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Testing the Competing Life Reinforcers Model for Substance Use in Reserve-Dwelling First Nation Youth

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Abstract

Purpose: North American Indigenous (NAI) communities often cite substance misuse as problematic in their communities. The Competing Life Reinforcers (CLRs) model suggests that when reinforcers are valued, important, and incompatible with substance use, they will be associated with less substance misuse. Three categories of CLRs were identified in our formative work and include: cultural, social, and extracurricular activities. The aims of the current study were to test the associations among valuing and availability of CLRs and NAI adolescent alcohol and marijuana use.

Methods: Adolescents living in rural First Nation reserve communities (*N*=106, 50.0% Female) reported their substance use and perceived availability and valuing of CLRs (e.g., smudging, after school activities).

Findings: Greater value placed on cultural reinforcers was significantly associated with reduced likelihood of past three-month drinking to get drunk (OR=0.85, 95%CI[0.73, 0.98]). Greater value placed on social reinforcers was associated with lower likelihood of past three-month drinking (OR=0.94, 95%CI[0.89, 0.995]) and past-three month drinking to get drunk (OR=0.94, 95%CI[0.88, 0.99]). Greater valuing extracurricular activities was associated with lower likelihood of past month marijuana use (OR=0.84, 95%CI[0.72, 098]), past three-month drinking (OR=0.77, 95%CI[0.64, 0.92]) and past three-month drinking to get drunk (OR=0.76, 95%CI[0.63, 0.92]).

Conclusions: CLRs may be protective against NAI adolescent substance use and may be useful targets for prevention and treatment for NAI adolescent substance use.

Keywords

Competing Life Reinforcers; adolescent substance use; alternative reinforcers; First Nation

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Introduction

Adolescent substance use is of significant public health concern, as earlier initiation of substance use is associated with higher rates of use, dependence, and a number of negative substance-related consequences later in life (Griffin & Botvin, 2010). This is of particular concern for North American Indigenous (NAI) adolescents (e.g., American Indians [AI] and Alaska Natives [NA] in the United States and First Nations people in Canada), who are at disproportionately increased risk for substance use disorders compared to non-Indigenous adolescents (Stanley & Swaim, 2015; Whitbeck et al., 2006; Whitbeck et al., 2014a). Research indicates that NAI adolescents are more likely to have used cigarettes (Spillane et al., 2020a) marijuana, or inhalants, or to have drunk alcohol until intoxicated (Swaim & Stanley, 2018) and have higher rates of heroin and other opioid misuse compared to their non-Indigenous peers (Nalven et al., 2020; Swaim & Stanley, 2018). They are also more likely to initiate using substances at young ages (Spillane et al., 2015; Stanley & Swaim, 2015; Whitesell et al., 2012b), with steady increases in alcohol and marijuana use throughout adolescence (Walls et al., 2013; Walls, 2008). At the same time, it is also important to highlight that there are notable differences in NAI substance use rates, representing tremendous variability (for a review of epidemiology see Whitesell et al., 2012a), with some communities reporting significantly higher rates of substance use than the general populations and others report significantly lower rates (Beals et al., 2003; Mitchell et al., 2003; Whitesell et al., 2012a). Nevertheless, NAI youth experience a disproportionate amount of negative consequences associated with substance use (Henry et al., 2011; Szlemko et al., 2006), including car accidents, arrests, school and work problems (Beauvais, 1992). Further, many NAI communities often cite alcohol and marijuana use and misuse as particularly problematic in their communities (Dennis & Momper, 2012; Spillane et al., 2020b).

Though much work has been done regarding the epidemiology of substance use disorders within NAI populations (Armenta et al., 2016), and investigations have begun to explore risk factors for substance use, our understanding of malleable protective factors for use remains limited (Beals et al., 2005; Whitbeck et al., 2006). Several studies have identified risk factors associated with NAI adolescent substance use including peer substance use (Oetting & Beauvais, 1986), exposure to stress (Whitesell et al., 2014), parental abuse/neglect and other family factors (Oetting et al., 1988; Wall et al., 2000), and perceived discrimination (Whitbeck et al., 2004). However, NAI communities have called for strengths-based approaches to reducing substance use, which would leverage positive community and individual strengths to protect against adolescent substance use; this approach would be highly congruent with NAI conceptualizations of health and well-being (Craven et al., 2016; Kirmayer et al., 2011). Therefore, there is a critical need for research that identifies positive factors that offer protection against the development of substance use problems instead of focusing on a deficit approach to substance use prevention.

Spillane et al. (2020) argue that Competing Life Reinforcers (CLRs) are one type of protective factor worthy of further investigation among NAI adolescents. The concept of CLRs was developed drawing upon Behavioral Theories of Choice (BTC) and Standard Life Reinforcers (SLRs; Spillane & Smith, 2007). BTC is a well-established framework

for understanding potential targets for substance use prevention and interventions (Audrain-McGovern et al., 2004; Bickel & Vuchinich, 2000; Green & Fisher, 2000; Higgins et al., 1994). BTC proposes that substance use varies based on two factors: availability of substances and availability of substance-free alternative reinforcers (e.g., activities that individuals like engaging in or important relationships), and that engaging in fewer substance-free alternative reinforcers results in more substance use (Khoddam & Leventhal, 2016). Adapting the BTC concept to understand NAI risk for alcohol misuse, Spillane & Smith (2007) developed the term SLRs to describe basic life reinforcers or experiences that people strive for (i.e., housing, family closeness, knowledge, economic security). Spillane and Smith (2007) proposed that alcohol use among reserve-dwelling NAI individuals may be attributable to a dearth of access to important SLRs, or to a lack of contingency between access to SLRs and alcohol use. This may lead NAI individuals to rely more heavily on alcohol use to attain reinforcement and/or to experience less incentives to abstain from alcohol use.

Extending theory to NAI adolescents based on BTC and SLRs, a CLR is defined as a reinforcer which must be 1) available when the individual is not using substances, 2) important to the individual, and 3) incompatible with substance use. In focus groups, NAI adolescents discussed risk and protective factors for substance use and identified reinforcers that they perceived would be protective against substance use which were categorized based on content area into three categories: cultural reinforcers, social reinforcers, and extracurricular activities (Spillane et al., 2020b). Extant literature supports each of these categories as protective against substance use among NAI youth. Cultural reinforcers have been found to moderate the association between alcohol expectancies and alcohol use among NAI adolescents, such that the association between expectancies and use was significant only for those who reported a low degree of valuing cultural activities (Goldstein et al., in press). Other work has found that endorsing a strong Indigenous cultural identity, holding traditional beliefs, and valuing and engaging in traditional practices have a protective effect against NAI adolescent substance use (Brown et al., 2016; McIvor & Napoleon, 2009; Spillane et al., 2020b; Tingey et al., 2016). Social reinforcers may be of great importance for NAI adolescents, in particular, given the importance of community and the collectivistic nature of NAI culture (Beauvais, 1992). Specifically, social support has been found to buffer the association between experiencing stressful life events and engagement in risky behaviors, including alcohol use, among Indigenous adolescents (Baldwin et al., 2011). Finally, extracurricular activities have been found to be protective against substance use in both non-Indigenous (Spillane et al., 2020c) and Indigenous adolescents (Moilanen et al., 2014; Osilla et al., 2007; Rawana & Ames, 2012). Although there is evidence suggesting that engagement with reinforcers may be protective against substance use, no study to date has explored the relations among perceived importance and availability of CLRs and NAI adolescent substance use.

The goal of the present study was to examine the association of importance and availability of the three categories of CLRs (i.e., cultural, social, and extracurricular activities) with alcohol and marijuana use behaviors as a means of testing the applicability of BTC to a group of adolescents living in rural Indigenous reserve communities in Canada. We hypothesized that rating CLRs as important and availability of those personally valued

CLRs would be associated with decreased likelihood of endorsing alcohol and marijuana use behaviors.

Methods

Participants and Procedures

A total of 106 First Nation adolescents from Indigenous communities located in rural areas of Eastern Canada participated in this research. Data for this study were collected in the spring of 2017. Participants were recruited via snowball sampling through advertisements and announcements in the reserve community as a study examining risk and protective factors associated with substance use among First Nation adolescents. Participants were asked to complete confidential pencil-and-paper questionnaires. All research procedures were approved by University of Rhode Island Institutional Review Board, Reference Number 853429, Title: Contextual Risk Factors for Substance Use in Adolescent Reservation-Dwelling American Indians and tribal chief and council. Parent permission was acquired prior to recruiting each child into the study. Once parent permission was received (i.e., signed consent form), the investigators explained the study to the youth, who also provided written assent. The questionnaires took an average of 45 minutes to complete and participants were compensated $25.00 USD for participating.

Measures

To assess the *Competing Life Reinforcers (CLR)* model, we created a measure based on prior work with two focus groups of adolescents from the same cultural group and in the same age group as is the sample in the present study ($N = 15$; 10 female; Spillane et al., 2020b). In the focus groups, questions were asked about activities that youth enjoy that would be incompatible with substance use (i.e., alcohol, marijuana, and cigarettes). Twenty-four unique items were developed from these focus groups (Spillane et al., 2020b) based on the thematic types of reinforcers that were identified, including culture, social, and extracurricular activities (see Table 1 for a summary of reinforcers included in the present study). *CLR availability* was measured by having respondents rate whether each item was available to them, with possible response options of yes (1) and no (0). Then to create an availability score for each activity type, we calculated the proportion of activities that participants endorsed as available to them out of the total number possible for that category (i.e., out of five for cultural reinforcers, fifteen for social reinforcers, and four for extracurricular activities). *CLR importance* was measured by having respondents rate the importance of each item (0 = *not at all*, 5 = *extremely important*). Finally, the importance item scores were summed to create total importance ratings for the three categories of CLRs (i.e., cultural, social, and extracurricular activities), consistent with the categories obtained from focus groups that informed the development of this measure (Spillane et al., 2020b). Cronbach's alphas of the importance scores for the three categories were .90, .94, and .85 for cultural, social, and extracurricular activities, respectively.

Substance Use Outcomes

Marijuana use.—Marijuana use was assessed by asking whether participants had used marijuana in the preceding 30 days. Response options were 1 ("yes") and 0 ("no").

Alcohol use.—Current alcohol use and current drinking to get drunk were assessed using two items from the Adolescent Drinking Questionnaire (ADQ; Donovan, 2004). Participants reported on their drinking frequency and frequency of being drunk over the past 3 months with eight possible response options (0 = *never, I did not drink any alcohol in the past three months*, 7 = *everyday).* For the current study, we created the variable "current drinking" by dichotomizing responses to the item assessing frequency of drinking over the past 3 months such that 0 = never drank in the last 3 months and 1 = any alcohol use in the past three months. Similarly, we created "current drinking to get drunk" by dichotomizing response choices to the item assessing frequency of being drunk over the past three months such that 0 = never was drunk in the last 3 months and 1 = at least one instance of being drunk in the past three months.

Demographics

Participants reported their age, sex, grade in school, and living situation (i.e., living with both parents versus some other living situation).

Analytical Approach

Preliminary analyses were conducted to examine assumptions of normality, homoscedasticity, linearity, and multicollinearity, as is recommended by Tabachnick, Fidell and Osterlind (2007). Three participants did not complete the entire survey (i.e., both stopped immediately after completing demographic information), and thus were removed from analyses to allow for complete-case analysis. Then, we examined Pearson product-moment correlations between continuous variables and point-biserial correlations between dichotomous and continuous variables among categories of CLRs and substance use outcomes to examine their bivariate associations. Next, we used independent samples *t*-tests with associated Cohen's *d* effect size estimates to examine differences in importance and availability ratings of each CLR category between adolescents who reported no current substance use and any current substance use. Then, we used nine binary logistic regression models to examine the associations between importance and availability of each of CLR category (i.e., cultural, social, and extracurricular activities) and each substance use outcome (i.e., current marijuana use, current drinking, and current drinking to get drunk). Finally, we used three binary logistic regression models to examine the associations between ratings of importance of each CLR category (e.g., cultural, social, and extracurricular) and each substance use outcome (e.g., current drinking, current drinking to get drunk, and marijuana use) with the CLR categories entered together[1]. Results are presented as odds ratios with 95% confidence intervals.

Results

Participants ranged in age from 11 to 18 years old (M = 14.6, SD = 2.2) and were in grades 6 through 12 (M = 8.6, SD = 2.6), with four participants no longer attending school. Half the sample (50.0%) identified as female, and all reported that they were a member of a

[1]We also used three binary logistic regression models to examine the associations between availability of each CLR category and each substance use outcome with the CLR categories entered together. None of the availability scores were significantly associated with odds of endorsing any of the substance use outcomes.

First Nation group and lived within reserve communities. Of the total sample, 86.4% (n = 90) lived in a home with one or both of their parents. On average, participants scored all CLR categories as being important to them (i.e., on a 0–4 scale, Cultural: M[*SD*] = 3.28 [0.87], Social: M[*SD*] = 3.29 [0.76], Extracurricular: M[*SD*] = 2.88 [1.00]). Participants also endorsed most reinforcers within each category as being available to them (i.e., percent of reinforcers available, Cultural: M[*SD*] = 80.3% [26.5], Social: M[*SD*] = 86.3% [17.9], Extracurricular: M[*SD*] = 73.4% [29.6]). Over one-third of our sample reported past month marijuana use (34.0%), drinking in the past three months (37.9%), and drinking to get drunk (35.0%) in the past three months. See Table 2 for bivariate and point biserial correlations. Adolescents who reported no current substance use rated cultural reinforcers (t[73.63] = 3.17, p = .002, d = .07), social reinforcers (t[101] = 2.52, p = .01, d = .50), and extracurricular activities (t[81.77] = 4.77, p < .001, d = .95) as more important than did adolescents who reported marijuana use, drinking, or drinking to get drunk. Adolescents who reported no current substance use also endorsed having significantly more social reinforcers (t[75.69] = 2.13, p = .04, d = .43) and extracurricular activities (t[89.51] = 2.31, p = .02, d = .46) available than did adolescents who reported any current substance use; there was no significant differences observed in availability of cultural reinforcers (t[100] = 0.22, p = .83, d = .04).

Logistic Regression Analyses Examining the Association of Cultural Reinforcers and Alcohol and Marijuana Use Outcomes

See Table 3 for all logistic regression results. Availability of cultural reinforcers was not significantly associated with any of the three substance use outcomes. However, importance of cultural reinforcers was significantly negatively associated with likelihood of reporting past three-month drinking to get drunk (b = −.16, SE = .08, p = .03, OR = 0.85, 95% CI [0.73, 0.98]).

Logistic Regression Analyses Examining the Association of Social Reinforcers and Alcohol and Marijuana Use Outcomes

Availability of social reinforcers was not significantly associated with any of the three substance use outcomes. However, importance of social reinforcers was significantly negatively associated with likelihood of reporting past three-month alcohol use (b = −.06, SE = .03, p = .03, OR = 0.94, 95% CI [0.89, 0.995]) and reporting past three-month drinking to get drunk (b = −.07, SE = .03, p = .02, OR = 0.94, 95% CI [0.88, 0.99]).

Logistic Regression Analyses Examining the Association of Extracurricular Activities and Alcohol and Marijuana Use Outcomes

Availability of extracurricular activities was not significantly associated with any of the three substance use outcomes. However, importance of extracurricular activities was significantly negatively associated with likelihood of reporting past month marijuana use (b = −.18, SE = .08, p = .03, OR = 0.84, 95% CI [0.72, 0.98]), reporting past three-month alcohol use (b = −.27, SE = .09, p = .004, OR = 0.77, 95% CI [0.64, 0.92]), and of reporting past three-month drinking to get drunk (b = −.27, SE = .10, p = .005, OR = 0.76, 95% CI [0.63, 0.92]).

Logistic Regression Analyses Examining the Association of Importance Ratings of All CLR Categories and Alcohol and Marijuana Use Outcomes

Importance ratings of cultural and social reinforcers were not significantly associated with any of the three substance use outcomes. However, importance of extracurricular activities was significantly negatively associated with likelihood of reporting past month marijuana use ($b = -.26$, $SE = .12$, $p = .03$, OR = 0.77, 95% CI [0.62, 0.97]), reportg past three-month alcohol use ($b = -.25$, $SE = .12$, $p = .04$, OR = 0.78, 95% CI [0.62, 0.98]), and of reporting past three-month drinking to get drunk ($b = -.25$, $SE = .12$, $p = .04$, OR = 0.78, 95% CI [0.62, 0.99]).

Discussion

The purpose of the current study was to increase our understanding of CLRs as they relate to substance use behaviors in First Nation adolescents. Our work extends previous research the role of activity engagement in adolescent substance use (e.g., Andrabi et al., 2017; Bartko & Eccles, 2003; Mahoney & Stattin, 2000; Moilanen et al., 2014; Spillane et al., 2020c) by focusing on the availability and importance of different reinforcers more broadly. This conceptualization provides a much broader opportunity to examine important aspects of life for Indigenous youth, including cultural activities, engaging in sports, and relationships with others, which may offer protection against substance use. We argue that the more importance placed on CLRs, the less likely youth will be to endorse substance use.

When adjusting for age and sex, we found that individuals who placed greater importance on cultural activities were less likely to endorse that they had been drunk in the past three months, and there was a near significant relationship for past month marijuana use ($p = .053$). Our finding that placing greater importance on cultural reinforcers is significantly related to lower odds of getting drunk in the past three months is consistent with a growing number of studies that have found culture to be protective against alcohol use (Goldstein et al., in press; McIvor et al., 2009; Spillane et al., 2020b). For instance, placing importance on cultural activities may reflect greater cultural identity affiliation, which previous work has been found to be protective against substance use for NAI youth (Tingey et al., 2016). However, our results are in contrast to studies that have found participation in tribal activities to be positively associated with alcohol use disorder symptoms (Yu & Stiffman, 2007) and greater substance use (Stiffman et al., 2007). These conflicting results may highlight that different aspects of culture should be considered and further suggest that importance of cultural activities should both be considered in addition to participation when evaluating the impact culture has on substance use outcomes (Tingey et al., 2016). This finding has important implications for substance use prevention and treatment programs. It is important to recognize that Indigenous communities are calling for interventions to be culturally centered because “culture is medicine” (Bassett et al., 2012; Walters et al., 2020) and therefore interventions should highlight increasing the importance that is placed on these cultural activities. For instance, families and communities can be encouraged to communicate with their youth about the value they place on engaging in cultural activities. These findings may also speak to the importance of future research including assessment of cultural identity affiliated, as those individuals who are more highly affiliated with

Indigenous culture may place greater importance and therefore confer greater benefit from these activities.

Those who endorsed greater social reinforcers reported that they were less likely to have drank or been drunk in the past three months. This finding is well supported by previous literature finding that NAI youth are more responsive to family influences in their decision to use substances compared to non-NAI youth (Swaim et al., 1993), and that this influence extends throughout the adolescent years (Beauvais, 2001). In qualitative focus groups used to develop the CLR measure, NAI youth frequently referenced the importance of supportive people in their lives who do not use substances as a protective factor against substance use (Spillane et al., 2020b); findings of the present study lend quantitative support to this notion. Other work has also found that non-familial adult role models are protective against substance use for NAI youth (Beebe et al., 2008), and that perceived social support buffers against risk for engagement in health-compromising behaviors, including substance use (Baldwin et al., 2011). This suggests that there would be value in emphasizing the role of relationships in prevention and treatment for substance use among NAI youth. It is also likely important to note that involving a variety of important people in such programming would be vital for NAI youth. Indigenous ways of "parenting" are more likely to include family networks made of various members of the family and fictive kin (Whitbeck et al., 2014b), and responsibilities for raising children are spread throughout these networks.

Of note, when all three types of reinforcers were entered into the same model only perceived importance of extracurricular activities were associated with decreased odds of endorsing all three substance use outcomes. In fact, the effect size for extracurricular activities is considered a large effect (d = .90; Cohen, 1969). Adolescents in our sample who are using substances rate these activities as less important than kids who are not using substances, underscoring the need for increasing the importance or value that is placed on such activities. This could also be related to age, as older adolescents in our sample perceived less availability of social and extracurricular reinforcers and rated importance as lower as well. Further, while speculative, it may likely be that less importance is attributed to certain activities the longer they are perceived as being unavailable to youth. That is, as youth age, noticing barriers to certain alternative reinforcers (e.g., lack of transportation to sporting events) may lead to the perception that the activity is less important. Indeed, some work has suggested that youth from low socioeconomic status (SES) backgrounds receive relatively less reinforcement from alternative activities than do adolescents from higher SES backgrounds (Leventhal et al., 2015). It may be that cognitive dissonance (Festinger, 1957) plays a role in this phenomenon, such that youth modify their beliefs (i.e., that these alternative reinforcers are unimportant) to align with their observations that those reinforcers are unavailable to them to reduce dissonance. Future work should aim to empirically examine this possible explanation. This suggests that any programming put into place needs to consider how to increase the availability and importance of such activities in older youth especially. These results are consistent with previous research, which has found that extracurricular activities play a protective role against substance use (Osilla et al., 2008; Moilanen et al., 2014; Warana & Ames, 2012; Spillane et al., 2020c; Stiffman et al., 2007). At the bivariate level, our results are partially consistent with previous research among NAI youth which has found that higher perceived availability of extracurricular

activities was associated with less substance use, including frequency of alcohol use and heavy drinking (Osilla et al., 2008; Moilanen et al., 2014). This further suggests the value of studying availability, importance, and participation as separate constructs because they can be differentially related to substance use outcomes and, therefore, multiple reinforcers should be targeted. These results highlight the potential impact of increasing the importance for each of these areas (i.e., culture, social, extracurricular activities) in prevention and treatment for NAI adolescent substance use. It is worth noting that adolescents living in rural communities may experience decreased access to these reinforcing substance-free activities simply because of decreased number of options in their physical proximity. Indeed, previous work has included such considerations when utilizing behavioral analytic approaches to explain substance use among adults living in rural communities (Mattaini, 1991). It is also certainly possible that structural racism has led to decreased access to certain alternative reinforcers to substance use (e.g., extracurricular activities are less likely to be offered at schools largely servicing students from minoritized backgrounds; Cohen et al., 2007). Indeed, previous research within Indigenous communities found that First Nation adults reported less access to alternative reinforcers than did a sample of White adults (Spillane et al., 2013). Other work has found that availability of alternative activities is less protective against substance use for Indigenous youth residing in reservation communities (as are the youth in the present study) compared to those living in metropolitan areas, perhaps due to increased barriers such as the need for transportation to get from reservations to those activities (Moilanen et al., 2014). Additionally, mistrust in schools stemming from the legacy of residential schooling and forced assimilation to White culture within schools (Milne, 2016) may lead Indigenous adolescents and their families to be wary of extracurricular activities and social relationships with individuals at schools located off-reserve. Such wariness may then limit the likelihood that Indigenous youth would identify such extracurricular activities or social reinforcers as important to them. Results of the present study support the need to future research to explicate the role of structural racism in these associations. Further, a primary implication of BTC is that the decision to engage in substance use is associated with the availability of substances (Correia et al., 2010; Vuchinich & Tucker, 1988). Thus, prevention approaches for adolescents in particular should make efforts to decrease access to substance use and increase access to and importance of enjoyable substance-free alternatives, such as the ones we included here.

Our results also lend themselves nicely to the viability of adapting treatments that have been developed to increase engagement in valued activities for non-Indigenous populations to Indigenous populations. Our results suggest that youth should be asked to share what they value and be encouraged to engage in activities that are consistent with those values, and that this will indirectly influence alcohol use. Many of the CLRs included in the present study likely map on to various values they hold (e.g., family relationships, activities), and that this is the consistency with values and activities is the mechanism through which CLRs confer protection. Substance use, on the other hand, would be inconsistent with those value systems. For example, Behavioral Activation is a structured treatment that was originally used to treat depression but has since been applied to substance use (Daughters et al., 2008; Hopko et al., 2003). In this treatment, individuals are encouraged to engage and schedule activities that are reinforcing to them. The Substance-Free Activity Session

(SFAS) attempts to increase engagement in alternatives to drinking by enhancing the salience of delayed substance-free reinforcers (Correia et al., 2010; Murphy et al., 2007). The SFAS is a brief session, typically used as an add-on to brief motivational interviewing, and has been shown to reduce alcohol consumption (Murphy et al., 2012) and marijuana use frequency (Yurasek et al., 2015) compared to a brief motivational interviewing plus relaxation condition. Previous research has found that engagement in enjoyable substance-free activities (e.g., watching movies, eating at restaurants, and hanging with friends or family) is associated with decreased substance use and increased motivation to change substance use behavior among college student populations (Murphy et al., 2007). While we did not study actual engagement or participation in activities, our results do suggest that tailoring these approaches by increasing the importance of culturally and developmentally appropriate reinforcers may prove to be a useful approach to reducing substance use in Indigenous youth.

Limitations and Future Directions

Although this study had several strengths, including a difficult to reach population of Indigenous youth, measure development, and direct prevention implications), our findings should be interpreted within the context of the study's limitations. First, data were collected from one cultural group of reserve-dwelling First Nation adolescents in Eastern Canada, and thus the results may not be applicable to other bands in other geographic regions, to other Indigenous groups, or to First Nation adolescents who live off-reserves. Additionally, given the nature of self-report data, especially when being asked to report on such a potentially sensitive topic as substance use involvement, it may be that participants misreported their actual engagement in behaviors. Due to the cross-sectional nature of these data, we cannot be certain of the temporality of the observed associations, and we did not measure actual engagement in CLRs. For instance, it is possible that adolescents perceive specific cultural activities or relationships as important and available, but do not engage in them for reasons other than lack of availability (e.g. conflicts in scheduling). Future research should examine the relationships between CLRs in a larger sample and from a longitudinal perspective and/or possibly make use of ecological momentary assessment to better understand mechanisms linking factors to substance use. It will also be important for future work to include assessment of engagement with reinforcers in addition to their importance and availability to ascertain a more complete picture of their role, as previous research has demonstrated that intensity of participation in alternative reinforcing activities is protective against substance use (Andrabi et al., 2017; Bartko & Eccles, 2003). Further, because these data were collected through self-report versus interview format, it is possible that participants interpreted questions differently than they were intended. For instance, it is possible that "importance" could have been interpreted as something that is necessary and expected (e.g., "it is important to brush my teeth), rather than values (as we intended it; e.g., "it is important to me to spend time with my family).

Conclusions

In conclusion, our findings highlight the potential impact of increasing the importance placed on each of these areas (i.e., culture, social, extracurricular activities) in prevention and treatment for NAI adolescent substance use, with perhaps a particular focus on older

adolescents. Further, it is of utmost importance to incorporate important cultural activities and to include trusted supportive people in interventions targeting NAI youth substance use. Prevention approaches for adolescents should make efforts to decrease access to substances and increase access to and importance/value of enjoyable substance-free alternatives, such as the ones we included here.

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Public Policy Relevance Statement:

It is of utmost importance to incorporate important cultural activities and to include trusted supportive people in interventions targeting NAI youth substance use. Prevention approaches for adolescents should make efforts to decrease access to substances and increase access to and importance/value of enjoyable substance-free cultural, social, and extracurricular alternatives.

Table 1

Summary of reinforcers assessed

Item	Importance *M* (*SD*)	Availability *n* (%)
Cultural Reinforcers		
Having powwows in the community?	3.48 (0.81)	97 (91.5%)
Learning about your culture?	3.42 (0.95)	85 (80.2%)
Having classes to learn how to make baskets, dream catchers, bead work?	3.10 (1.18)	70 (66.0%)
Having sweats available?	3.24 (1.00)	83 (78.3%)
Having talking circles?	3.18 (1.08)	78 (73.6%)
Social Reinforcers		
A role model available to you? (i.e., someone you can look up to)	3.05 (1.12)	85 (80.2%)
An adult at school who is concerned about your well-being? (i.e., guidance counselor, teacher, principal, etc)	3.10 (1.16)	83 (78.3%)
Adults who encourage you to succeed?	3.28 (1.05)	92 (86.8%)
Friends who live on the reserve?	3.28 (1.01)	94 (88.7%)
Friends who live off the reserve?	3.13 (1.07)	89 (84.0%)
Friends who do not use alcohol or drugs?	3.25 (1.10)	84 (79.2%)
Family activities available to participate on your reservation?	3.06 (1.16)	74 (69.8%)
A good relationship with your mom?	3.43 (1.01)	92 (86.8%)
A good relationship with your dad?	3.21 (1.15)	80 (75.5%)
A good relationship with your siblings?	3.46 (0.93)	93 (87.7%)
A good relationship with your cousins?	3.37 (0.97)	88 (83.0%)
A good relationship with your friends at school?	3.47 (0.82)	92 (86.8%)
A good relationship with your friends on the reserve?	3.45 (0.89)	97 (91.5%)
A good relationship with your aunts and uncles?	3.40 (0.95)	92 (86.8%)
A good relationship with your grandparents?	3.61 (0.73)	94 (88.7%)
Extracurricular Activities		
Volunteer opportunities (i.e., offering to help someone for free)	2.85 (1.10)	83 (78.3%)
Organized sports available to participate in? (i.e., sports that have a coach, with regular practices)	2.90 (1.22)	69 (65.1%)
Organized school activities? (i.e., activities such as clubs at school, yearbook club)	2.56 (1.31)	67 (63.2%)
Fun activities available to you?	3.18 (1.07)	83 (78.3%)

Note: Importance and product term are on a 0–4 scale, Availability represents percentage of the sample endorsing that reinforcer as available

Table 2.

Bivariate and Point-Biserial Correlations Among Variables of Interest.

		1	2	3	4	5	6	7	8	9	10	11
1.	Age	-										
2.	Gender	.02	-									
3.	Past month marijuana use	.49***	−.04	-								
4.	Past 3-month drinking	.55***	.08	.58***	-							
5.	Past 3-month drinking to get drunk	.56***	.09	.52***	.90***	-						
6.	Cultural reinforcers – Importance	−.16	.17	−28**	−.25*	−.27**	-					
7.	Cultural reinforcers – Availability	−.002	−.07	−.07	−.02	−.02	.17	-				
8.	Social reinforcers – Importance	−.10	.12	−.20*	−.20*	−.23*	.73***	.16	-			
9.	Social reinforcers – Availability	−.24*	−.002	−.30**	−.14	−.19	.51***	.29**	.58***	-		
10.	Extracurricular activities - Importance	−.25*	.07	−.40**	−.38***	−.41***	.69***	.18	.70***	.58***	-	
11.	Extracurricular activities - Availability	−.22*	.01	−.31**	−.18	−.24*	.40***	.35***	.33**	.40***	.54***	-

Note: Availability of CLRs reflects the proportion of reinforcers in each category that participants endorsed as available to them

* $p<.05$

** $p<.01$

*** $p<.001$

Table 3.

Multivariate Logistic Regression Examining the Effects of Competing Reinforcers on Substance Use Behaviors

	b	SE	*p*	OR	95% CI
Cultural Reinforcers					
Model 1: Past Month Marijuana Use					
Intercept					
Age	**.58**	**.14**	**<.001**	**1.78**	**[1.36, 2.32]**
Gender	−.03	.52	.96	0.97	[0.35, 2.69]
Importance of Cultural Reinforcers	−.12	.06	.05	0.88	[0.78, 1.00]
Availability of Cultural Reinforcers	−.16	.94	.86	0.85	[0.13, 5.40]
Model 2: Past 3 Month Drinking					
Intercept					
Age	**.65**	**.14**	**<.001**	**1.92**	**[1.46, 2.52]**
Gender	−.61	.54	.26	0.55	[0.19, 1.57]
Importance of Cultural Reinforcers	−.13	.07	.07	0.88	[0.77, 1.01]
Availability of Cultural Reinforcers	.03	.95	.97	1.03	[0.16, 6.68]
Model 3: Past 3 Month Drinking to Get Drunk					
Intercept					
Age	**.70**	**.15**	**<.001**	**2.02**	**[1.49, 2.72]**
Gender	−.81	.58	.16	0.44	[0.14, 1.39]
Importance of Cultural Reinforcers	**−.16**	**.08**	**.03**	**0.85**	**[0.73, 0.98]**
Availability of Cultural Reinforcers	−.06	.98	.95	0.94	[0.14, 6.44]
Social Reinforcers					
Model 1: Past Month Marijuana Use					
Intercept					
Age	**.55**	**.14**	**<.001**	**1.73**	**[1.33, 2.26]**
Gender	.17	.50	.73	1.19	[0.44, 3.19]
Importance of Social Reinforcers	−.02	.03	.57	0.99	[0.93, 1.04]
Availability of Social Reinforcers	−1.89	1.79	.29	0.15	[0.01, 4.99]
Model 2: Past 3 Month Drinking					
Intercept					
Age	**.70**	**.15**	**<.001**	**2.02**	**[1.51, 2.70]**
Gender	−.52	.52	.32	0.60	[0.21, 1.67]
Importance of Social Reinforcers	**−.06**	**.03**	**.03**	**0.94**	**[0.89, 0.995]**
Model 3: Past 3 Month Drinking to Get Drunk					
Intercept					
Age	**.74**	**.16**	**<.001**	**2.09**	**[1.53, 2.86]**
Gender	−.67	.56	.23	0.51	[0.17, 1.52]
Importance of Social Reinforcers	**−.07**	**.03**	**.02**	**0.94**	**[0.88, 0.99]**

	b	SE	*p*	OR	95% CI
Availability of Social Reinforcers	.95	1.63	.56	2.59	[0.11, 63.64]
Extracurricular Activities					
Model 1: Past Month Marijuana Use					
Intercept					
Age	**.54**	**.14**	**<.001**	**1.72**	**[1.31, 2.25]**
Gender	.13	.51	.81	1.13	[0.41, 3.10]
Importance of Extracurricular Activities	**−.18**	**.08**	**.03**	**0.84**	**[0.72, 0.98]**
Availability of Extracurricular Activities	−.61	.99	.54	0.54	[0.08, 3.77]
Model 2: Past 3 Month Drinking					
Intercept					
Age	**.64**	**.15**	**<.001**	**1.90**	**[1.42, 2.54]**
Gender	−.56	.53	.29	0.57	[0.20, 1.62]
Importance of Extracurricular Activities	**−.27**	**.09**	**.004**	**0.77**	**[0.64, 0.92]**
Availability of Extracurricular Activities	.96	1.07	.37	2.61	[0.32, 21.21]
Model 3: Past 3 Month Drinking to Get Drunk					
Intercept					
Age	**.68**	**.16**	**<.001**	**1.98**	**[1.45, 2.70]**
Gender	−.68	.56	.23	0.51	0.17, 1.53]
Importance of Extracurricular Activities	**−.27**	**.10**	**.005**	**0.76**	**[0.63, 0.92]**
Availability of Extracurricular Activities	.15	1.09	.89	1.17	[0.14, 9.87]
All Reinforcers					
Model 1: Past Month Marijuana Use					
Intercept					
Age	**.56**	**.14**	**<.001**	**1.74**	**[1.32, 2.30]**
Gender	.10	.53	.85	1.11	[0.39, 3.15]
Importance of Cultural Reinforcers	−.08	.09	.39	0.92	[0.77, 1.11]
Importance of Social Reinforcers	.05	.04	.21	1.05	[0.97, 1.15]
Importance of Extracurricular Activities	**−.26**	**.12**	**.03**	**0.77**	**[0.62, 0.97]**
Model 2: Past 3 Month Drinking					
Intercept					
Age	**.63**	**.15**	**<.001**	**1.87**	**[1.41, 2.49]**
Gender	−.48	.55	.38	0.6	[0.21, 1.81]
Importance of Cultural Reinforcers	−.02	.10	.83	0.98	[0.81, 1.18]
Importance of Social Reinforcers	.02	.04	.70	1.02	[0.94, 1.10]
Importance of Extracurricular Activities	**−.25**	**.12**	**.04**	**0.78**	**[0.62, 0.98]**
Model 3: Past 3 Month Drinking to Get Drunk					
Intercept					
Age	**.69**	**.16**	**<.001**	**2.00**	**[1.46, 2.74]**
Gender	−.72	.60	.23	0.49	[0.15, 1.58]
Importance of Cultural Reinforcers	−.04	.10	.68	0.96	[0.79, 1.17]

	b	SE	*p*	OR	95% CI
Importance of Social Reinforcers	.01	.04	.90	1.01	[0.92, 1.09]
Importance of Extracurricular Activities	**−.25**	**.12**	**.04**	**0.78**	**[0.62, 0.99]**

Note: bolded typeface indicates significance at $p < .05$