

Young Adult Perceptions of Cannabis Use

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Abstract

In Canada, adolescents and young adults consume more cannabis than any other age group. Despite adolescents and young adults being particularly vulnerable to cannabis use related harms, research suggests that this age group often holds misconceptions about possible harms associated with cannabis use. The primary purpose of this study was to examine young adults' perceived dangerousness of regular cannabis use and the extent to which perceptions of dangerousness differs depending on the age (14, 21, or 28 years) and sex (male or female) of the cannabis user. Participants ($N = 656$) between the ages of 18 to 25 years completed an online survey that utilized an experimental vignette design whereby participants were randomly assigned one of six vignettes depicting a character who used cannabis regularly and based on their assigned vignette were asked to rate seven items of perceived dangerousness. A series of ANOVAs showed a significant main effect of age on six of seven items. Post hoc tests revealed that cannabis use by a 14-year-old was viewed as significantly more dangerous than cannabis use by a 21 and 28-year-old. However, cannabis use by a 21-year-old was not viewed as significantly more dangerous than cannabis use by a 28-year-old. Female cannabis use was perceived as more dangerous than male cannabis use in respect to social well-being. An inverse relationship between Cannabis Use Disorder Identification Test (CUDIT) score and perceived dangerousness was also found. Overall, these findings suggest that young adults may not fully appreciate the potential harms associated with regular cannabis use in their age cohort and that this may be particularly true of those having experienced adverse consequences associated with their own cannabis use.

Keywords: cannabis use, young adults, perceived dangerousness

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Young Adult Perceptions of Cannabis Use

Cannabis sativa, commonly referred to as cannabis, is a drug that can be consumed in several ways including inhalation (e.g., smoking, vaporizing), ingestion when baked into foods (e.g., edibles), or application as a topical oil. The active ingredient, $\Delta 9$ -tetrahydrocannabinol (THC), causes a “high” and defines the potency of the drug. On October 17th, 2018, Canadian laws surrounding cannabis underwent extensive changes as recreational cannabis use was legalized under The Cannabis Act (Government of Canada, 2018a). Currently, individuals at least 19 years of age (18 years in some provinces) can purchase cannabis from a licensed retailer, acquire up to 30 grams, and share up to 30 grams with other adults. To prevent access to cannabis by individuals under the legal age, the Canadian government has outlined harsh consequences for adults who supply cannabis to minors (Government of Canada, 2018b).

The legalization of recreational cannabis has been controversial as there are benefits and costs to public health and policy. From a legal standpoint, legalized recreational cannabis can alleviate strain on the justice system. After cannabis was legalized in 2012 in Washington State, there was a large decrease in the number of criminal convictions due to cannabis (Darnell & Bitney, 2017). Other benefits include increased tax revenue, discouraging the illegal market, assured safety of the product (i.e., not laced with another substance), increase in available jobs, decrease in law enforcement expenses, and the introduction of a profitable new industry (McGinty, Niederdeppe, Heley, & Barry, 2017).

Although it appears there are many benefits to legalizing cannabis, there are also several costs. Some of these costs may include increased fatalities due to motor vehicle

accidents (Salomonsen-Sautel, Min, Sakai, Thurstone, & Hopfer, 2014), increased pediatric exposure to cannabis (Onders, Casavant, Spiller, Chounthirath, & Smith, 2016), various health risks (e.g., breathing problems, vascular conditions, and alterations in brain development) (Volkow, Baler, Compton, & Weiss, 2014), and increased costs to the healthcare sector (McGinty et al., 2017). Above all, one of the primary concerns presented by recreational cannabis legalization is the potential increases in the prevalence of cannabis use and Cannabis Use Disorders (CUDs) in both adolescent and young adult populations (Kosterman et al., 2016) and the associated negative effects on these individuals.

In 2013, a report from the United Nations International Children's Emergency Fund (UNICEF) stated that Canadian adolescents aged 15 to 19 had the highest cannabis use rates in the world (UNICEF Office of Research, 2013). Furthermore, cannabis use rates in young adult populations are among the highest in Canada (Statistics Canada, 2017). Importantly, individuals in these age groups have been identified as being at a particularly high risk for cannabis use-related issues including declines in neurocognitive functioning (Gonzalez et al., 2012; Meier et al., 2012), poorer academic performance (Arria, Caldeira, Bugbee, Vincent, & O'Grady, 2015; Meier, Hill, Small, & Luthar, 2015), developing mental illnesses (Hayatbakhsh et al., 2007; Patton et al., 2002), driving under the influence (Lipari, Hughes, & Bose, 2016), and fatal vehicle accidents due to driving under the influence (Traffic Injury Research Foundation, 2017). Despite these findings, many adolescents and young adults do not perceive cannabis use to be harmful (Johnston et al., 2018; Schulenberg et al., 2017). The purpose of the current study was to examine the nature of young adult perceptions of cannabis use in terms of the dangers

posed to well-being (psychological, cognitive, social, and neural developmental) and to examine the extent to which perceptions of dangerousness differ across cannabis user demographic characteristics (age and sex).

Prevalence of Cannabis Use

It is estimated that Canadians aged 15 years and older have a lifetime cannabis use prevalence rate of 46.6% and a 12-month prevalence rate of 14.8% (Statistics Canada, 2017). Although reported trends in past-year use have fluctuated over time, the overall trend from 1985 to 2015 indicates a large increase in past-year use, as cannabis use rates have doubled since 1985. Specifically, in 1985, 5.6% of Canadians reported using cannabis in the past year compared to the reported 12.3% in 2015 (Rotermann & Macdonald, 2018). Of note, adolescents and young adults often have higher rates of cannabis use than any other age group. In Canada, individuals between the ages of 15 and 19 have a lifetime prevalence rate of 26.9% and a 12-month prevalence rate of 19.4%, while young adults between the ages of 20 and 24 have respective rates of 52.6% and 33.2% (Statistics Canada, 2017). Prevalence rates drop among individuals between the ages of 25 and 45, with past year use rates of 21.9% (Statistics Canada, 2017). Cannabis use statistics also illustrate sex differences. For example, in 2017, 18.7% of males and 11.1% of females over the age of 15 reported using cannabis in the past year (Statistics Canada, 2017).

Cannabis use prevalence rates have been found to vary somewhat between provinces. In Newfoundland and Labrador (NL), Statistics Canada's estimate of lifetime prevalence was 44.7%, and the 12-month prevalence estimate was 11.9% (Statistics Canada, 2017), indicating slightly lower usage than the national average. However,

according to Statistics Canada, patterns of use remain higher among adolescents and young adults in NL. A report from the Government of NL on cannabis use rates among students indicated that 30% of students between the ages of 13 and 18 had used cannabis in the past year, and the average age of first-time use was 14.2 years (Government of Newfoundland and Labrador, 2012). In 2017, 12.7% of male NL residents and 11.1% of female NL residents over the age of 15 reported using cannabis in the past 12 months (Statistics Canada, 2017).

Initial survey data post-legalization suggests an increase in cannabis use rates among first-time users; however, many of these first-time users are over the age of 45 (Statistics Canada, 2019). Although overall post-legalization prevalence rates have not increased substantially, it has been argued that this is due to the high demand for cannabis and the subsequent lack of supply. For example, retailers in the province of NL quickly sold out of cannabis after legalization and have not been able to keep up with demand which is expected to continue for up to two years (Armstrong, 2019; CBC News, 2018).

Potency of Cannabis

In addition to cannabis use rates increasing over time, the potency of cannabis (measured by THC concentration) has also increased. In Canada, dried cannabis strains in the 1980s had an average THC potency of 3%; however, in 2019, this potency has increased to approximately 15% and can reach up to 30% (Government of Canada, 2019). Similarly, research in the United States evaluated cannabis potency between 1995 and 2014 and found that the THC content has increased from 4% to over 12% (ElSohly et al., 2016). In addition to increasing THC content of the cannabis flower, a particularly potent form of cannabis known as butane hash oil has become particularly popular (Daniulaityte

et al., 2015). In comparison to other forms of cannabis preparations (e.g., cannabis oils), chemically concentrated extracts, such as butane hash oil, have the highest THC potency at 90% (Government of Canada, 2019). Butane hash oil and other high potency products have been linked to a more severe dependence (particularly in young people) (Freeman & Winstock, 2015; Meier, 2017). The increasing rates of cannabis use and products, as well as increased THC content, can result in negative health effects. For example, preliminary research on the negative impacts of butane hash oil use suggests that its use is more likely to be associated with severe dependence (Meier, 2017) as expressed through increased tolerance and withdrawal symptoms (Loflin & Earleywine, 2014).

Cannabis Use Disorder and Severity of Use

Cannabis use frequency differs for each individual. While many individuals may abstain from cannabis completely, a subset of individuals use cannabis to a problematic degree. Cannabis use severity is often measured by assessing the frequency of an individual's cannabis use and/or the impact it has on the individual's life (Asbridge, Duff, Marsh, & Erickson, 2014; Piontek, Daniela, Kraus, & Klempova, 2008). Several questionnaires have been developed to assess cannabis use severity and identify individuals that may have a CUD. These questionnaires include the Cannabis Use Disorders Identification Test (CUDIT; Adamson & Sellman, 2003), Cannabis Abuse Screening Test (CAST; Legleye, Karila, Beck, & Reynaud, 2007), and Severity of Dependence Scale (SDS; Gossop et al., 1995). Broadly, cannabis use becomes problematic when it interferes with one's well-being and poses harm to the individual either physically (e.g., cognitive impairments), socially (e.g., relationship strain due to disapproval of family members), legally (e.g., driving under the influence), and/or

psychologically (e.g., anxiety). Ultimately, interference across any or all of these domains may indicate the presence of a CUD.

In the *Diagnostic and Statistical Manual of Mental Disorders fifth edition (DSM-5*; American Psychiatric Association, 2013), CUD is categorized within the Substance-Related and Addictive Disorder classification. To be diagnosed with this disorder, an individual must experience at least two out of 11 symptoms that must take place within a 12-month period, cause significant impairment or distress to the individual, and result from chronic cannabis use. Examples of symptoms include: loss of control or an inability to reduce cannabis use despite attempts to do so; persistent cravings, desires, or urges to use cannabis; reduced or discontinued participation in important social, occupational, or recreational activities as a result of cannabis use; failure to fulfill duties at work, school or home as a result of cannabis use; increased tolerance to cannabis (i.e., feeling as if one needs to use increasingly more cannabis to experience the desired effect); and symptoms of withdrawal when cannabis is not used (e.g., irritability, difficulty with sleep, nervousness or anxiety). CUD can vary in severity where presenting symptoms are considered to be mild (two or three symptoms), moderate (four or five symptoms), or severe (six or more symptoms) (American Psychiatric Association, 2013).

The lifetime prevalence and 12-month prevalence of CUD are 6.8% and 1.3%, respectively (Pearson, Janz, & Ali, 2013). The average age of CUD onset is approximately 22 years, and CUD prevalence rates are highest among young adults (Hasin et al., 2016). However, one study by Richter, Pugh, and Ball (2017) reported that 3.5% of adolescent lifetime users met criteria for a CUD, while 11.6% of past-year users and 15.3% of current users met CUD criteria indicating that CUD is particularly

prevalent among adolescents. Regarding sociodemographic risk factors, research suggests that males, people of Indigenous or African descent, individuals who are not married, and individuals with lower incomes are all at a greater risk of developing CUD (e.g., Hasin et al., 2016; Stinson, Ruan, Pickering, Grant, 2006). Concerning co-morbid mental health issues, CUD is associated with higher rates of mood disorders, anxiety disorders, personality disorders, post-traumatic stress disorder, and other substance use disorders (Hasin et al., 2016).

Cannabis Use Risks and Harms

Cannabis use can have significant harms on multiple domains of functioning, including cognitive, social, psychological, and legal aspects (Danseco, Kingery, & Coggeshall, 1999). Adolescents and young adults aged 15 to 24 years are particularly susceptible to multiple cannabis use-related harms, particularly as they relate to cognitive functioning and development.

Brain development. Throughout adolescence and early adulthood, the brain continues to develop with ongoing synaptic pruning and myelination. Importantly, these developmental changes have been shown to play an important role in the development of cognitive abilities (Toga, Thompson, & Sowell, 2006). The use of cannabis during this developmental period is problematic because it may interfere with the processes underlying brain maturation. Specifically, the neurotransmitter glutamate is essential in the process of synaptic pruning during adolescence and young adulthood. Exposure to THC can disrupt the release of glutamate which can result in abnormal synaptic connections. When there is interference with specific neural circuits in the prefrontal cortex, this can impact the transmission of dopamine and Gamma-Aminobutyric acid

(GABA). Key components to schizophrenia include abnormal prefrontal cortex functioning and altered transmission of dopamine. Since both of these problems can exist as a result of cannabis exposure while the brain is still developing, this can lead to cannabis-induced schizophrenia (Bossong & Niesink, 2010). Additionally, cannabis use has the ability to alter the volume and structure of thin grey matter, as well as white matter, both of which may affect working memory and neurocognitive performance (e.g., Battistella et al., 2014; Bava, Jacobus, Mahmood, Yang, & Tapert, 2010; Churchwell, Lopez-Larson, & Yurgelun-Todd, 2010; Mata et al., 2010).

Cognitive functioning. Cognitive functioning, particularly with respect to learning and memory, is affected by cannabis use in both adolescent (Battistella et al., 2014; Takagi et al., 2011) and adult populations (e.g., Grant, Gonzalez, Carey, Natarajan, & Wolfson, 2003; Pope, Gruber, Hudson, Huestis, & Yurgelun-Todd, 2001). A meta-analysis and systematic review by Scott and colleagues (2018) examined the impacts that cannabis use has on cognitive functioning due to alterations in brain development. The results indicated that adolescent and young adult cannabis use affects cognitive functioning in multiple domains, which includes learning, executive functioning- abstraction/shifting, speed of information processing, delayed memory, executive functioning-inhibition, executive functioning-updating/working memory, and attention. Interestingly, these authors also found that the negative effects of cannabis on cognitive functioning greatly diminish after 72 hours of last use. Given domains such as executive functioning can impact individuals' ability to learn, remember, plan, stay attentive, and display impulse control (e.g., Fontes et al., 2011), impediments to the development of

these cognitive functions can have negative impacts on academic performance and externalizing behaviours (Meier et al., 2015).

Social functioning. Individuals can also experience social harm from cannabis use in the form of parent and/or peer disapproval. A study by Napper, Froidevaux, and LaBrie (2016) found that most parents communicated the risks of cannabis use to their child by expressing disapproval of the substance. Other studies have determined that most parents do not approve of cannabis use (e.g., Kosterman et al., 2016), and perceived parental disapproval discourages adolescent use (King, Vidourek, & Hoffman, 2012). Research has also suggested that familial factors can increase the risk of cannabis use among adolescents. For example, adverse family experiences, such as parental divorce or death of a family member (Best et al., 2005), or child maltreatment (Hussey, Chang, & Kotch, 2006), increase the likelihood of cannabis use and cannabis use related issues. Research has also suggested that adolescent substance use can cause strain in familial relationships. For example, parents and siblings reported a sense of betrayal, loss of trust, and secrecy (Incerti, Henderson-Wilson, & Dunn, 2015; Jackson, Usher & O'Brien, 2006). This indicates that cannabis use, and in particular, problematic cannabis use, can have negative impacts on relationships in the family and cause strain. Although families can serve as both a protective and risk factor for adolescent cannabis use, it appears that peers also play an important role in the onset of cannabis use. Early adolescent cannabis use is associated with having peers who use substances (Best et al., 2005).

Research has also suggested that individuals with social anxiety are more likely to use cannabis (Schmits, Mathys, & Quertemont, 2016). This is likely because cannabis

may help some individuals cope with their anxiety in social settings and in their interactions with others (Buckner & Zvolensky, 2014).

Psychological functioning. Cannabis use is associated with an increased risk of psychological harm and the development of mental illness. Studies have demonstrated that cannabis use in adolescents and young adults is associated with the development of depression and anxiety symptoms (e.g., Patton et al., 2002). Specifically, compared to non-users, young women who used cannabis daily were five times more likely to experience depression and anxiety, and adolescents who used cannabis weekly were two times more likely to exhibit symptoms of depression and anxiety than non-users (Patton et al., 2002). Although individuals report that cannabis can assist with symptoms of social anxiety, heavy or frequent cannabis use can result in an increased expression of anxiety symptoms (Bonn-Miller, Zvolensky, Leen-Feldner, Feldner, & Yartz, 2005) or greater risk of anxiety-related problems, such as panic attacks (Zvolensky et al., 2006).

It is also important to highlight the notion of cannabis-related psychosis. In 2016, a meta-analysis was completed on all available published data on cannabis use and psychosis (Marconi, Di Forti, Lewis, Murray, & Vassos, 2016). Results indicated that the risk of developing psychosis was four times greater among the heaviest cannabis users compared to non-users and two times greater among average cannabis users compared to non-users (Marconi et al., 2016). Relatedly, cannabis use has also been associated with an increased risk of paranoia while under the influence (Camera et al., 2012).

Although there is a clear relationship between cannabis use and mental health issues demonstrated in the literature, the directionality of this relationship is often less clear. The conflict in causality is best illustrated in a cohort study by Horwood and

colleagues (2012). Out of the four cohorts analyzed, two supported the notion that cannabis use can lead to depression, one supported the notion that depression can lead to cannabis use, and the fourth cohort did not have any significant associations when using a longitudinal model (Horwood et al., 2012). Longitudinal research has also produced conflicting evidence (e.g., Feingold, Weiser, Rehm, & Lev-Ran, 2015). To further complicate the understanding of the directionality of this relationship, other research on cannabis use and psychosis suggests that the relationship is bidirectional (Ferdinand et al., 2005). Regardless of the causality, it is clear that cannabis users are at an increased risk of experiencing mental health problems.

Legal implications. Presently in Canada, it is legal to possess up to 30 grams of cannabis. Although recreational cannabis is legal, there are still penalties for violating offences including possession over the limit, illegal distribution or sale, taking cannabis across the border, giving cannabis to an individual under the age of 18, and using youth to commit a cannabis-related offence. Another important legal threat posed by cannabis use is impaired driving. Using cannabis before driving significantly delays response times and abilities to perform complex driving tasks, and these effects of impairment can last over five hours after use (Ogourtsova, Kalaba, Gelinis, Korner-Bitensky, & Ware, 2018). In a study conducted in Australia, the majority of cannabis users reported having operated a motor vehicle while under the influence, while one-quarter of users reported regularly driving while impaired (Swift, Jones, & Donnelly, 2010). Research has also shown that driving while impaired increases the risk of fatal motor vehicle accidents (Salomonsen-Sautel et al., 2014). In a report released by the Government of Canada (2017), a survey revealed that 39% of respondents had operated a vehicle within two hours of using

cannabis. Additionally, 39% of respondents indicated they were passengers in a vehicle where the driver used cannabis within the previous two hours. Opinions on cannabis use and driving varied where 75% of respondents thought that cannabis affected one's ability to drive, but only 50% of cannabis users believed this to be true (Government of Canada, 2017).

As highlighted through various domains of well-being, cannabis use can negatively impact users. Because of this, it is important to assess young adults' knowledge and perceptions about the dangerousness of cannabis.

Common Perceptions and Misconceptions About Cannabis Use

There are a number of documented misconceptions about cannabis use. These misconceptions are commonly found in the adolescent and young adult age group. In a report from the Canadian Centre on Substance Use, McKiernan and Fleming (2017) completed qualitative research to investigate youth perceptions of cannabis use. Seventy-seven participants between the ages of 14 and 19 years were recruited from seven cities across Canada. The results of this study reported three main themes regarding misconceptions. First, many participants did not think that cannabis is addictive. Some adolescents stated that the addiction was only "mental and not physical", meaning that these adolescents did not believe cannabis use could result in physical dependency. Others thought that addiction was attributable to an "addictive personality". Additionally, participants acknowledged feeling "grumpy" when sober (indicating a sense of dependence) but did not attribute this to physical withdrawal. Second, participants were under the impression that cannabis is not harmful. Specifically, results revealed that adolescents felt cannabis was the safest of all illicit drugs and medical cannabis was a

“healthier” and a more “natural” alternative to other medication with chemicals in it. This misconception has also been reported by participants in other studies assessing public perceptions of cannabis use (Holm, Sandberg, Kolind, & Hesse, 2014). Third, adolescents suggested that cannabis effects depend on the person. Although many youths understood the risks of impaired driving, some reported that it depends on the person and level of impairment. Multiple participants stated that it was acceptable for a designated driver to smoke cannabis as it is less intoxicating than alcohol (McKiernan & Fleming, 2017). These themes illustrate common yet concerning misconceptions that individuals hold regarding cannabis use.

Although little research has investigated young adult misconceptions about cannabis use, studies examining adolescent misconceptions are enlightening. It is possible that as adolescents transition into young adults, their beliefs about cannabis use do not change. Given the common misconceptions about addiction, harms, medical cannabis, and variability of influence among users, it is important to assess the perceived harms and risks from adolescents and young adults.

Perceived Dangerousness of Cannabis Use

In Canada, there has been minimal research conducted on perceived dangerousness of cannabis use. One Canadian study evaluated the attitudes of adolescents, young adults, and parents with respect to cannabis use (Ekos Research Associates Inc., 2016). Results indicated that 40% of adolescents (ages 13-18 years) and 27% of young adults (ages 19-24 years) believed recreational cannabis use is a high risk to one’s health. Among all participants, 89% indicated that adolescent cannabis use is harmful, while 63% indicated that cannabis use among young adults is harmful.

Additionally, the results of this study indicated that young adults did not perceive cannabis use to be as harmful as adolescents in the following domains: attention and memory, school and work, mental health, physical health, and relationships with family and friends (Ekos Research Associates Inc., 2016). A limitation of this study is the lack of experimental design and therefore, ability to manipulate variables. Based on the results of this study, it appears there are differences in how adolescents and young adults view cannabis use. Additionally, it seems as though perceived dangerousness decreases with age.

In the United States, research has found that perceived harm of cannabis use is inversely correlated with frequency of cannabis use (e.g., Danseco et al., 1999; Hemmelstein, 1995; Kosterman et al., 2016). In other words, those who perceive cannabis use as more harmful are less likely to use cannabis; however, to the current author's knowledge, this relationship has not been found in a Canadian sample.

Change in perceptions of dangerousness. Research conducted in the United States also indicates that cannabis use perceptions have changed over time. This change may be, in part, a result of some jurisdictions moving toward recreational legalization (e.g., Colorado). In a nationally representative study conducted in the United States, a National Survey on Drug Use and Health (NSDUH) was completed to collect data on perceptions of cannabis use (Substance Abuse and Mental Health Services Administration, 2003, 2013). Pacek, Mauro, and Martins (2015), combined this data from a ten-year period to analyze how perceived harms associated with cannabis use had changed between 2002 and 2012. Cannabis use perceptions were measured through self-report, and a question which asked, “[h]ow much do people risk harming themselves

physically and in other ways when they smoke [cannabis] once or twice a week?” (Pacek et al., 2015). It appears this survey did not ask additional questions on cannabis use perceptions. The results of this study revealed that between 2002 and 2012, there was a statistically significant decrease in perceived risk associated with regular cannabis use.

Monitoring the Future was a nationally representative survey conducted in the United States between 1975 and 2017 to assess the risk perceptions of cannabis held by grade 12 students (Johnston et al., 2018). Participants were asked the same question that was used by the NSDUH to assess their perceived risk of cannabis use. The Monitoring the Future study revealed similar outcomes as Pacek et al. (2015) as results indicated that grade 12 students’ perceptions of risk due to regular cannabis use decreased from 78.6% in 1991 to 29.0% in 2017, with substantial decreases after 2005 (Johnston et al., 2018). Based on additional longitudinal research by Johnston et al. (2018) and Pacek et al. (2015) it appears that cannabis use perceptions have shifted, and individuals over the age of 12 are less likely to view cannabis as harmful.

The War on Drugs in the United States was a government initiative aimed to reduce substance use and distribution. Although this initiative began in the 1970s, it has not been seen as effective as cannabis use rates continue to increase (History, 2018). Legalization has been seen to increase tolerant political perceptions of cannabis use (History, 2018). Additionally, increasing prevalence rates of cannabis use may lead to the continual decrease in perceptions of harm.

Adolescent perceptions of cannabis use. Research in the United States has evaluated adolescent perceptions of cannabis in relation to risks and harms. It appears

that adolescent perceptions of harm have decreased, as well as personal disapproval of cannabis use (Johnston et al., 2018).

Earlier research on adolescent perceptions of cannabis use assessed perceived risk through four questions. These questions addressed perceived risk related to one's health, getting into trouble, loss of friends, and poor academics. Researchers reported a negative correlation between adolescent perceptions of risk and cannabis use (Hemmelstein, 1995). This is supported by a literature review/secondary analysis by Danseco et al. (1999). In this review, researchers noted that parental and peer disapproval affects cannabis use in adolescents. Specifically, research has illustrated that parental cannabis use and attitudes are directly related to the likelihood that their child will use cannabis. Therefore, children of parents who use cannabis and do not have restrictive rules for cannabis use are more likely to begin using cannabis as well (Vermeulen-Smit, Verdurmen, Engels, & Vollebergh, 2015).

Young adult perceptions of cannabis use. Research conducted in the United States also suggests that many young adults may not have accurate perceptions of the dangerousness of cannabis use. Pacek et al. (2015) noted that individuals between the age of 18 and 25 were less likely to perceive cannabis use as dangerous than individuals below the age of 18. In a recent study, Pearson et al. (2017) demonstrated that although many cannabis users experienced negative consequences (e.g., socially, academically, self-perception), participants were in favour of legalized recreational cannabis and felt that using cannabis is safer than drinking alcohol. In another study of young adult perceptions of cannabis and tobacco products, Berg and colleagues (2015) asked three questions to assess perceived harm to health, addiction, and sociability. The results

revealed that young adults perceived cannabis to be the least harmful to their health and less addictive than most other products. Additionally, participants indicated that cannabis is highly socially acceptable, and participants had positive perceptions of cannabis (Berg et al., 2015). Similar results were supported by the Monitoring the Future Survey for college students and adults (Schulenberg et al., 2017). Specifically, 13% of individuals aged 19-22 years and 14.1% of individuals 23-26 years reported occasional cannabis use is associated with great risks. Additionally, 30% of participants ages 19-22 years and 30.2% of participants ages 23-26 years noted that regular cannabis users were at great risk for harming themselves physically or in other ways (Schulenberg et al., 2017). Results from the Monitoring the Future survey also revealed that in 2016, perceived risk was the lowest it had been in approximately 20 years, and the rate of daily cannabis use was at an all-time high. It is suspected that a movement toward cannabis legalization in some jurisdictions may play a role in these findings (Schulenberg et al., 2017). It is also important to note that disapproval of cannabis experimentation and use was far lower than the disapproval of experimentation and use of any other substance. Although this survey had a large and representative sample size, perceived harm was measured through a self-report of one question, with varying frequencies of cannabis use (i.e., “[h]ow much do you think people risk harming themselves (physically or in other ways), if they smoke cannabis occasionally”). Other research has suggested that perceived harms associated with cannabis use remained static between the ages of 18 and 25 years. In this study, perceived harm was assessed by asking respondents about the risk of smoking cannabis once or twice per week (Schuermeyer et al., 2014).

Gender and cannabis use perceptions. Little research has been conducted on how perceived dangerousness of cannabis use may change depending on the gender of the individual using cannabis. Qualitative research on female substance use suggests that individuals view female substance use as less acceptable (Kirtadze et al., 2013). Research also suggests that females may attribute more substance use stigma onto others than males (Brown, 2011) and that females perceive cannabis use as more harmful than males (Okaneke, Vearrier, McKeever, LaSala, & Greenberg, 2015).

The Current Study

Use of recreational cannabis is newly legal in Canada. It is possible that legalization could result in an increase in cannabis use and cannabis use-related issues among adolescents and young adults (Hopfer, 2014). As previously discussed, adolescents and young adults are a particularly vulnerable group to cannabis use-related harms including harms associated with cognitive, social, psychological, and legal functioning. However, previous research based primarily on respondent self-reports suggests that individuals, including adolescents and young adults, may hold misconceptions about cannabis use and may not fully appreciate the risks associated with cannabis use in this population (McKiernan & Fleming, 2017). Given that perceived harm is inversely correlated with cannabis use (Kosterman et al., 2016), perceived dangerousness has decreased over the last ten years (Johnston et al., 2018), and there is limited Canadian research on young adult perceptions of cannabis use, it is important to assess perceived dangerousness among individuals between the ages of 18 and 25.

The current study will build on previous research by utilizing an experimental vignette design and assessing perceived dangerousness through multiple domains (as

suggested in the Danseco et al. (1999) review) rather than a single item. The primary purpose of this study was to examine young adults' perceived dangerousness associated with regular cannabis use and the extent to which perceptions of dangerousness differ depending on the age (14, 21, or 28 years) and sex (male or female) of the cannabis user. The secondary purpose was to examine if participants' self-reported cannabis use-related issues were associated with their perceived level of dangerousness for cannabis use. Perceived dangerousness was measured through dimensions of functioning such as mental health, cognitive health, brain development, social well-being, extent to which the participant believes the vignette character's cannabis use is dangerous, extent to which the participant believes the vignette character's cannabis use is problematic, and the participant's approval/disapproval of the vignette character's cannabis use.

Method

Participants

Participants ($N = 656$) between the ages of 18 and 25 ($M = 21.24$; $SD = 2.31$) completed this study. Although almost 1% of participants chose not to report their gender, among those who did, 174 were male (26.5%), 470 were female (72.4%), and one participant identified as nonbinary (0.2%). Participant education ranged between 10 and 21 years with an average of 15.75 years completed. The majority of this sample identified their ethnic background as Caucasian/White (92.5%; $n = 607$), followed by Asian (2.4%; $n = 16$), Indigenous (2.1%; $n = 14$), East Indian (1.8%; $n = 12$), Hispanic/Latino (1.2%; $n = 8$), African-Canadian/Black (1.2%; $n = 8$), Middle Eastern (0.6%; $n = 4$), and six individuals (0.9%) self-identified as "other". The majority of participants had used cannabis (72.1%). The average age of first-time cannabis use was 16.75 years which is

approximately two years older than the reported first age of use indicated by a 2012 provincial report by the Government of NL (Government of Newfoundland and Labrador, 2012). Among all participants, the average CUDIT score was 3.142 (range: 0 – 38).

Procedure

The data for this study were collected through the online survey platform, Qualtrics. Participants were primarily recruited through social media sites such as Facebook, and the distribution of Quick Response (QR) codes. Each recruitment method included a brief description of the research, a link to the survey, and a link for the participant to enter in a draw for a \$50 gift card. These surveys were separated to ensure that personal information from the draw could not be linked to the participant's responses in this survey. Participants opened the link to the study and were presented with an informed consent form (Appendix A). Participants were then randomly assigned to one of six vignettes where an independent variable (i.e., age (14 years old vs. 21 years old vs. 28 years old) and sex (male vs. female)) in each vignette was altered. After reading the vignette, the participant completed a series of questionnaires which began with seven single items on perceived dangerousness, a question on if the participant had used cannabis before, the CUDIT questionnaire, and a demographic survey. Participants only completed the CUDIT questionnaire if they responded "yes" to using cannabis before. After completing the survey, participants were presented with a debriefing form (Appendix B). This study was approved by the Research Ethics Board at Memorial University of Newfoundland.

Vignettes

Six vignettes depicted a character named John or Jane outlining his/her age and frequency of use. The information in each vignette remained constant except for the two altered independent variables including the age of the character (14 years vs. 21 years vs. 28 years) and the sex of the character (male vs. female). The six scenarios are as follows: 1) a 14-year-old male who uses cannabis almost daily, 2) a 21-year-old male who uses cannabis almost daily, 3) a 28-year-old male who uses cannabis almost daily, 4) a 14-year-old female who uses cannabis almost daily, 5) a 21-year-old female who uses cannabis almost daily, and 6) a 28-year-old female who uses cannabis almost daily (see Appendix C).

Measures

Perceived dangerousness. A series of single-item measures (Appendix D) were developed for this study as presently, there does not appear to be a measure that assesses perceived dangerousness of cannabis use through multiple dimensions (i.e., physical harm, social consequences, psychological harm, etc.). The content of these items are based on a review by Danseco et al. (1999) and provides a thorough understanding of young adults' cognizance of cannabis use. There were seven items each with five anchors ranging from 0 to 4. The first item pertained to overall perceived dangerousness of cannabis use (0 = *Not at all dangerous*, 4 = *Extremely dangerous*); items two through four pertained to impact on mental health, social life, and cognitive health (0 = *Very negative impact*, 2 = *No impact*, 4 = *Very positive impact*); and items five through seven pertained to impact on brain development, cannabis use as a problem in general, and the

level of disapproval toward cannabis use (0 = *Not at all*, 4 = *An extreme amount*). In the current sample, the Cronbach alpha was $\alpha = 0.82$ for these seven items.

Cannabis Use Disorders Identifications Test (CUDIT). This measure was developed by Adamson and Sellman (2003). The CUDIT contains ten questions which evaluates participants' frequency of cannabis use, ability to function without cannabis, consequences experienced, and ability to stop usage. This measure has good internal consistency, with reported Cronbach alpha of 0.72 (Annaheim, Rehm, & Gmel, 2008). In the current sample, the Cronbach alpha was $\alpha = 0.83$ (See Appendix E).

Demographic survey. Participants were asked a total of eight questions about their age, gender identity, relationship status, ethnic background, highest level of education, employment status, and the province or territory they are from (see Appendix F).

Data Analysis

After the completion of data collection, descriptive statistics were analyzed. This allowed the sample to be characterized by demographic variables and scores on standardized measures. Additionally, the demographic variables and CUDIT scores of the six groups were compared to ensure there were no pre-existing group differences on these variables. A series of ANOVAs were conducted to analyze the independent variable effects: (1) the age of the vignette character, and (2) the sex of the vignette character on the dependent variable perceived dangerousness of cannabis use. Overall seven ANOVAs were conducted to examine the independent variable effects on (1) overall perceived dangerousness of cannabis use, (2) perceived psychological dangerousness, (3) perceived

social dangerousness, (4) perceived cognitive dangerousness, (5) perceived dangerousness for brain development, (6) the extent to which the vignette character's cannabis use is a problem, and (7) disapproval of cannabis use. Lastly, a series of Pearson r correlation coefficients were utilized to examine the relationships between participants' perceived dangerousness of cannabis use and their CUDIT total score. All statistical analyses described were completed using IBM SPSS Statistics Software.

Results

Analyses of Frequency of Missing Data

Analyses of frequency of missing data revealed that 65 participants completed at least one question but were missing the majority of data. It seems likely that these individuals clicked on the survey link but decided not to continue participating within the first few questions. These participants were removed from further analyses and were not included in the total number of participants. An additional participant was removed for indicating that they began using cannabis at the age of 26 when the survey restricted individuals above the age of 25 from participating.

Preliminary Analyses

A series of chi-squares and ANOVAs were conducted to determine if there were any group differences on demographic variables examined, including age, gender, ethnicity, relationship status, and education level. There were no significant differences between groups on any demographic variables measured.

Primary Analyses

Seven 2 x 3 factorial ANOVAs were conducted to assess young adults' perceived dangerousness of cannabis use. Independent variables included the age of the vignette

character (14 years old vs. 21 years old vs. 28 years old.) and sex (male vs. female). The dependent variable was perceived dangerousness and consisted of seven items developed for the purposes of this study. Levene's Test of Equality of Variances was significant on all seven of the outcome items of perceived dangerousness. An alpha level of .01 was used to correct for multiple analyses and for significant heterogeneity of variances.

Results of the first factorial ANOVA indicated a significant main effect of age on the item score "to what extent do you feel John/Jane's cannabis use is dangerous?", $F(2,650) = 47.530, p < .001, \text{Partial } \eta^2 = .128$. Post hoc tests revealed significant group differences between participants who were assigned the vignette character 14 years of age ($M = 1.869, SD = 0.996$) as compared to participants assigned the vignette character 21 years of age ($M = 1.123, SD = 0.891$), $t(650) = 8.345, p < .001, d = 0.789$, and 28 years of age ($M = 1.104, SD = 0.875$), $t(650) = 8.656, p < .001, d = 0.816$. There was no difference in perceived dangerousness between the 21-year-old and 28-year-old vignette characters, $t(650) = 0.225, p = .822$. Results did not indicate a significant main effect of sex, $F(1, 650) = 1.120, p = .290, \text{Partial } \eta^2 = .002$, in that participants assigned a male vignette character ($M = 1.313, SD = 0.973$) did not significantly differ on score compared to those assigned a female vignette character ($M = 1.388, SD = 0.993$). There was no significant interaction between age and sex, $F(2, 650) = .472, p = .624, \text{Partial } \eta^2 = .001$. Results of this ANOVA can be found in Figure 1.

Results of the second factorial ANOVA indicated a significant main effect of age on the item score "what impact do you believe Jane/John's cannabis use has on her/his mental health?", $F(2,648) = 46.990, p < .001, \text{Partial } \eta^2 = .127$. Post hoc tests revealed significant group differences between participants who were assigned the vignette

character 14 years of age ($M = 1.267, SD = 1.027$) as compared to participants assigned the vignette character 21 years of age ($M = 2.192, SD = 1.157$), $t(648) = 8.642, p < .001, d = 0.845$, and 28 years of age ($M = 2.140, SD = 1.175$), $t(648) = 8.250, p < .001, d = 0.817$. There was no difference in perceived dangerousness between the 21-year-old and 28-year-old vignette characters, $t(648) = -0.493, p = .875$. Results did not indicate a significant main effect of sex, $F(1,648) = .005, p = .946$, Partial $\eta^2 < .001$, in that participants assigned a male vignette character ($M = 1.881, SD = 1.170$) did not significantly differ on score compared to those assigned a female vignette character ($M = 1.884, SD = 1.182$). There was no significant interaction between age and sex, $F(2, 648) = .681, p = .506$, Partial $\eta^2 = .002$. Results of this ANOVA can be found in Figure 2.

Results of the third factorial ANOVA indicated a main effect of age on the item score “what impact do you believe Jane/John’s cannabis use has on her/his cognitive health?”, $F(2,650) = 5.433, p = .005$, Partial $\eta^2 = .016$. Post hoc tests revealed significant group differences between participants who were assigned the vignette character 14 years of age ($M = 0.956, SD = 0.767$) as compared to participants assigned the vignette character 21 years of age ($M = 1.182, SD = 0.779$), $t(650) = 3.042, p = 0.007, d = 0.292$. There was no difference in perceived dangerousness between the 14- and 28-year-old vignette characters ($M = 1.152, SD = 0.769$), $t(650) = 2.670, p = .021$, and 21-year-old and 28-year-old vignette characters, $t(650) = -0.411, p = .911$. Results did not indicate a significant main effect of sex, $F(1, 650) = .023, p = .880$, Partial $\eta^2 = .001$, in that participants assigned a male vignette character ($M = 1.097, SD = 0.771$) did not significantly differ on score compared to those assigned a female vignette character ($M =$

1.104, $SD = 0.768$). There was no significant interaction between age and sex, $F(2, 650) = .229, p = .795, \text{Partial } \eta^2 = .001$. Results of this ANOVA can be found in Figure 3.

Results of the fourth factorial ANOVA indicated a main effect of age on the item score “to what extent do you believe Jane/John’s cannabis use negatively impacts her/his brain development?”, $F(2,650) = 57.386, p < .001, \text{Partial } \eta^2 = .150$. Post hoc tests revealed significant group differences between participants who were assigned the vignette character 14 years of age ($M = 2.238, SD = 1.081$) as compared to participants assigned the vignette character 21 years of age ($M = 1.400, SD = 0.990$), $t(650) = 8.461, p < .001, d = 0.807$, and 28 years of age ($M = 1.257, SD = 0.989$), $t(650) = 10.021, p < .001, d = 0.947$. There was no difference in perceived dangerousness between the 21-year-old and 28-year-old vignette characters, $t(650) = 1.495, p = .294$. Results did not indicate a significant main effect of sex, $F(1, 650) = .286, p = .593, \text{Partial } \eta^2 < .001$, in that participants assigned a male vignette character ($M = 1.593, SD = 1.090$) did not significantly differ on score compared to those assigned a female vignette character ($M = 1.633, SD = 1.119$). There was no significant interaction between age and sex, $F(2, 650) = .346, p = .708, \text{Partial } \eta^2 = .001$. Results of this ANOVA can be found in Figure 4.

Results of the fifth factorial ANOVA indicated a main effect of age on the item score “to what extent do you believe Jane/John’s cannabis use is a problem?”, $F(2,648) = 59.676, p < .001, \text{Partial } \eta^2 = .156$. Post hoc tests revealed significant group differences between participants who were assigned the vignette character 14 years of age ($M = 2.282, SD = 1.045$) as compared to participants assigned the vignette character 21 years of age ($M = 1.268, SD = 1.105$), $t(648) = 9.644, p < .001, d = 0.943$, and 28 years of age ($M = 1.303, SD = 1.176$), $t(648) = 9.404, p < .001, d = 0.916$. There was no difference in

perceived dangerousness between the 21-year-old and 28-year-old vignette characters, $t(648) = -0.329, p = .942$. Results did not indicate a significant main effect of sex, $F(1, 648) = .111, p = .740$, Partial $\eta^2 < .001$, in that participants assigned a male vignette character ($M = 1.584, SD = 1.150$) did not significantly differ on score compared to those assigned a female vignette character ($M = 1.615, SD = 1.203$). There was no significant interaction between age and sex, $F(2, 648) = .470, p = .625$, Partial $\eta^2 = .001$. Results of this ANOVA can be found in Figure 5.

Results of the sixth factorial ANOVA indicated a main effect of age on the item score “to what extent do you disapprove of Jane/John’s cannabis use?”, $F(2,647) = 27.147, p < .001$, Partial $\eta^2 = .077$. Post hoc tests revealed significant group differences between participants who were assigned the vignette character 14 years of age ($M = 1.961, SD = 1.200$) as compared to participants assigned the vignette character 21 years of age ($M = 1.191, SD = 1.321$), $t(647) = 6.290, p < .001, d = 0.609$, and 28 years of age ($M = 1.167, SD = 1.245$), $t(647) = 6.557, p < .001, d = 0.650$. There was no difference in perceived dangerousness between the 21-year-old and 28-year-old vignette characters, $t(647) = 0.216, p = .829$. Results did not indicate a significant main effect of sex, $F(1, 647) = .664, p = .415$, Partial $\eta^2 = .001$, in that participants assigned a male vignette character ($M = 1.385, SD = 1.303$) did not significantly differ on score compared to those assigned a female vignette character ($M = 1.463, SD = 1.312$). There was no significant interaction between age and sex, $F(2, 647) = .097, p = .907$, Partial $\eta^2 < .001$. Results of this ANOVA can be found in Figure 6.

Results of the seventh factorial ANOVA did not indicate a significant main effect of age on the item score “what impact do you believe Jane’s/John’s cannabis use has on

her/his social life?”, $F(2,650) = 1.786, p = .168, \text{Partial } \eta^2 = .005$. Results indicated a significant main effect of sex, $F(1,650) = 65.822, p < .001, \text{Partial } \eta^2 = .092$, in that participants assigned a male vignette character ($M = 2.067, SD = 1.037$) significantly differed on score compared to those assigned a female vignette character ($M = 2.688, SD = 0.930$). There was no significant interaction between age and sex, $F(2, 650) = .451, p = .637, \text{Partial } \eta^2 = .001$. Results of this ANOVA can be found in Figure 7.

As well, a series of Pearson r correlation coefficients were conducted to evaluate if participant cannabis use was correlated with perceived dangerousness on each dimension. CUDIT score was negatively correlated with six of seven perceived dangerousness item scores. See Table 1 for correlation results.

Discussion

In recent years, there has been a growing body of literature to indicate that adolescent and young adult (up to 25 years) populations are a particularly vulnerable group to experiencing adverse outcomes associated with cannabis use, most notably regular cannabis use (e.g., Degenhardt et al., 2013; Nina, Francis, Smith, Ho, & Gilman, 2018; Patton et al., 2002; Scott et al., 2018). Furthermore, research has shown that many adolescents and young adults hold misconceptions about cannabis use and possible related harms (McKiernan & Fleming, 2017). Implementing an experimental vignette design, the primary purpose of the current study was to examine young adults (age range 18-25 years) levels of perceived dangerousness of regular cannabis use (almost daily) and if perceived dangerousness changed depending on the age (14, 21, or 28 years) and sex (male or female) of the cannabis user. Findings showed a main effect of age on all measures of perceived dangerousness except social well-being. Additionally, there was a

main effect of sex for social well-being. Significant inverse relationships were found between cannabis use severity (CUDIT score) and all perceived dangerousness item scores with the exception of mental health. This was the first study to have implemented an experimental vignette design to evaluate perceived dangerousness of cannabis use in young adults and to examine how age and sex of the cannabis user may impact these perceptions in multiple domains of well-being.

Perceived Dangerousness Based on Age of Vignette Character

The results of this study indicate that participants perceived 14-year-old “almost daily” cannabis use as more concerning than 21 and 28-year-old cannabis use across multiple domains of perceived dangerousness. These findings are encouraging because they suggest that participants understand adolescents are a particularly vulnerable group for experiencing negative consequences associated with cannabis use. For example, adolescence is an important developmental stage for brain maturation as it includes significant pruning of dendrites and the elimination of unnecessary synapses (Toga et al., 2006), processes found to be negatively impacted by regular adolescent cannabis use (Bossong & Niesink, 2010). Regular cannabis use in adolescents has also been found to be associated with a decrease in grey matter (Battistella et al., 2014), a decrease in volume of the right medial orbital prefrontal cortex (Churchwell et al., 2010), interference with neural circuits in specific regions of the prefrontal cortex, a disruption in the transmission of dopamine and GABA, and an increased risk of developing cannabis-induced schizophrenia (Bossong & Niesink, 2010). Furthermore, these cannabis-associated alterations to brain structure have been linked to decreased cognitive functions such as deficits in managing impulsive urges, planning and processing information

(Churchwell et al., 2010), decision making, and delayed and immediate episodic memory (Duperrouzel et al., 2019). In addition to negative impacts on brain development and cognitive processing, regular cannabis use is also associated with poorer mental health functioning in adolescents including increased symptoms of anxiety and depression (Patton et al., 2002), along with greater odds of experiencing symptoms of psychosis including hallucinations, paranoia, and grandiosity (Bagot, Milin, & Kaminer, 2015).

Some adolescents may also be at an increased risk of developing a CUD, with the progression of a CUD being more rapid for this age group (American Psychiatric Association, 2013).

Despite significant perceived differences between 14-year-old cannabis use and use by 21 and 28-year-olds, results showed no differences between participants' level of concern for a 21-year-old's use as compared to a 28-year-old's use. In fact, not only were there no significant differences between these groups, there were no trends in the data to suggest that participants may see 21-year-old use as even slightly more concerning than 28-year-old use, with the seven perceived dangerousness item score means being almost identical between the two groups. These null findings are important to consider because many of the vulnerabilities experienced by adolescent cannabis users are also experienced by young adult cannabis users. For example, similar to the research on adolescent brain development, research on young adult brain development supports the same notion that cannabis use can alter the structure of the brain and cognitive abilities. In 18 to 25-year-olds, there is decreased cortical thickness of various regions in the temporal and prefrontal lobes among cannabis users (Nina et al., 2018), and among those with frequent or heavy cannabis use, this can negatively impact cognitive functioning in several

domains. These domains include learning, executive functioning-*abstraction/shifting*, speed of information processing, delayed memory, executive functioning-*inhibition*, executive functioning-*updating/working memory*, and attention (Scott et al., 2018). Onset of cannabis use during adolescence has been linked to delayed development of psychosis in early adulthood, especially with earlier onset of use (McGrath et al., 2010).

Additionally, longitudinal research has shown that cannabis use during adolescence and young adulthood was related to anxiety and depressive symptoms at the age of 29. Daily cannabis use at 24-years-old predicted increased anxiety symptoms at 29 years of age by 2.3 times compared to individuals who do not use cannabis (Degenhardt et al., 2013).

Young adults also have the highest prevalence rates of CUD (Hasin et al., 2016), placing this age group at an increased risk of experiencing the negative effects of a substance use disorder in addition to impacts on brain development, cognitive and mental health. Based on these studies, it is apparent that young adults are still highly vulnerable to the effects of regular cannabis use; however, the current findings suggest that young adults may not fully appreciate the potential harms associated with regular cannabis use in their age cohort. Given that young adults are among the highest consumers of cannabis in Canada (Statistics Canada, 2017), it is important that effective psychoeducational resources on cannabis-related harms in this population be accessible.

There are several factors that may have contributed to the current findings pertaining to the effect of age of the regular cannabis user on perceived dangerousness. First, while it is encouraging that participants may have viewed a 14-year-old's cannabis use as more dangerous than a 21 or 28-year-old due to actual known harms of adolescent cannabis use, it is possible that the legal age to purchase and possess cannabis influenced

our findings. Since the age of legal consumption is 19 years old in most Canadian provinces, a 14-year-old's cannabis use may be perceived as more dangerous as it is illegal. In contrast, cannabis use by a 21 and 28-year-old may not have been perceived as particularly dangerous because it is legal. Second, previous research suggests that adults are more likely to disapprove of adolescent substance use than fellow-adult substance use (Musick, Seltzer, & Schwartz, 2008). This may help account for why there was a significant difference between perceived dangerousness of a 14-year-old compared to a 21 and 28-year old, and no significant difference in perceived dangerousness of cannabis use between a 21-year-old and 28-year-old. Third, cannabis use norms among young adults may help explain our findings. Given that young adults have norms of binge drinking and cannabis use, particularly in college and university settings (Keith, Hart, McNeil, Silver, & Goodwin, 2015), perhaps it is not that surprising that young adult perceptions in the current study did not distinguish the dangerousness of cannabis use by a 21-year-old and the dangerousness of cannabis use by a 28-year-old.

Perceived Dangerousness Based on Sex of Vignette Character

Although the results indicated a significant main effect of age on six of the seven perceived dangerousness items, only one item was found to have a significant main effect of sex: perceived social dangerousness. Specifically, cannabis use by the female character was perceived to be more dangerous than cannabis use by the male character in the context of social well-being. One possible explanation for this finding has to do with traditional gender roles and social expectations of women with respect to substance use. For example, previous research on gender roles and alcohol consumption has found that alcohol use has been traditionally viewed as an expression of masculinity (Lemle &

Mishkind, 1989) whereas females have been discouraged from using alcohol and instead, expected to display warmth and concern for others (Hussman & Goldstein, 2019). These cultural expectations shape social behaviours and, in turn, continue to influence gender norms (Holmila & Raitasalo, 2005). It is possible that participants in this study viewed cannabis use as a more “masculine” social activity where cannabis use by females in social settings may have been perceived to violate notions of feminine warmth and maternal abilities. This possibility may account for the perception that cannabis use is more harmful for the social well-being of females compared to males. Although traditional gender norms of substance use have diminished over time, this finding suggests that they have not been completely abolished among young adults.

Inverse Relationship Between Cannabis Use Severity and Perceived Dangerousness

Results indicated an inverse relationship between CUDIT score and perceived dangerousness on the extent to which participants thought the vignette character’s cannabis use was dangerous, the extent to which participants thought the vignette character’s cannabis use was a problem, the extent to which they disapproved of the vignette character’s cannabis use, and the impact cannabis use has on each of brain development, cognitive health, and social well-being. This means that individuals with higher CUDIT scores (i.e., those demonstrating greater problematic cannabis use) perceived vignette characters’ cannabis use as less dangerous than individuals with lower CUDIT scores. Interestingly, there was no correlation between CUDIT scores and perceived dangerousness for mental health, suggesting that cannabis use severity may not have played a role in participant perceptions of dangerousness of this domain.

Research has repeatedly demonstrated a relationship between cannabis use and

perceived dangerousness. Specifically, as cannabis use increases, perceived harm decreases (e.g., Danseco et al., 1999; Hemmelstein, 1995). Although this relationship has been observed among adolescents, adults, and parents (Hemmelstein, 1995; Kosterman et al., 2016), this is the first study to examine this relationship among Canadian young adults. Although our findings suggest an association between CUDIT score and perceived dangerousness item scores, there is a lack of clarity in the directionality of this relationship. For example, it is unclear whether people who perceive cannabis as less dangerous are more likely to use cannabis frequently, or if people who use cannabis frequently are less likely to perceive cannabis as dangerous. It is also possible that cognitive dissonance may have contributed to these findings. Cognitive dissonance is the notion that “if a person knows various things that are not psychologically consistent with one another, [they] will, in a variety of ways, try to make them more consistent” (Festinger, 1962). Using cannabis regularly and understanding the harms associated with regular cannabis use creates a situation where these items are not psychologically consistent. To create consistency, one may alter the notion that regular cannabis use is harmful.

Regardless of the directionality of this relationship and the reasons for it, these findings are informative because they suggest that young adults who use cannabis more frequently, and to a more severe extent, are less likely to perceive cannabis as problematic and dangerous. Lastly, it was unclear why there was a non-significant correlation between CUDIT score and perceived dangerousness to mental health. One possible explanation for this outcome is that some participants, regardless of CUDIT score, may have perceived cannabis to be helpful for mental health (e.g., helping reduce

anxiety), while others may have perceived it to be dangerous (e.g., making anxiety worse).

Limitations and Future Research

It is important to note some limitations present in this study. First, the generalizability of the current findings is limited. Participants were restricted to those between the ages of 18 and 25 years because this limits the sample to a group of individuals who are more susceptible to harms associated with regular cannabis use. Given that individuals under the age of 18 are also susceptible to cannabis use-related harms and are arguably at a greater risk of experiencing these harms due to younger brain maturation (Toga et al., 2006), future research could utilize a similar study design to examine a younger adolescent population. It would be interesting to see if adolescent participants perceived a 14-year-old's cannabis use to be as dangerous as young adults did in the current study. Furthermore, as a result of recruitment methods utilized, the majority of young adults recruited to participate in this study were likely attending post-secondary education. The perceptions of young adults in a university setting may not be representative of those who have not completed post-secondary education or are no longer attending college or university. Second, given that no perceived dangerousness measure currently exists, single-item measures were developed to assess domains of perceived dangerousness within the current study. Rather than using exclusively one single item to assess perceived dangerousness, as often used by studies in the United States (e.g., Johnston et al., 2018), seven items were utilized for this study. These items were developed based on recommendations from the literature, particularly the review by Danseco and colleagues (1999), so multiple domains of dangerousness could be assessed.

Although it was not ideal to use multiple single-item measures, previous research does suggest that single-item measures can still be considered reliable and valid (Robins, Hendin, & Trzesniewski, 2001; von Hippel, Brener, & Horwitz, 2018). Future research could develop and examine a multi-dimensional scale to assess the construct of perceived dangerousness. Third, the strong majority of participants identified as female (72.4%), indicating that these results may not be generalizable to those who do not identify as female. During the data collection period, there were more female undergraduate and graduate students (both part-time and full-time) than male undergraduate and graduate students (Memorial University of Newfoundland, 2018). It is possible that this also played a role in the overrepresentation of females in this study. Future research could re-examine this topic and aim to engage more male participants.

Conclusion

The current study provides important insights into young adults' perceptions of the dangers associated with regular cannabis use. Specifically, young adults perceived cannabis use by a 14-year-old adolescent as more concerning than a 21-year-old young adult. However, despite research identifying young adults as a vulnerable group to experiencing negative health outcomes associated with regular cannabis use, young adults in the current sample did not view a 21-year-old's cannabis use as any more concerning than a 28-year-old's use. These findings suggest that young adults may not fully appreciate the dangers associated with regular cannabis use and the effects it can have on multiple domains of well-being. It is important that appropriate measures be taken to help ensure that young adults understand the risks associated with regular cannabis use in their age demographic.

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Table 1	
<i>Correlation Between Perceived Dangerousness Items and CUDIT Score</i>	
<u>Measure</u>	<u>CUDIT Score</u>
Perceived Dangerousness	-.230***
Social Well-Being	-.092*
Cognitive Health	-.162***
Brain Development	-.193***
Disapproval of Cannabis	-.233***
Cannabis Use as a Problem	-.188***
Mental Health	.071

Note: * $p < .05$

*** $p < .001$

Figure 1: Effect of Age on Perceived Dangerousness of Vignette Character's Cannabis Use

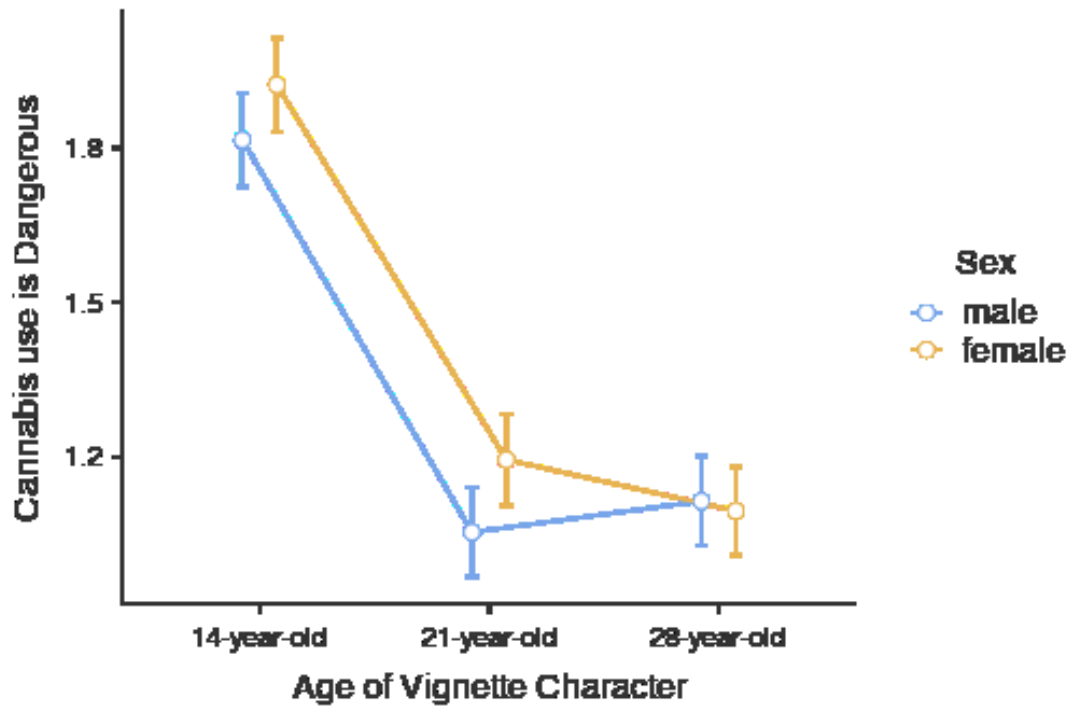


Figure 2: Effect of Vignette Character’s Age on the Item Score “What impact do you Believe Jane/John’s Cannabis Use has on her/his Mental Health?”

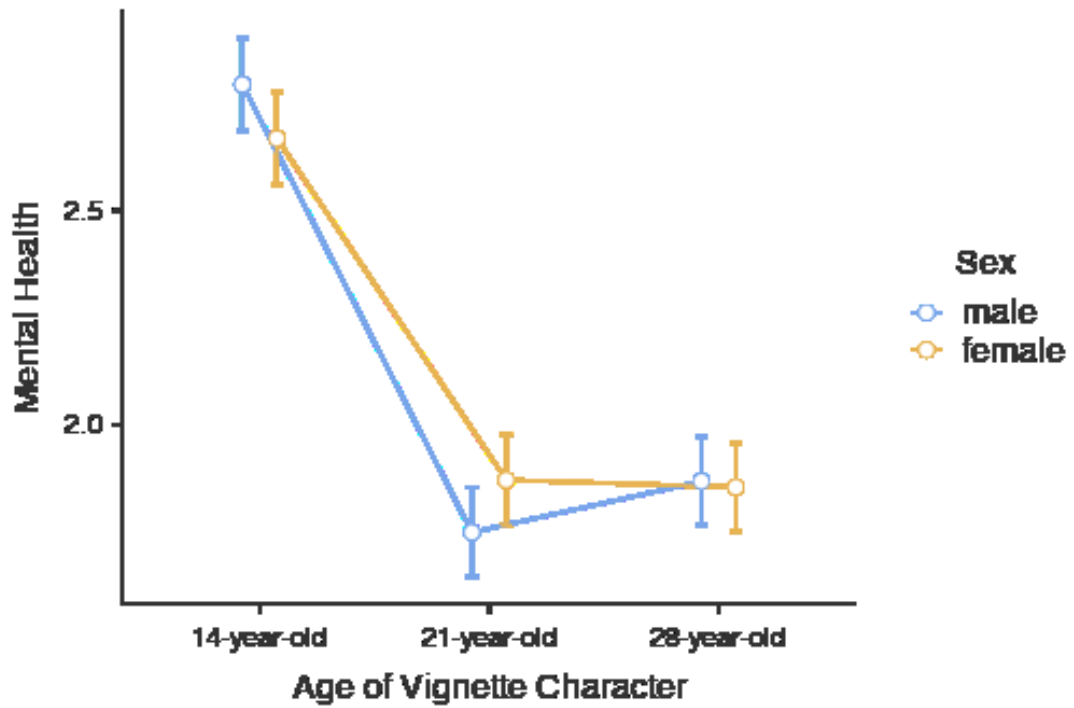


Figure 3: Effect of Vignette Character's Age on the Item Score "What Impact do you Believe Jane/John's Cannabis Use has on her/his Cognitive Health?"

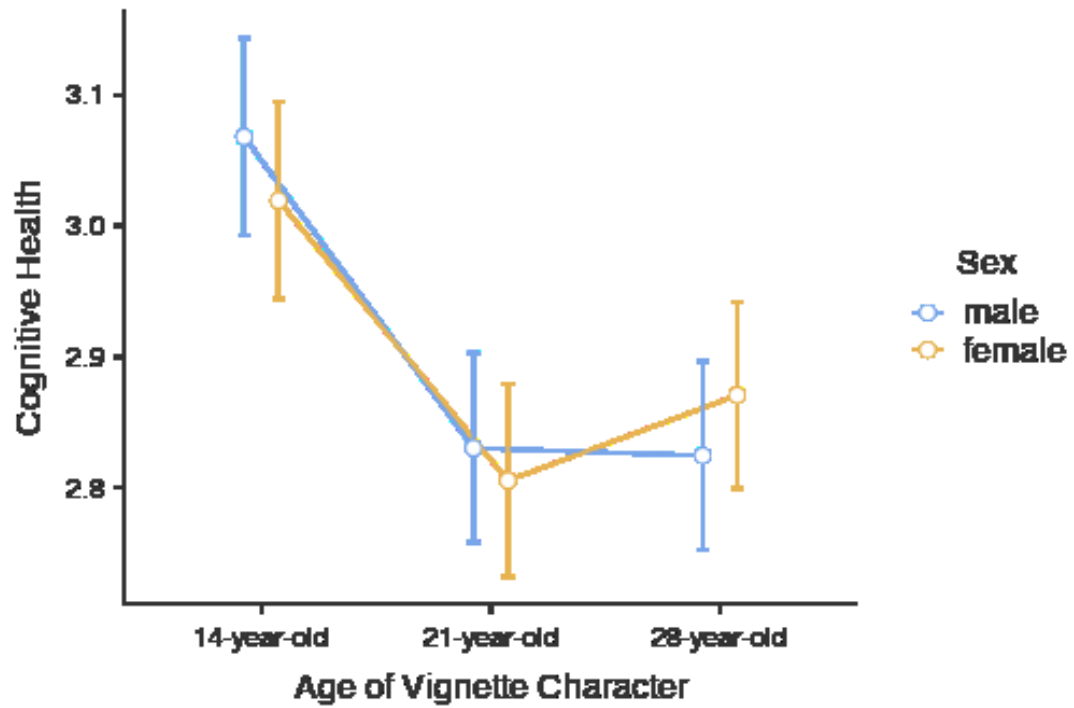


Figure 4: Effect of Vignette Character’s Age on the Item Score “What Impact do you Believe Jane/John’s Cannabis Use has on her/his Brain Development?”

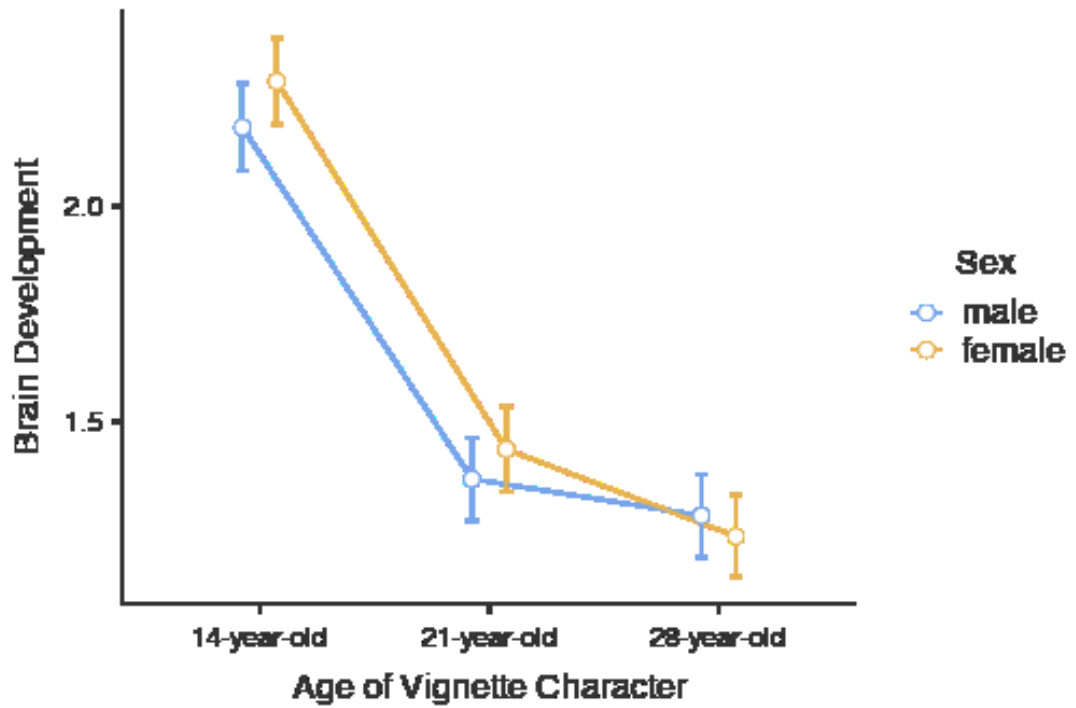


Figure 5: Effect of Vignette Character's Age on the Item Score "To What Extent do you Believe Jane/John's Cannabis Use is a Problem?"

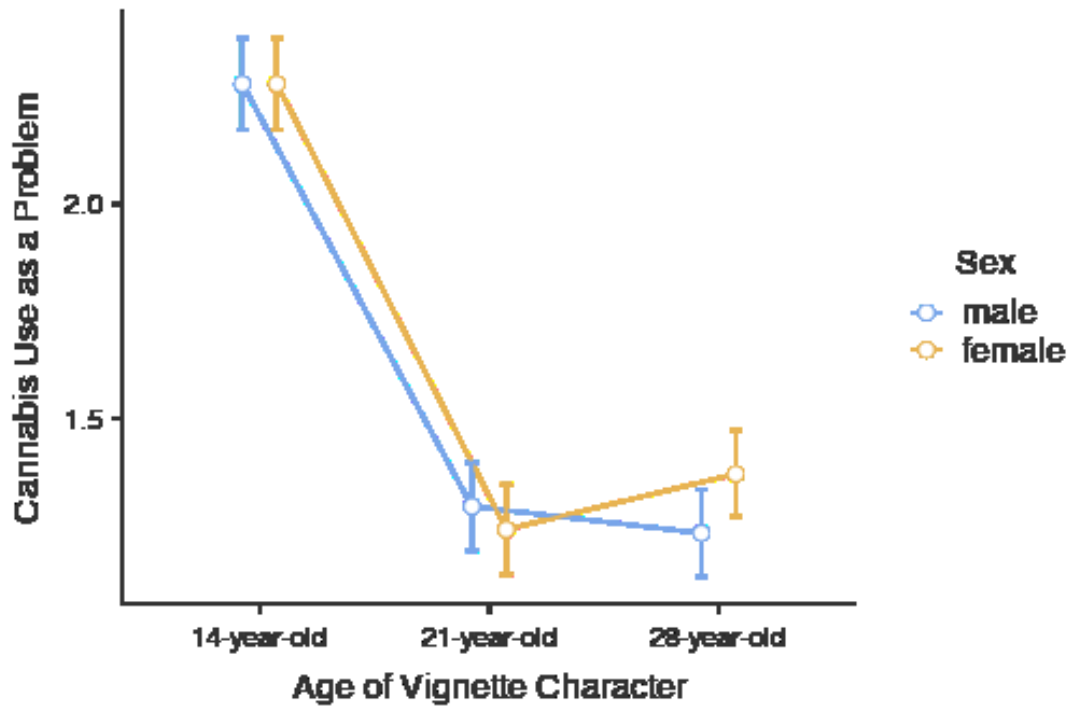


Figure 6: Effect of Vignette Character’s Age on the Item Score “To What Extent do you Disapprove of Jane/John’s Cannabis Use?”

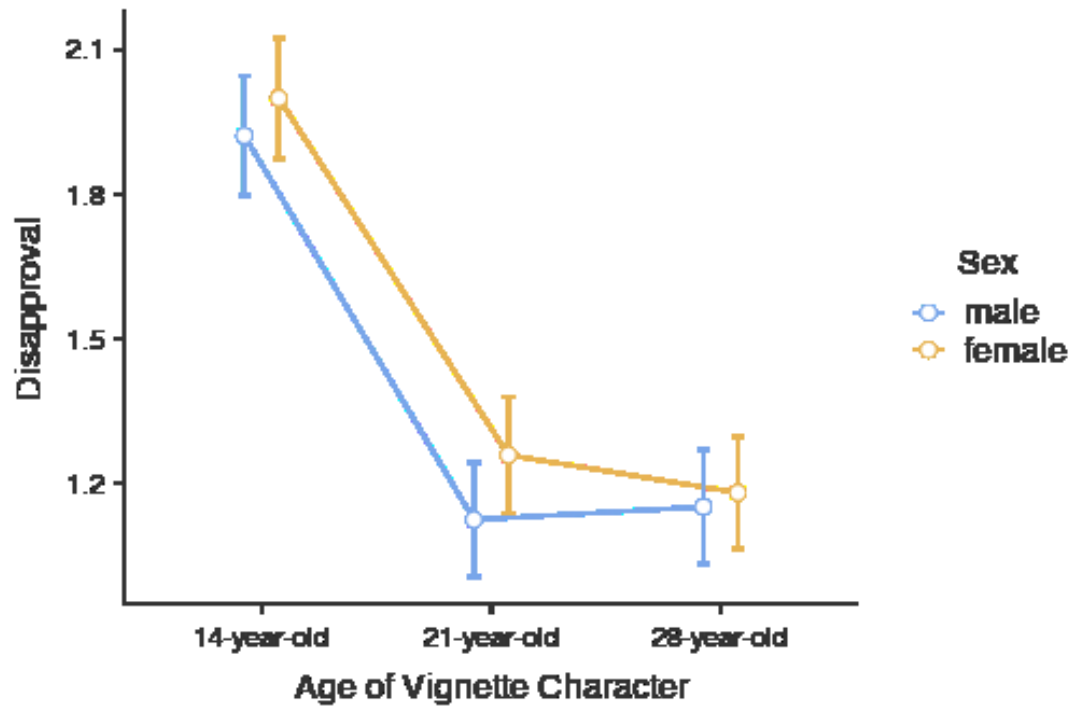
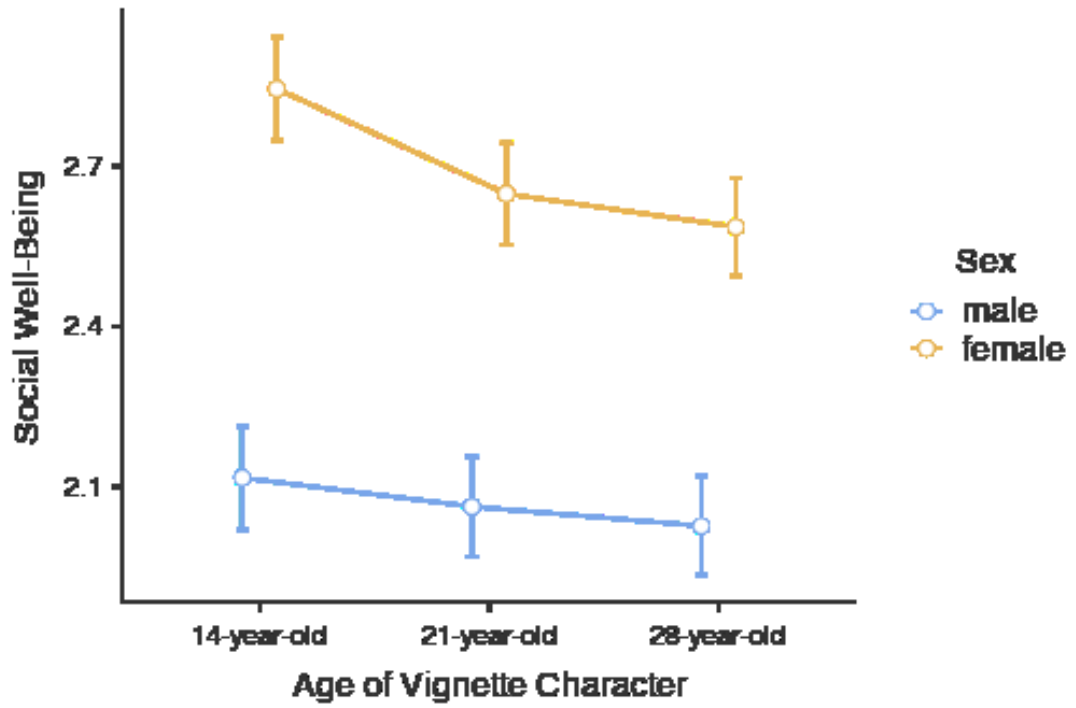


Figure 7: Effect of Vignette Character’s Gender on the Item Score “What Impact do you Believe Jane/John’s Cannabis Use has on her/his Social Well-Being?”



Appendix A



Faculty of Science
Department of Psychology
www.mun.ca/psychology

Informed Consent Form

Title: Young Adult Perceptions of Cannabis Use

Researchers: Laura Harris, B.Sc (Hons)

Graduate Student, Department of Psychology
Memorial University of Newfoundland
Email: lharris@mun.ca

Dr. Nick Harris, PhD, R Psych

Assistant Professor, Department of Psychology
Memorial University of Newfoundland
Phone: (709) 864-7676
Email: nharris@mun.ca

You are invited to take part in a research project entitled:

“Young Adult Perceptions of Cannabis Use”

This form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. It also describes your right to withdraw from the study. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able to make an informed decision. This is the informed consent process. Take time to read this carefully and to understand the information given to you. Please contact the researchers, Laura Harris or Dr. Nick Harris, if you have any questions about the study or would like more information before you consent.

It is entirely up to you to decide whether to take part in this research. If you choose not to take part in this research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you, now or in the future.

Introduction:

My name is Laura Harris, and I am a graduate student in the Department of Psychology at Memorial University of Newfoundland. I am completing this study as part of my Masters thesis.

Purpose of study:

The purpose of this study is to examine people's perceptions and opinions about cannabis use. The results of this study will be used to further investigate cannabis use, help generalize existing findings, and explore areas with little research.

Are you eligible to participate?

To be eligible to participate in this study, you must be between the ages of 18 and 25 years old.

What you will do in this study:

In this study, you will be asked to complete an online survey. Participation involves answering questions about your age, sex, ethnic/racial heritage, province of origin, and education completed. You will also be asked to complete a series of questionnaires. Please note that during your participation in this study, you may skip any questions that you do not want to answer.

Length of time: Completion of the online survey will take approximately 10 minutes.

Withdrawal from the study:

There are no consequences to withdrawing from the study. You are free to withdraw from the study at any time, up until the point when you submit your survey responses to the researchers. If at any time you wish to discontinue the survey, you can simply click the EXIT button at the top of your screen. Once you submit the survey to us, it is not possible to identify your survey, so it is not possible to remove it from the study. Should you decide to close the browser at any time during the study without submitting your survey, any responses will be lost and not included in the study.

Possible benefits:

Although you may not receive any immediate, direct benefits yourself, your participation will help us to better understand young adult perceptions of cannabis use. Once the research from this study is compiled, we will share the report with all interested participants. If you would like to receive these results, please e-mail one of the researchers.

Possible risks:

During your participation in this study, it is possible that you may become aware that you are struggling with a mental health or substance use related issue. If you have any concerns about your current mental health or psychological functioning, you can contact the Mental Health Helpline at 709-737-4668 or the MUN Student Wellness and Counselling Centre at 709-864-8500.

Compensation:

To thank you for your time, you may enter your e-mail address into a draw to win one of five \$50 restaurant gift cards. Please note that to ensure your anonymity your e-mail address will be kept separate from the information you provide on the survey.

Confidentiality vs. Anonymity:

There is a difference between confidentiality and anonymity: Confidentiality is ensuring that identities of participants are accessible only to those authorized to have access. Anonymity is a result of not disclosing participant's identifying characteristics (such as name or description of physical appearance).

Confidentiality:

Confidentiality will be ensured at all times. Only the researchers will have access to any and all data. As well, the researchers will have no way of knowing who, or who did not, complete a survey.

Anonymity:

The survey will be anonymous. In no way will the researcher have the ability to link the participant's responses back to them. All information presented or published from the results will be in aggregate form.

Storage of Data:

All data will be stored on a password-protected computer located in Dr. Nick Harris's lab on the Memorial University campus. The researchers will be the only individuals with access to the data. Data will be kept for a minimum of five years as required by Memorial University policy on Integrity of Scholarly Research. Following this five-year period, all data will be fully deleted. The online server, Qualtrics, hosting this survey stores all data on a server in Toronto, Ontario and thus is not subject to the US Patriot Act.

Reporting of Results:

The data collected will be compiled into a report and may be presented and published through peer-reviewed forums and will also be publicly available through the QEII Library. These outputs will be a summary of the information obtained and will not include identifying features.

Sharing of Results with Participants:

Once the report is complete, it will be shared online via the following website: www.ucs.mun.ca/~nharris. It will also be available at <http://collections.mun.ca/cdm/search/collection/theses>

Questions:

You are welcome to ask questions at any time during your participation in this research. If you would like more information about this study, please contact Laura Harris or Dr. Nick Harris.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at (709) 864-2861.

Consent:

Your submitting the survey to the researchers means that:

- You have read the information about the research.
- You have been able to ask questions about this study, if so desired.
- You are satisfied with the answers to all your questions.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw from the study at any time, up until you submit the survey to the researchers, and that doing so will not affect you now or in the future.

If you submit the survey to the researchers, you do not give up your legal rights and do not release the researchers from their professional responsibilities. By submitting the survey to the researchers, and thus consenting to participate in this study: I have read what this study is about and understood the risks and benefits. I have had adequate time to think about this and had the opportunity to ask questions, if so desired, and any questions have been answered. I agree to participate in the research project understanding the risks and contributions of my participation, that my participation is voluntary, and that I may end my participation at any time up until I have submitted my survey.

A copy of this Informed Consent Form can be printed for my records.

Please click below to proceed to the survey:

Appendix B



Faculty of Science
Nick Harris, PhD
Department of Psychology
nharris@mun.ca
www.mun.ca/psychology

Public Perceptions of Cannabis Use

Researchers:

Laura Harris, Graduate Student, Department of Psychology, Memorial University of Newfoundland, Email: lharris@mun.ca

Dr. Nick Harris, Assistant Professor, Department of Psychology, Memorial University of Newfoundland, Phone: (709) 864-7676, e-mail: nharris@mun.ca

Thank you for participating in this study! Your participation and the data that you contribute are valuable and appreciated. This feedback sheet is intended to explain to you the purpose and hypotheses of the study in which you have just participated.

The purpose of this study was to better understand young adult's perceptions of the dangerousness of cannabis use by adolescents and young adults. We did not include in the title, invitation, or consent form that this study was investigating the perception of danger. We did not disclose this information to avoid bias in the study responses and results.

Canadian adolescents and young adults have among the highest cannabis use rates in the world. This population has been identified as being at a particularly high risk for cannabis use related issues in various domains including physically, socially, psychologically, and legally. To our knowledge, this is the first experimental study that has been conducted examining the perceived dangerousness of cannabis use in adolescents and young adults.

The information that you provided will shed light on areas for further research and will be used to contribute to existing literature.

You were asked demographic questions about your age, sex, relationship status, ethnic/racial heritage, province of origin, and academic status. This information was collected to ensure there were no pre-existing differences between participants on any of the above factors that might impact how dangerous they perceive cannabis use to be. A question on personal cannabis use and questionnaire on cannabis use disorder was also used to evaluate how this affects perceived dangerousness of cannabis. You were also asked to complete questionnaires measuring your

perceptions of dangerousness for the character you were assigned to. You were assigned to one of six vignettes. In each vignette, the age or gender of the character was altered: 1) 14-year-old female; 2) 21-year-old female; 3) 28-year-old female; 4) 14-year-old male; 5) 21-year-old male; 6) 28-year-old male. This is to compare if and how young adults perceive differences in cannabis use when these factors are varied.

Statistical analysis will be completed on the data. Once the report is complete, it will be shared online at www.uccs.mun.ca/~nharris and it will also be available at <http://collections.mun.ca/cdm/search/collection/theses>

During your participation in this study it is possible that you may have become concerned about your own current mental health or substance use. If you have any concerns about your current mental health or psychological functioning, you can contact the Mental Health Helpline at 709-737-4668 or the MUN Student Wellness and Counselling Centre at 709-864-8500. If you would like information on referrals to mental health and addiction services you can contact Eastern Health, Adult Central Intake at 709-752-8888.

We appreciate your participation in this study and hope that this has been an interesting experience. If you no longer wish to have your data submitted, you can exit the browser instead of clicking the red button at the bottom of the page. By exiting the browser, all information you have entered will be lost.

If you have any additional questions about this research, please contact graduate student Laura Harris at lharris@mun.ca or Dr. Nick Harris at (709) 864-7676 or nharris@mun.ca

If you have any ethical concerns about your participation in this study (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or at (709) 864-2861.

Once again, thank you for your participation in this study.

If you would like to learn more about research in this area, please see the following articles:

Dansecu, E. R., Kingery, P. M., & Coggeshall, M. B. (1999). Perceived risk of harm from marijuana use among youth in the USA. *School Psychology International*, 20(1), 39-56. doi:10.1177/0143034399201004

George, T., & Vaccarino, F. (Eds.). (2015). *Substance abuse in Canada: The Effects of Cannabis Use during Adolescence*. Ottawa, ON: Canadian Centre on Substance Abuse.

Pacek, L. R., Mauro, P. M., & Martins, S. S. (2015). Perceived risk of regular cannabis use in the United States from 2002 to 2012: differences by sex, age, and race/ethnicity. *Drug and Alcohol Dependence*, 149, 232-244. doi: 10.1016/j.drugalcdep.2015.02.009

Appendix C

Vignettes

1. Jane is a 14-year-old female who lives in your community. Jane smokes cannabis almost daily.
2. John is a 14-year-old male who lives in your community. John smokes cannabis almost daily.
3. Jane is a 21-year-old female who lives in your community. Jane smokes cannabis almost daily.
4. John is a 21-year-old male who lives in your community. John smokes cannabis almost daily.
5. Jane is a 28-year-old female who lives in your community. Jane smokes cannabis almost daily.
6. John is a 28-year-old male who lives in your community. John smokes cannabis almost daily.

Appendix D
Perceived Dangerousness Questionnaire: Jane

Please answer each of the following questions by selecting the option that best matches your opinion. Please read each question carefully, and answer each one as it pertains to John's cannabis use. There are no right or wrong answers. If you do not wish to answer any questions you may leave them blank. If you no longer wish to continue the study, you can press the EXIT button at the top of your screen to close your survey and all data will be lost.

1. To what extent do you feel Jane's cannabis use dangerous?

0	1	2	3	4
Not at all dangerous	A little dangerous	Moderately dangerous	Very dangerous	Extremely dangerous

2. What impact do you believe Jane's cannabis use has on her mental health?

0	1	2	3	4
Very negative impact	Somewhat negative impact	No impact	Somewhat positive impact	Very positive impact

3. What impact do you believe Jane's cannabis use has on her social life?

0	1	2	3	4
Very negative impact	Somewhat negative impact	No impact	Somewhat positive impact	Very positive impact

4. What impact do you believe Jane's cannabis use has on her cognitive health (e.g., intelligence, memory)?

0	1	2	3	4
Very negative impact	Somewhat negative impact	No impact	Somewhat positive impact	Very positive impact

5. To what extent do you believe Jane's cannabis use negatively impacting her brain development?

0	1	2	3	4
Not at all	A small amount	A moderate amount	A large amount	An extreme amount

6. To what extent do you believe Jane's cannabis use is a problem?

0	1	2	3	4
Not at all	A small amount	A moderate amount	A large amount	An extreme amount

7. To what extent do you disapprove of Jane's cannabis use?

0	1	2	3	4
Not at all	A small amount	A moderate amount	A large amount	An extreme amount

Perceived Dangerousness Questionnaire: John

Please answer each of the following questions by selecting the option that best matches your opinion. Please read each question carefully, and answer each one as it pertains to John's cannabis use. There are no right or wrong answers. If you do not wish to answer any questions you may leave them blank. If you no longer wish to continue the study, you can press the EXIT button at the top of your screen to close your survey and all data will be lost.

1. To what extent do you feel John's cannabis use dangerous?

0	1	2	3	4
Not at all dangerous	A little dangerous	Moderately dangerous	Very dangerous	Extremely dangerous

2. What impact do you believe John's cannabis use has on his mental health?

0	1	2	3	4
Very negative impact	Somewhat negative impact	No impact	Somewhat positive impact	Very positive impact

3. What impact do you believe John's cannabis use has on his social life?

0	1	2	3	4
Very negative impact	Somewhat negative impact	No impact	Somewhat positive impact	Very positive impact

4. What impact do you believe John's cannabis use has on his cognitive health (e.g., intelligence, memory)?

0	1	2	3	4
Very negative impact	Somewhat negative impact	No impact	Somewhat positive impact	Very positive impact

5. To what extent do you believe John's cannabis use negatively impacting his brain development?

0	1	2	3	4
Not at all	A small amount	A moderate amount	A large amount	An extreme amount

6. To what extent do you believe John's cannabis use is a problem?

0	1	2	3	4
Not at all	A small amount	A moderate amount	A large amount	An extreme amount

7. To what extent do you disapprove of John's cannabis use?

0	1	2	3	4
Not at all	A small amount	A moderate amount	A large amount	An extreme amount

Appendix E

Cannabis Use Disorders Identification Test (CUDIT)

Over the past 6 months...

(1) How often did you use cannabis?

Never (0) – monthly or less (1) – 2 – 4 times a month (2) – 2 – 3 times a week (3) – 4 or more times a week (4)

Note: If Never is indicated respondent will not be asked remaining CUDIT items.

(2) How many hours were you "stoned" on a typical day when you had been using cannabis?

1 or 2 (0) – 3 or 4 (1) – 5 or 6 (2) – 7 to 9 (3) – 10 or more (4)

(3) How often were you "stoned" for 6 or more hours?

Never (0) – less than monthly (1) – monthly (2) – weekly (3) – daily or almost daily (4)

(4) How often did you find that you were not able to stop using cannabis once you had started?

Never (0) – less than monthly (1) – monthly (2) – weekly (3) – daily or almost daily (4)

(5) How often did you fail to do what was normally expected from you because of using cannabis?

Never (0) – less than monthly (1) – monthly (2) – weekly (3) – daily or almost daily (4)

(6) How often did you need to use cannabis in the morning to get yourself going after a heavy session of using cannabis?

Never (0) – less than monthly (1) – monthly (2) – weekly (3) – daily or almost daily (4)

(7) How often did you have a feeling of guilt or remorse after using cannabis?

Never (0) – less than monthly (1) – monthly (2) – weekly (3) – daily or almost daily (4)

(8) How often have you had a problem with your memory or concentration after using cannabis?

Never (0) – less than monthly (1) – monthly (2) – weekly (3) – daily or almost daily (4)

(9) Have you or someone else been injured as a result of your use of cannabis?

No (0) – yes (4)

(10) Has a relative, friend or doctor or other health worker been concerned about your use of cannabis or suggested you cut down?

No (0) – yes (4)

Appendix F
Demographic Information

- 1) What is your age? _____

- 2) With which gender do you identify?
 - a. Male
 - b. Female
 - c. Transgender
 - d. Prefer not to say
 - e. Other – Please specify: _____

- 3) How would you describe your relationship status?
 - a. Single
 - b. In a relationship
 - c. Common Law/Married
 - d. Divorced
 - e. Widowed
 - f. Other – Please specify: _____

- 4) What is your ethnic background?
 - a. Caucasian/White
 - b. African-Canadian/Black
 - c. Hispanic/Latino
 - d. Asian
 - e. Indigenous (First Nation, Métis or Inuit)
 - f. Middle Eastern
 - g. East Indian
 - h. Other – Please specify: _____

- 5) What is the highest level of education you have completed?
 - a. Below high school
 - b. Some high school, no diploma
 - c. High school graduate, diploma or the equivalent
 - d. Some college credit, no degree
 - e. Trade/technical/vocational training
 - f. Associate degree
 - g. Bachelor's degree
 - h. Master's degree
 - i. Professional degree
 - j. Doctorate degree
 - k. Other:

- 6) Are you currently employed?
 - a. Not employed
 - b. Currently hold part time employment
 - c. Currently hold full time employment

- 7) What Canadian province or territory are you from?
 - a. Alberta
 - b. British Columbia
 - c. Manitoba
 - d. New Brunswick
 - e. Newfoundland and Labrador
 - f. Northwest Territories
 - g. Nova Scotia
 - h. Nunavut
 - i. Ontario
 - j. Prince Edward Island
 - k. Quebec
 - l. Saskatchewan
 - m. Yukon
 - n. I am not from a Canadian province or territory