched psychosocial interventions across all MMT treatment modalities. Offering programs that target appropriate coping skills (e.g., based on personality risk factors and substance use motives), in conjunction with MMT, may be a way to improve client outcomes (Conrod et al., 2000b; Conrod et al., 2013).

Conclusion

MMT clients in the current study reported experiencing treatment benefits regardless of MMT delivery model, although clients accessing MMT at fee-for-service clinics reported the lowest level of functioning on objective measures. Moreover, clients across the three groups agreed that receiving support from MMT staff and having access

to ancillary mental health services were the most important factors influencing MMT clinic perceptions. Overall, the current findings suggest that MMT should focus on supporting the patient holistically by offering pharmacological interventions, while ensuring access to community services which address the psychosocial needs of individuals seeking MMT (e.g., housing, education, employment, peer support, counselling etc.). Further research should focus on what combination of MMT and ancillary programs are most effective for treating individuals with OUD. Hence, by moving away from a “one size fits all” approach to MMT, clients may experience superior treatment outcomes.

Table 1
 Participant Characteristics as a Percentage of the Group Samples ($N = 70$)

	Comprehensive ($n = 21$)	LTHT ($n = 26$)	Fee-for-Service ($n = 23$)	χ^2	P
Gender				0.79	.675
Male	57.1	46.2	56.5		
Female	42.9	53.8	43.5		
Ethnicity				0.23	.893
Caucasian	100	80.0	95.2		
Time in treatment				7.97	.093
< 1 Year	19.0	7.6	17.3		
1 – 4 Years	9.6	38.5	43.5		
> 4 Years	71.4	53.8	39.1		
Previous opioid prescription	47.6	42.3	50.0	1.13	.569
Currently employed	47.7	15.4	4.3	10.49*	.005
Receiving social assistance	28.6	46.1	82.4	17.52**	.000
Past incarceration	52.4	56.0	55.6	4.64	.099
Opioid use severity					
Mild	4.8	0	0	2.77	.251
Moderate	4.8	3.8	0		
Severe	90.5	96.2	100		
Cocaine use (past 30 days)	21.0	15.3	56.5	10.87**	.004
Opioid use (past 30 days)	10.6	30.6	56.4	8.30*	.016
Benzo use (past 30 days)	15.0	28.0	54.5	8.89*	.012

Note. χ^2 statistic represents differences between MMT groups.

* $p < .05$, ** $p < .01$

Table 2
Participant Characteristics as a Percentage of the Group Interview Samples (n = 32)

	Comprehensive (n = 9)	LTHT (n = 11)	Fee-for-Service (n = 12)	χ^2	P
Gender					
Male	55.6	54.5	41.7	0.075	.784
Female	44.4	45.5	58.3		
Ethnicity				0.451	.500
Caucasian	100	81.8	75.0		
Time in treatment				2.367	.796
< 1 Year	22.2	9.1	25.0		
1 – 4 Years	0	27.3	50.0		
> 4 Years	77.8	63.6	25.0		
Previous opioid prescription	50.0	54.5	44.4	0.005	.944
Currently employed	88.9	18.2	8.3	0.272	.602
Receiving social assistance	22.2	72.8	91.5	0.295	.587
Past incarceration	55.6	54.5	75.0	0.100	.752
Opioid use severity				1.455	.228
Mild	0	0	0		
Moderate	0	30.0	0		
Severe	100	70.0	100		
Cocaine use (past 30 days)	44.4	36.4	58.3	2.378	.180
Opioid use (past 30 days)	44.4	45.5	50.0	0.005	.944
Benzo use (past 30 days)	22.2	27.3	41.7	0.010	.921

Note. χ^2 statistic represents difference between interview sample and full sample.

Table 3
Descriptive Statistics for Study Variables (N = 70)

	Comprehensive (n = 21)	LTHT (n = 26)	Fee-for-Service (n = 23)	Actual Range of Values	Potential Range of Values
Substance use severity ^a (frequency of substance use in the past 30 days)	10.89 (8.2)	13.26 (7.5)	20.67 (11.3)	0 - 54	0 - 60
Polysubstance use ^a (number of substances used in past 30 days)	2.37 (1.8)	2.88 (2.0)	4.34(2.3)	0 - 10	0 - 10
Anxiety sensitivity ^a	13.58 (3.02)	14.48 (2.86)	13.39 (3.38)	7 - 20	5 - 20
Hopelessness ^a	14.74 (3.38)	15.54 (3.78)	16.37 (4.04)	7 - 26	7 - 28
Sensation seeking ^a	14.71 (3.66)	15.77 (3.42)	14.76 (3.11)	8 - 23	6 - 24
Impulsivity ^a	11.34 (2.53)	12.56 (3.02)	13.11 (2.62)	6 - 18	5 - 20
Ambivalent ^b	5.3	0	0	-	-
Recognition ^b	0	0	0	-	-
Taking steps ^b	94.4	100	100	-	-

^aThe values presented for the participants represent the mean (standard deviation). ^bThe values presented for the participants represent the percentage of participants classified.

Table 4
Group Differences on Substance Use Severity, Polysubstance Use, and Personality

	Comprehensive (<i>n</i> = 21)	LTHT (<i>n</i> = 26)	Fee-for-Service (<i>n</i> = 23)	<i>F</i>	<i>P</i>	η_p^2
Substance use severity (frequency of substance use in the past 30 days)	10.89 (8.2) ^a	13.26 (7.5) ^a	20.67 (11.3) ^b	6.83*	.002	0.17
Polysubstance use (number of substances used in past 30 days)	2.37 (1.8) ^a	2.88 (2.0) ^a	4.34 (2.3) ^b	5.98*	.004	0.16
Anxiety sensitivity	13.58 (3.02) ^a	14.48 (2.86) ^a	13.39 (3.38) ^a	0.87	.424	0.02
Hopelessness	14.74 (3.38) ^a	15.54 (3.78) ^a	16.37 (4.04) ^a	0.98	.380	0.17
Sensation seeking	14.71 (3.66) ^a	15.77 (3.42) ^a	14.76 (3.11) ^a	0.74	.480	0.02
Impulsivity	11.34 (2.53) ^a	12.56 (3.02) ^a	13.11 (2.62) ^a	2.19	.119	0.09

Note. The values presented for the participants represent the mean (standard deviation).

Note. Matched letter superscript (a/a) = no significant difference; Contrast letter supper script (a/b) = significant difference

* $p < .01$

Table 5
Coding Frame for Qualitative Analysis

Main Category	Subcategory	Description	Example
Positive Clinic Perception	Client incentives	Participants report that clinic offer money or gifts to clients.	“Like, down there at Christmas time, you get a \$50 gift certificate from the grocery store, which is great.”
	Convenient location	Participants report that it is easy to get to the clinic.	“I just live up the street, so I walk.”
	Counselling and mental health services	Participants report accessing counselling or mental health services at the clinic.	“They offer counseling and all kinds of stuff like that”.
	Discourages benzo use	Participants report that the clinic does not prescribe benzos.	“They're not safe really together. [The doctor] doesn't prescribe them because of that.”
	Good balance of rules	Participants report that the rules are fair.	“They have tough rules but they're also very flexible.”
	Referral to other services	Participants report that the clinic has referred them to other services.	“If they can't do it they will direct you to somebody who can.”
	Short waitlist	Participants report not waiting not to access services.	“There wasn't a wait list. The first time I came, I came right in.”
	Supportive staff	Participants report staff is caring; non-judgmental; fair; understanding; trustworthy; etc.	“I have always felt like respected and safe.”

Negative Clinic Perception

Inconvenient hours	Participants report difficulties accessing services because of business hours.	“It's either nine o'clock in the morning or two o'clock in the afternoon, which are really bad times for me.”
Inconvenient location	Participants find it difficult to get to the clinic.	“I don't have a vehicle, so it's kind of tough getting here.”
Long waitlist	Participants report waiting a long time to access services.	“I waited eight months, actually.”
Need for better mental health services	Participants report not being able to access the mental health services they need; no psychiatrist on staff; etc.	“It would be nice if they could get a counselor in on a maybe once a month.”
Need for more organization	Participants report needing more structure; more communication with staff and doctors.	“They change the rules day by day, I find.”
Need for programs and resources	Participants report not having access to programs and resources related to recovery.	“They just give you your drink and, see ya.”
Negative attitudes toward staff	Participants report not feeling comfortable with staff; not trusting staff; large staff turnover; etc.	“I feel like I wouldn't be able to confide in them if I went through that right now.”
No group counselling	Participants report a desire for group counselling or programs.	“Um, they used to have a group, I think, over there, but then all the old counselors left.”

Negative
Methadone
Perception

No personalization	Participants report a once size fits all approach or blanket rules.	“There, there's no personalization into any of it.”
Prescribes benzos	Participants report that the clinic prescribes benzos without stipulations.	“I'm actually prescribed benzos. You know, I'm not going to lie, I do sometimes ... take more than I should.”
Program has changed	Participants report negative changes in the program policies.	“It's not the same anymore. It's not the people itself, but their policies.”
Too lenient	Participants report that the clinic has lenient rules which enable users.	“To be honest, I really think more of a threat to be kicked off the program due to other substance uses ... might change direction for some people.”
Too strict	Participants report that the clinic had strict rules which discourage clients.	“I think that would be the hardest thing, is with, um, with the rules, like with, you know, you have to go to the doctor, you have to give the urine, like there's no, there's no if, ands or buts.”
Replacement drug	Participants report methadone is just another drug; they are still dependent; they are still an addict; etc.	“It's kind of a disappointment with me in a little way, because I'm depending on something else.”

Does not affect other substances	Participants report that they still use other substances.	Just another dependent.” “It doesn't help with cocaine or anything, just the opiates.”
Fear of withdrawal	Participants report being afraid to come off of methadone because of withdrawal symptoms.	“I'm scared, and methadone is, um, you do go through withdrawal. It doesn't matter now slow you come down, um, it's going to hurt and I'm scared.”
Lack of knowledge about methadone	Participants report not being informed about the effects and duration of methadone.	“I didn't really know what methadone was, I didn't research it or anything like that.”
Methadone dose too high	Participants report doses are too high for functioning, etc.	“If there was a way that they could figure out where they should stop your dose, that's the biggest thing for me.”
Methadone treatment too long-term	Participants report not wanting to be on methadone long-term.	“I'd rather just suffer through it for two weeks, maybe go to detox if I had to, you know.”
Physical side effects	Participants report negative physical side effects of taking methadone.	“It was making me groggy and it was making me like a zombie.”
Start dose too low	Participants report that it takes too long to build up to stable methadone dose.	“It was really a slow build up. I wasn't supplementing with anything.”
Still using opioids	Participants report still using opioids while in methadone.	“I still do a pill once in a while. Like once a month I'll ... I'll grab fifty

		dollars' worth of 'em."
	Ups and downs	Participants report that the journey on methadone is a rollercoaster; good and bad; ups and downs; etc.
	Unsuccessful attempts with MMT	Participants report relapsing after previous MMT.
	Would not recommend	Participants would not recommend MMT.
		"It was a rollercoaster for a while."
		"I didn't ... it didn't work for me the first time."
		"If somebody can get off it and stay off it I would recommend them not to go on it (methadone)."
Positive Methadone Perception	Positive social impact	Participants report leaving unhealthy relationships; leaving toxic social environments.
	Stability/normality	Participants report getting their lives back; being normal again' etc.
	Helps with other substances	Participants report that they have reduced their use of other substances as well.
	Reduces crime	Participants report staying away from criminal activity; stealing for money; etc.
		"Like it got me away from all those kinds of people socially."
		"I just got my life back really."
		"I find with methadone I still don't want to drink, so it helps me not want to drink too."
		"I don't have to run around ... I don't have to steal nothin, or run outta money, to ... for a pill. You know?"

	Positive family impact	Participants report fostering better relationships with their families.	“My family likes me again.”
	Reduces opioid use	Participants report using fewer opiates; no opiates.	“It helped me stay sober and live a good life.”
	Saves lives	Participants report that MMT saved their lives; would not be here without it; etc.	“If I hadn't have started it I'd be dead now.”
	Would recommend	Participants have and would recommend MMT.	“I mean, I would recommend it to anybody.”
Patient History	Crime/incarceration	Participants report committing crime or spending time in jail.	“I was actually stealing from that job to help buy Dilaudids.”
	Mental health issues	Participants report current or past trouble with mental health issues.	“I was diagnosed by two different psychiatrists as having PTSD.”
	Multiple TX attempts other than MMT	Participants report doing through detox, going cold turkey, etc.	“Um, I've been in detox probably six or seven times.”
	Readiness for treatment	Participants report needing to be ready for treatment; commit to treatment.	“I felt I was quite ready, which doesn't mean I didn't have failures, but I felt that I was ... I wanted, I truly wanted to do something about it.”
	Polysubstance use	Participants report using multiple substances.	“I was doing everything, like, anything, but it was usually pills.”
	Opioid prescription	Participants report receiving a legitimate prescription for	“I was quite heavy into prescription drugs, a lot prescribed by my

	opiates at some point.	doctor for back pain.”
Recreation/self-medicating	Participants report never having a legitimate prescription for opiates.	“It was completely recreational and I completely knew what I was getting into cause my sister had gone through it.”
Voluntary treatment	Participants report seeking treatment voluntarily.	“It was my decision to call. I had heard about the program.”

Table 6
Coding Frequencies for Most Prominent Comprehensive Program Model Themes

	Percent Coverage in Category	Percent Coverage in Transcript
Positive clinic perception		29
Supportive staff	54	16
Counselling	20	6
Good balance of rules	13	4
Short wait-list	9	3
Negative clinic perception		18
Negative attitude toward staff	29	5
Inconvenient location	26	5
Too strict	15	3
No personalization	12	2
Positive methadone perception		20
Gain stability/normality	16	3
Reduces opioid use	16	3
Positive family impact	16	3
Saves lives	13	3
Negative methadone perception		13
Unsuccessful MMT	24	3
Fear of withdrawal	24	3
Replacement drug	16	2
Start dose too low	12	2
Patient History		19
Voluntary treatment	22	4
Opioid prescription	22	4
Readiness for treatment	16	3
Multiple treatment attempts	16	3

Table 7
Coding Frequencies for Most Prominent LTHT Program Model Themes

	Percent Coverage in Category	Percent Coverage in Transcript
Positive clinic perception		34
Supportive staff	46	16
Good balance of rule	7	3
Counselling	7	3
Convenient location	7	3
Negative clinic perception		21
Needs more organization	16	3
Too strict	8	2
Need for better mental health services	8	2
Negative attitude toward staff	6	1
Positive methadone perception		13
Reduces opioid use	43	5
Saves lives	20	3
Positive family impact	17	2
Reduces crime	13	2
Negative methadone perception		16
Unsuccessful MMT	16	3
Replacement drug	16	3
MMT too long-term	13	2
Physical side-effects	13	2
Patient History		16
Recreation/self-medicating	20	3
Opioid prescription	20	3
Voluntary treatment	13	2
Polysubstance use	13	2

Table 8
Coding Frequencies for Most Prominent Fee-for-Service Program Model Themes

	Percent Coverage in Category	Percent Coverage in Transcript
Positive clinic perception		29
Supportive staff	64	18
Counselling	20	6
Short waitlist	9	3
Referral to other services	9	3
Negative clinic perception		16
Needs more organization	39	6
Negative attitude toward staff	33	5
Need for more programs	14	2
Inconvenient hours	14	2
Positive methadone perception		20
Reduces opioid use	29	6
Gain stability/normality	9	2
Reduces crime	4	1
Positive social impact	2	1
Negative methadone perception		13
Replacement drug	34	4
MMT too long-term	24	3
No help with other substances	24	3
Unsuccessful MMT	14	2
Patient History		22
Voluntary treatment	22	5
Crime/incarceration	18	4
Opioid prescription	18	4
Mental health issues	14	3

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Appendix A

Semi-Structured Interview

(Part 1) **PARTICIPANT HISTORY AND PROGRESS IN MMT**

Why did you start this MMT program?

Probe: Have you been in other MMT programs?

How ready did you feel about starting this MMT program?

Probe: Were you referred to the program?

How has MMT affected your substance use?

Probe: What was your substance use like before entering the program? What about now?

Opioids? Other substances?

Probe: Did your opioid use start with a legitimate prescription for pain or an accident?

(Part 2) **PERCEPTION OF MMT PROGRAM(S)**

What do you think of this MMT program so far?

Probe: Program expectations? Rules?

What is the most important/helpful aspect of MMT for you? What is least helpful?

Probe: Medication? Support?

(Part 3) **USE OF ANCILLARY SERVICES**

What sort of support do you get in the program?

Probe: Physical? Emotional? Social?

What do you feel this program is helping you with beyond changing your substance use?

Probe: Treatment? Physical care? Thoughts/behaviours? Emotions? Finances? Information?

How well do you think that the program is meeting these areas you feel that you need help with?

Probe: Are you getting services from elsewhere too?

(Part 4) **BARRIERS TO MMT AND FACTORS ASSOCIATED WITH RECOVERY**

What can this program do that would help you better manage difficulties in your life?

Probe: Take them through the needs that they have identified from the above list and ask them to give suggestions that may help the program to meet these needs.

How easy or difficult is it for you to access MMT services? What gets in the way?

Probe: Transportation? Childcare? Referral Process?

Probe: How far away do you live from this MMT site? Did this affect your decision to attend this MMT program?

(Part 5) **OVERALL MMT EXPERIENCE**

How would you describe your overall experience with MMT?

Probe: Would you recommend this MMT program to others? Why or why not?

Probe: Do you have any other thoughts or observations about your experience in this program?

(Part 6) **FINALLY:**

Thank you for your time. Do you have any questions that you would like to ask of me?

Appendix B

Participant Information

Instructions: Please answer each of the following questions by indicating the appropriate response.

Part A

1. Please indicate your age:

2. Please indicate your gender:

3. Please indicate how long you have been in your current MMT program:

- | | |
|---|--|
| <input type="checkbox"/> Less than 3 months | <input type="checkbox"/> 1 to 2 years |
| <input type="checkbox"/> 3 to 6 months | <input type="checkbox"/> 2 to 4 years |
| <input type="checkbox"/> 6 months to a year | <input type="checkbox"/> More than 4 years |

4. Please indicate in which region you live:

- | | |
|---|--|
| <input type="checkbox"/> Saint John North | <input type="checkbox"/> Grand Bay-Westfield |
| <input type="checkbox"/> Saint John East | <input type="checkbox"/> Rothesay/Quispamsis |
| <input type="checkbox"/> Saint John South | <input type="checkbox"/> Hampton |
| <input type="checkbox"/> Saint John West | <input type="checkbox"/> Sussex |
| <input type="checkbox"/> Other: _____ | |

5. Please indicate your ethnicity (check all that apply):

- | | |
|---|--|
| <input type="checkbox"/> White/Caucasian | <input type="checkbox"/> Hispanic/Latino |
| <input type="checkbox"/> Black/African Canadian | <input type="checkbox"/> Middle Eastern/Arabic |
| <input type="checkbox"/> Asian/Pacific Islander | <input type="checkbox"/> Other |

Part B

This refers to substances such as methadone (only if NOT prescribed), morphine, dilaudid, codeine (Tylenol 3 & 4), heroin, percocets, oxycontin, demerol, vicodin, and fentanyl.

1. How old were you when you first used an opioid?

2. Did your opioid use start with a prescription for pain or an accident (prescribed to you by a doctor)?

YES	NO
-----	----

3. On what date did you last use an opioid other than prescribed methadone?

 (dd/mm/yyyy)

4. Frequency of opioid use in the last year (Circle one):

Daily	Weekly	Bi-weekly	Monthly	Less than Monthly
-------	--------	-----------	---------	-------------------

5. How would you rate the severity of your problems caused by opioids? (Circle one):

1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---

None

Severe

Moderate

(No consequences consequences)

(Legal, Social, Work consequences)

Part C

Please respond to the next questions concerning your opioid use IN THE LAST YEAR

1. Have you often taken opioids in larger amounts or over a longer period of time than intended?

YES	NO
-----	----

2. Have you had a strong desire or unsuccessful efforts to cut down or control opioid use?

YES	NO
-----	----

3. Have you spent a great deal of time on activities necessary to obtain opioids, use opioids, or recover from their effects?

YES	NO
-----	----

4. Have you had cravings or a strong desire to use opioids?

YES	NO
-----	----

5. Has your opioid use caused you problems at work, school, or home?

YES	NO
-----	----

6. Have you continued to use opioids use despite having social or interpersonal problems caused by opioids?

YES	NO
-----	----

7. Have you given up, or reduced your social, work, or recreational activities because of opioid use?

YES	NO
-----	----

8. Have you continued using opioids in situation in which it is physically dangerous?

YES	NO
-----	----

9. Have you continued using opioids despite having physical or psychological problems that are likely caused by opioids?

YES	NO
-----	----

10. Have you experienced either of the following?

- a. A need for a larger amount of opioids to achieve the desired effect?

YES	NO
-----	----

- b. Less of an effect if you continue to use the same amount of opioid?

YES	NO
-----	----

11. Have you experienced either of the following when you stop taking opioids?

- a. Opioid withdrawal syndrome (dysphoric mood, nausea or vomiting, muscle aches, runny eyes, shivering or sweating, diarrhea, insomnia, fever, yawning)?

YES	NO
-----	----

- b. Taken the same (or a closely related) substance to relieve or avoid withdrawal symptoms?

YES	NO
-----	----

Appendix C

ASI-Self Report

Instructions: Please answer each of the following questions as honestly as possible.

1. Please circle how frequently you have used the following substances *in the past 30 days* (**not** including drugs taken as prescribed by your doctor).

a. Alcohol

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

b. Tobacco

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

c. Heroin

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

IV USE?

- d. Other opiates/narcotics** (morphine; Dilaudid; Demerol; Percocet; Vicodin; Hydro; Fentanyl) **DO NOT INCLUDE PRESCRIBED METHADONE**

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

IV USE?

- e. Barbiturates** (Nembutal, Seconol, Amytal, Secobarbital, Phenobarbital)

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

IV USE?

- f. Sedatives/Tranquilizers** (benzos, Valium, Xanax, Ativan)

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

IV USE?

- g. Cocaine** (free-base, crack cocaine)

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

IV USE?

h. Amphetamines (meth, Dexedrine, Ritalin, speed, ice)

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

i. Cannabis (marijuana, hashish)

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

j. Hallucinogens (LSD, mescaline, mushrooms, ecstasy, PCP)

Never use	Less than once a month	One or two times a month	Once or twice a week	Nearly every day	Once a day or more
-----------	------------------------	--------------------------	----------------------	------------------	--------------------

2. **How many days have you used more than one substance (including alcohol) in the past 30 days?**

(number of days)

3. **In the past 30 days, how many days have you experienced drug problems?**

(number of days)

4. **How troubled or bothered have you been by these drug problems in the past 30 days?**

Not at all	Slightly	Moderately	Considerably	Extremely
------------	----------	------------	--------------	-----------

5. **How important to you now is treatment for these drug problems?**

Not at all	Slightly	Moderately	Considerably	Extremely
------------	----------	------------	--------------	-----------

6. **What is your preferred substance of choice?**

Employment

7. **What is your usual employment pattern in the last 3 years?**

- | | |
|--|--|
| <input type="checkbox"/> Full time (35+ hours) | <input type="checkbox"/> Military service |
| <input type="checkbox"/> Part time (regular hours) | <input type="checkbox"/> Retired/disability |
| <input type="checkbox"/> Part time (irregular hours) | <input type="checkbox"/> Unemployed |
| <input type="checkbox"/> Student | <input type="checkbox"/> In controlled environment |

8. **Do you receive money from any of the following sources? (check all that apply)**

- | | |
|--|--|
| <input type="checkbox"/> Employment | <input type="checkbox"/> Pension, benefits, or social security |
| <input type="checkbox"/> Unemployment compensation | <input type="checkbox"/> Partner, family, or friends |
| <input type="checkbox"/> Welfare | <input type="checkbox"/> Illegal |

Legal Status

9. **Was your admission in methadone treatment prompted or suggested by the criminal justice system (e.g., court ordered)?**

YES	NO
-----	----

10. **Are you on probation or parole?**

YES	NO
-----	----

11. **Have you ever been incarcerated?**

YES	NO
-----	----

12. **How many days in the past 30 days have you engaged in illegal activities for profit?**

(number of days)

Appendix D
(SURPS)

Instructions: Please read the following statements carefully. Rate the degree each statement applies to you by circling the appropriate option.

1. I am often content.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

2. I often don't think things through before I speak.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

3. I would like to skydive.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

4. I am happy.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

5. I often involve myself in situations that I later regret being involved in.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

6. I enjoy new and exciting experiences even if they are unconventional.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

7. I have faith that my future holds great promise.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

8. It's frightening to feel dizzy or faint.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

9. I like doing things that frighten me a little.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

10. It frightens me when I feel my heart beat change.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

11. I usually act without stopping to think.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

12. I would like to learn how to drive a motorcycle.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

13. I feel proud of my accomplishments.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

14. I get scared when I'm too nervous.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

15. Generally, I am an impulsive person.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

16. I am interested in experience for its own sake, even if it is illegal.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

17. I feel that I'm a failure.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

18. I get scared when I experience unusual body sensations.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

19. I would enjoy hiking long distances in wild and uninhabited territory.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

20. I feel pleasant.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

21. It scares me when I'm unable to focus on a task.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

22. I feel I have to be manipulative to get what I want.

Strongly Disagree	Disagree	Agree	Strongly Agree
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23. I am very enthusiastic about my future.

Strongly Disagree	Disagree	Agree	Strongly Agree
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Appendix E
(SOCRATES 8D)

Instructions: Please read the following statements carefully. Each one describes a way that you might (or might not) feel about your drug use. For each statement, circle one response indicate how much you agree or disagree with it right now. Please circle one and only one number for every statement.

1. I really want to make changes in my use of drugs.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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2. Sometimes I wonder if I am an addict.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

3. If I don't change my drug use soon, my problems are going to get worse.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

4. I have already started making some changes in my drug use.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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5. I was using drugs too much at one time, but I've managed to change that.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

6. Sometimes I wonder if my drug use is hurting other people.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

7. I have a drug problem.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

8. I'm not just thinking about changing my drug use, I'm already doing something about it.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

9. I have already changed my drug use, and I am looking for ways to keep from slipping back to my old pattern.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

10. I have serious problems with drugs.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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11. Sometimes I wonder if I am in control of my drug use.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

12. My drug use is causing a lot of harm.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

13. I am actively doing things now to cut down or stop my use of drugs.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

14. I want to help to keep from going back to the drug problems that I had before.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

15. I know that I have a drug problem.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

16. There are times when I wonder if I use drugs too much.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

17. I am a drug addict.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

18. I am working hard to change my drug use.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
-------------------	----------	-----------	-------	----------------

19. I have made some changes in my drug use, and I want some help to keep from going back to the way I was before.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
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Appendix F
Informed Consent A



TITLE OF STUDY/PROTOCOL: Client experiences in three methadone maintenance therapy (MMT) programs in Saint John, New Brunswick: A step toward treatment matching

PRINCIPAL INVESTIGATOR:

Lillian MacNeill (University of New Brunswick), PhD Candidate

FILE NUMBER:

INTRODUCTION

We invite you to participate in the research study named above. Before you can decide whether or not to volunteer, you must understand the purpose, how it may affect you, any risks to you, and what is expected of you. This process is called informed consent.

- Your participation is entirely voluntary;
- The quality of your care will not be affected by whether or not you participate;
- You may withdraw from the study at any time without affecting your present or future health care;
- If the study is changed in any way which could affect your willingness to stay in the study, you will be told about the changes and may be asked to sign a new informed consent;
- Your participation in this study may be stopped if your doctor decides it is in the best interest of your health and welfare.

PURPOSE OF STUDY

The current study will assess clients' experiences at different MMT sites in Saint John, New Brunswick. This will provide insight into which client and treatment characteristics are most important for client satisfaction and success in certain MMT programs. Personalization of MMT programs has been suggested as a means of improving MMT effectiveness.

PROCEDURE

If you decide to participate in this study you will be asked to complete four self-report questionnaires about substance use, problems associated with substance use, personality, and treatment readiness. These questionnaires will take approximately 30 minutes to

complete. You will receive your choice of a \$10 Irving Oil or a \$10 Tim Hortons gift card as a thank you for participating in this study.

POTENTIAL RISKS/DISCOMFORTS

There are no anticipated major risks to participating in this study. The decision to participate in this study is entirely your own. The services you receive at this MMT clinic will in no way be affected by your decision to participate or not. There is a mild risk that some of the questions will be upsetting to you. We remind you that you are free to not answer certain questions, as well as to withdraw your participation from the study at any time. Upon withdrawing from the study, any information collected from you will be destroyed at your request.

POTENTIAL BENEFITS

Although this study will have no direct benefits for you, results will be used to improve the experience of future clients enrolling in Methadone Maintenance Therapy.

QUESTIONS

If you have questions after you read this form, ask the investigator from the study to explain. You should not sign this form until you are sure that you understand the study.

If you have general questions or concerns about your rights as a research participant, you may contact someone not involved in the study by calling the Horizon Health Network Ethicist Dr. Timothy Christie at (506) 648-6556, or the chair of the UNB Saint John Research Ethics Board Lisa Best at (506) 648-5562.

PRIVACY AND CONFIDENTIALITY

Protecting your privacy is an important part of this study.

When you sign this consent form you give us permission to:

- Collect information from you.
- Share information with the people responsible for protecting your safety.

If you have questions or concerns about your privacy rights as a research participant, you may contact someone not involved in the study. You may contact the Privacy Officer for Horizon Health Network at the toll free number 1-877-422-8717.

Use of information

The research team will collect and use only the information they need to conduct the study.

This information will include your:

- Information from study questionnaires.

Please note, the results of the study may be published in academic/medical literature, but you will not be identified.

Your name and contact information will be kept secure by the research team at the site where the study is being performed. It will not be shared with others without your permission. Your name will not appear in any report or article published as a result of this study.

Your questionnaire responses are anonymous. Your consent form will be separated from your questionnaire package and stored in a secure location. Therefore, your name will not be associated with any of your questionnaire responses.

Information collected for this study will be kept for approximately 7 years before being destroyed or deleted.

By signing this consent form, you agree that your information may be used as described above.

Your access to information

You may ask the researcher to see the information that has been collected about you and to correct any inaccuracies.

COMPENSATION

You will receive one \$10 Irving Oil or \$10 Tim Hortons gift card, as compensation for your time completing the survey package.

ADDITIONAL INFORMATION

You are encouraged to ask questions at any time during the study.

CONSENT TO PARTICIPATE IN A CLINICAL RESEARCH STUDY A

TITLE OF PROTOCOL: Client experiences in three methadone maintenance therapy (MMT) programs in Saint John, New Brunswick: A step toward treatment matching

PRINCIPAL INVESTIGATOR: Lillian MacNeill (University of New Brunswick).
PhD Candidate

PARTICIPANT'S QUESTIONS:	
Has this study been explained to you?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Have you had an opportunity to ask questions and discuss this study?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Are you comfortable with the information that has been provided?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you understand that you are free to withdraw from this study?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you understand that you will receive a signed copy of this consent?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you understand that your Primary Healthcare Provider will be informed that you are participating in this study?	<input type="checkbox"/> Yes <input type="checkbox"/> No

PARTICIPANT'S STATEMENT

I have read the above information and understand the purpose of the research as well as the potential benefits and risks of participation in the study. I have had the opportunity to ask questions, and all my questions have been answered. By signing, I am indicating that I have reviewed all pages of this document. I hereby give my informed consent to be a participant in this study.

Printed Name of Participant

Signature of Participant

Date

If you would like to receive a summary of the outcome of the research, please enter your contact information below (email or mailing address):

Printed Name of Person Conducting
Informed Consent Discussion

Signature of Person Conducting
Informed Consent Discussion

Date

INVESTIGATOR'S/DELEGATE'S STATEMENT

I have explained to the above participant the nature, requirements and the purpose of the study, potential benefits, and possible risks associated with participation in this study. I have answered any questions that have been raised. I believe that the participant understands the implications and the voluntary nature of the study.

Investigator/Delegate (Print)

Date

Signature

Appendix G
Informed Consent B



TITLE OF STUDY/PROTOCOL: Client experiences in three methadone maintenance therapy (MMT) programs in Saint John, New Brunswick: A step toward treatment matching

PRINCIPAL INVESTIGATOR:

Lillian MacNeill (University of New Brunswick), PhD Candidate

FILE NUMBER:

INTRODUCTION

We invite you to participate in a semi-structured interview for the research study named above. Before you can decide whether or not to volunteer, you must understand the purpose, how it may affect you, any risks to you, and what is expected of you. This process is called informed consent.

- Your participation is entirely voluntary;
- The quality of your care will not be affected by whether or not you participate;
- You may withdraw from the study at any time without affecting your present or future health care;
- If the study is changed in any way which could affect your willingness to stay in the study, you will be told about the changes and may be asked to sign a new informed consent;
- Your participation in this study may be stopped if your doctor decides it is in the best interest of your health and welfare.

PROCEDURE

If you decide to participate you will be asked to take part in a 30-minute interview about your history and progress in MMT treatment, your use of different MMT treatment programs and services, factors associated with recovery, and overall MMT experience. To ensure important points are not missed, the interviews will be audio recorded. You will receive an additional \$10 Irving Oil or \$10 Tim Hortons gift card as a thank you for time.

PRIVACY AND CONFIDENTIALITY

Protecting your privacy is an important part of this study.
When you sign this consent form you give us permission to:

- Collect information from you.
- Share information with the people responsible for protecting your safety.

If you have questions or concerns about your privacy rights as a research participant, you may contact someone not involved in the study. You may contact the Privacy Officer for Horizon Health Network at the toll free number 1-877-422-8717.

Use of information

The research team will collect and use only the information they need to conduct the study.

This information will include your:

- Information from study interviews.

Please note, the results of the study may be published in academic/medical literature, but you will not be identified.

All interviews will be audio recorded, but your responses will be kept confidential and any quotes will be anonymized. Your name will be removed from the interview recordings during transcription and your audio file will be assigned an identification number (corresponding to your survey package) and kept on an encrypted USB device.

Information collected for this study will be kept for approximately 7 years before being destroyed or deleted.

By signing this consent form, you agree that your information may be used as described above.

Your access to information

You may ask the researcher to see the information that has been collected about you and to correct any inaccuracies.

COMPENSATION

You will receive one \$10 Irving Oil or \$10 Tim Hortons gift card, as compensation for your time completing the survey package and one \$10 pre-paid Visa card or \$10 Tim Hortons gift card, as compensation for your time if you participate in the interview.

ADDITIONAL INFORMATION

You are encouraged to ask questions at any time during the study.

CONSENT TO PARTICIPATE IN A CLINICAL RESEARCH STUDY B

TITLE OF PROTOCOL: Client experiences in three methadone maintenance therapy (MMT) programs in Saint John, New Brunswick: A step toward treatment matching

PRINCIPAL INVESTIGATOR: Lillian MacNeill (University of New Brunswick).
PhD Candidate

PARTICIPANT'S QUESTIONS:	
Has this study been explained to you?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Have you had an opportunity to ask questions and discuss this study?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Are you comfortable with the information that has been provided?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you understand that you are free to withdraw from this study?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you understand that you will receive a signed copy of this consent?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you understand that your Primary Healthcare Provider will be informed that you are participating in this study?	<input type="checkbox"/> Yes <input type="checkbox"/> No

PARTICIPANT'S STATEMENT

I have read the above information and understand the purpose of the research as well as the potential benefits and risks of participation in the study. I have had the opportunity to ask questions, and all my questions have been answered. By signing, I am indicating that I have reviewed all pages of this document. I hereby give my informed consent to be a participant in this study.

Printed Name of Participant

Signature of Participant

Date

If you would like to receive a summary of the outcome of the research, please enter your contact information below (email or mailing address):

Printed Name of Person Conducting
Informed Consent Discussion

Signature of Person Conducting
Informed Consent Discussion

Date

INVESTIGATOR'S/DELEGATE'S STATEMENT

I have explained to the above participant the nature, requirements and the purpose of the study, potential benefits, and possible risks associated with participation in this study. I have answered any questions that have been raised. I believe that the participant understands the implications and the voluntary nature of the study.

Investigator/Delegate (Print)

Date

Signature

Curriculum Vitae

Candidate's full name: Lillian MacNeill

Universities attended (with dates and degrees obtained):

University of New Brunswick, Saint John

Ph.D. Experimental Psychology, 2019

M.A. Experimental Psychology, 2014

Hon. Honors in Psychology, 2011

B.A. Major in Psychology, minor in Cognitive Neuroscience, 2010

Publications:

MacNeill, L.P., Best, L. A., & Davis, L. L. (2017). The role of personality in body image dissatisfaction and disordered eating: Discrepancies between men and women.

Journal of Eating Disorders, 5(44). doi: 10.1186/s40337-017-0177-8

MacNeill, L. P., DiTommaso, E., & Brunelle, C. (2016). Coping Style as a Moderator of Chronic Loneliness and Substance Use in Emerging Adults. Journal of Anxiety and Depression, 5(215). doi: 10.4172/2167-1044.1000215

MacNeill, L. P., & Best, L. A. (2015). Perceived Current and Ideal Body Size in Female Undergraduates. Eating Behaviors, 18, 71-75. doi:10.1016/j.eatbeh.2015.03.004

Fanjoy (MacNeill), L. P., MacNeill, A. L., & Best, L. A. (2012). The Use of Diagrams in Science: An Examination of Trends in Articles Published in Science between 1880 and 2010. In P. Cox, B. Plimmer, and P. Rogers (Eds.) Diagrammatic Representation and Inference: 7th International Conference, Diagrams 2012 (pp. 303-305). Heidelberg: Springer. doi: 10.1007/978-3-642-31223-6_33

Conference Presentations:

1. MacNeill, L. P., & Brunelle, C. (2019). Client Characteristics and Experiences in Three Methadone Maintenance Therapy (MMT) Models in Saint John, New Brunswick. An oral presentation at the the Inter-professional Health Research Day 2019 (iHR), Saint John, New Brunswick.
2. MacNeill, L. P. & Brunelle, C. (2019 June). Client Experiences in Three Models of Methadone Maintenance Therapy in a Mid-size Atlantic Canadian city. An oral presentation at the Psychologists in Hospitals and Health Centres (PHHC)'s Symposium: The Patient Perspective: Assessing Patient Experiences in Three Areas of Healthcare, The Canadian Psychological Association's 80th Annual Convention, Halifax, Nova Scotia.
3. MacNeill, L. P., Skelding, B., & Brunelle, C. (2018 November). Client Characteristics and Outcomes in Methadone Maintenance Therapy (MMT) in Saint John, New Brunswick. Presented as a poster at the Canadian Research Initiative in Substance Misuse (CRISM) Atlantic Symposium, Moncton, NB.
4. MacNeill, L. P. & Brunelle, C. (2018 November). Client Experiences in Three Methadone Maintenance Therapy (MMT) Programs in Saint John, New Brunswick: A Step toward Treatment Matching. An oral presentation at the Canadian Research Initiative in Substance Misuse (CRISM) 2018 Addiction Summit, Montreal, Quebec.
5. MacNeill, L. P., MacNeill, A. L., Golding, M., Cull, A., Mayich, J., & DiTommaso, E. (2018 June). Coping Strategies and Mental Health Outcomes in Patients Waiting for Orthopaedic Foot and Ankle Care. Presented as a poster at the 2018 International

- Congress of Applied Psychology (ICAP 2018)/ Canadian Psychological Association's 79th Annual Convention, Montréal, Québec.
6. MacNeill, L. P., Brunelle, C., Keeping-Burke, L., Doyle, S., & Carr, T. (2017 June). "We Not Me": A Qualitative Analysis of a Spirituality-Based 12-Step Program for Women in Addiction Recovery. An oral presentation at the Psychologists in Hospitals and Health Centres (PHHC) Graduate Symposium, The Canadian Psychological Association's 78th Annual Convention, Toronto, Ontario.
 7. Keeping-Burke, L., Brunelle, C., MacNeill, L.P., Doyle, S., & Carr, T. (2017 May). Women in Addiction Recovery: Understanding the Journey. An oral presentation at the Atlantic Region Canadian Association of Schools of Nursing (ARCASN) Conference, Moncton, New Brunswick.
 8. MacNeill, L. P., DiTommaso, R., & Brunelle, C. (2016 June). Coping Style as a Moderator between Attachment Orientation and Substance Use in Emerging Adults. Presented as a poster at The Canadian Psychological Association's 77th Annual Convention, Victoria, British Columbia.
 9. Carr, T., Keeping-Burke, L., Brunelle, C., MacNeill, L. P., & Doyle, S. (2016 May). Assessing a Spirituality-Based 12-Step Program for Women in Addiction Recovery. Presented as a poster at the 21st Annual Research Day: Moving Research Forward, Fredericton, New Brunswick.
 10. MacNeill, L. P., Carr, T., Keeping-Burke, L., Brunelle, C., & Doyle, S. (2016 April). The Meaning and Impact of a Spirituality-Based 12-Step Program for Women in Addiction Recovery. Oral presentation at the Graduate Research Conference 2016, Fredericton, New Brunswick.

11. MacNeill, L. P., DiTommaso, R., & Brunelle, C. (2016 April). Loneliness as a Predictor of Substance Use in Emerging Adults. Presented as poster at the Inter-professional Health Research Day 2016 (iHR), Saint John, New Brunswick.
12. MacNeill, L. P. & Best, L. A. (2015 June). Current and Ideal Body Size in Participants Exhibiting Disordered and Non-disordered Eating Attitudes: An Examination of Gender Differences. Presented as a poster at The Canadian Psychological Association's 76th Annual Convention, Ottawa, Ontario.
13. MacNeill, L. P. & Best, L. A. (2015 April). Current and Ideal Body Size in Participants Exhibiting Disordered and Non-disordered Eating Attitudes: An Examination of Gender Differences. Presented as a poster at the Graduate Research Conference 2015, Fredericton, New Brunswick.
14. MacNeill, L. P. (2013 November). Gender Differences in the Personality Correlates of Body Image Satisfaction and Disordered Eating. Presented as a poster presentation at the 5th Annual Conference on Health Research in New Brunswick, Saint John, New Brunswick.
15. Best, L.A., Ciszewski, S., MacNeill, L., Woodland, J., & Shannon, A. (2013 November). Prevalence of Disordered Eating in Male University Students. Presented as a poster presentation at the 5th Annual Conference on Health Research in New Brunswick, Saint John, New Brunswick.
16. Fanjoy (MacNeill), L. P., MacNeill, A. L., & Best, L. A. (2013 March). Exercise Habits of Female University Undergraduates. Presented as a poster at the Graduate Research Conference 2013, Fredericton, New Brunswick.

17. Fanjoy (MacNeill), L. P., MacNeill, A. L., & Best, L. A. (2013 March). Exercise Habits of Female University Undergraduates. Presented as a poster at the Inter-professional Health Research Day 2013 (iHR), Saint John, New Brunswick.
18. Fanjoy (MacNeill), L. P., MacNeill, A. L., & Best, L. A. (2012 July). The Use of Diagrams in Science: An Examination of Trends in Articles Published in Science between 1880 and 2010. Presented as a poster at the Diagrams 2012 Conference, Canterbury, England.
19. Fanjoy (MacNeill), L. P., MacNeill, A. L., & Best, L. A. (2012 July). The Use of Diagrams in Science: An Examination of Trends in Articles Published in Science between 1880 and 2010. Presented as a seminar at the Diagrams 2012 Conference Graduate Symposium, Canterbury, England.
20. MacNeill, A. L. & Fanjoy (MacNeill), L. P. (2012 July). The Serial Colour (SECO) Profile: A Colour-Based Form of Graphical Representation. Presented at the Diagrams 2012 Conference Graduate Symposium, Canterbury, England.
21. Fanjoy (MacNeill), L. P. & Best, L. A. (2012, April). Perceived Current and Ideal Weight in a Population of Female Undergraduates. Presented as a poster at the Graduate Research Conference 2012, Fredericton, New Brunswick.
22. Fanjoy (MacNeill), L. P. & Best, L. A. (2012, March). Perceived Current and Ideal Weight in a Population of Female Undergraduates. Presented as a poster at the Inter-professional Health Research Day 2012 (iHR), Saint John, New Brunswick.