

DISSERTATION

**IS A LIFE SKILLS TRAINING INFUSION AN EFFECTIVE STRATEGY TO REDUCE
SUBSTANCE USE AMONG AT-RISK TEENS IN A MENTORING PROGRAM?**

Submitted by

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ABSTRACT

IS A LIFE SKILLS TRAINING INFUSION AN EFFECTIVE STRATEGY TO REDUCE SUBSTANCE USE AMONG AT-RISK TEENS IN A MENTORING PROGRAM?

Adolescent substance use is a challenge that has myriad detrimental consequences for the individual, school systems, and society. Before graduating from high school, 70% of high school students have consumed alcohol (Johnston, O’Malley, Bachman, & Schulenberg, 2009) and 40% have tried marijuana (Johnston et al., 2009). There is a critical need to address this issue using novel evidence-based interventions that are adaptable to a school or community’s needs.

Interventions focusing improving adolescent skills and providing a pro-social adult may help adolescents overcome some of the factors that put them at risk for substance use. For the current project, I designed, implemented, and evaluated an infusion-model type intervention, where two evidence-based programs for substance use reduction among at-risk teens were innovatively combined and executed. Specifically, Life Skills Training (LST; Botvin, Eng, & Williams, 1980), a skills-based program that traditionally has been delivered in a school classroom setting, was adapted and infused into Campus Connections (CC), a youth mentorship program at Colorado State University that matches university students with an at-risk youth from the community. Participants included 166 11-18 year olds enrolled in CC (85 in the LST infusion group, 81 in the comparsion group). Facilitators were trained to deliver age-appropriate 20-minute LST lessons each evening during CC, and the college student mentors were trained to practice skills and behaviors as well as have conversations with the participants about each topic during the rest of the CC evening. After a successful implementation, the evaluation unexpectedly did not show significant results. Participants in the LST infusion group did not

have increased social skills, personal self-management skills, or drug resistance skills, nor did they have lower levels of substance use, substance use intentions, or self-reported delinquent behavior. A secondary evaluation of the LST-infusion treatment group only did not show that mentor fidelity to the program infusion improved outcomes. Practical implications for prevention and limitations of the current study are discussed.

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CHAPTER I: INTRODUCTION

Adolescent alcohol and drug use is a major public health concern. Upwards of 70% of high school students have consumed alcohol by grade 12 (Johnston, O’Malley, Bachman, & Schulenberg, 2009), 20% have participated in binge drinking in the past month (Youth Risk Behavior Surveillance System [YRBSS], 2011a), and 40% have tried marijuana (Johnston et al., 2009). All adolescents are at some risk for substance use, but certain factors put young people at even higher risk. In particular, risk factors for adolescent substance use include lack of a prosocial adult mentor (National Institute on Drug Abuse [NIDA], 2003), past exposure to substance use within the family context (Hawkins, Catalano, & Miller, 1992), and lack of parental monitoring (Clark, Shamblen, Ringwalt, & Hanly, 2012). These risk factors make adolescents more vulnerable to substance use, but also to a host of other problem behaviors, including juvenile delinquency, school dropout, risky sexual behavior and more (NIDA, 2003). Using alcohol and other substances subsequently increases one’s level of risk in participating in problem behaviors in the short- and long-term future. For instance, in the short term, adolescents that use substances may be more likely to engage in truancy (Henry, 2010) and risky sexual behavior (Crockett, Raffaelli, & Shen, 2006). In the long-term, adolescents who initiated use of substances at an early age (i.e., 14 or younger) are at a higher risk to be diagnosed with a DSM-IV alcohol dependence or alcohol abuse disorder (Dawson, Goldstein, Chou, Ruan, & Grant, 2008). The compounding problems of at-risk youths make early prevention of substance use essential in order for these youths to reach their full potential and overcome life challenges. Therefore, there is a critical need to identify effective mechanisms to prevent substance use among at-risk youths.

Many evidence-based programs for adolescent substance use prevention have been rigorously tested and deemed effective. Blueprints for Prevention at the University of Colorado (2014) has identified ten model programs as of January 2014 to prevent substance use and other problem behaviors. These programs include Functional Family Therapy (FFT; Sexton & Alexander, 2003), Project Toward No Drug Abuse (Project TND; Sussman, Dent, & Stacy, 2002), and Promoting Alternative Thinking Strategies (PATHS; Greenberg, Kusche, Cook, & Quamma, 1995), amongst others. One of these model programs is the Life Skills Training Program (LST; Botvin, Eng, & Williams, 1980; Botvin, Griffin, & Nichols, 2006). LST has also been deemed as *Top Tier* by the Coalition for Evidence-Based Policy and *Effective* by the Office of Juvenile Justice and Delinquency Prevention Model Programs Guide and the Office of Justice Programs. LST was the only substance-use prevention program (of 474 listed) to be given the highest rankings by each organization.

LST, like many adolescent substance use prevention programs, was designed to be delivered in a specific venue (e.g., schools) and in a very specific manner. LST is a universal program, designed to reach a broad range of adolescents and is typically delivered to an entire student body. As an increasingly large emphasis is placed on demonstrating academic proficiency via standardized tests, it is becoming increasingly difficult for schools to commit to the delivery of many school programs such as art, music, and theater (National Council of Teachers of English [NCTE], 2014), and thus one might suppose that delivery of prevention interventions during the school day has been impacted, as well. Many schools must overcome barriers such as inadequate funds, lack of leadership, and a lack of time to devote to prevention initiatives (e.g., Greenberg, Domitrovich, Graczyk, & Zins, 2004; Hallfors, Pankratz, & Hartman, 2007). In order to reach specific adolescent populations such as at-risk youths or

youths disengaged from school, and to increase the likelihood that these youths are exposed to these evidence-based programs, it is important to consider other venues where these evidence-based programs can be delivered. However, before prevention scientists can be sure that these evidence-based programs produce similar positive effects in alternative venues, research is necessary to study the adoption, delivery, and impacts of these programs in new settings. This is an important and essential task, given the rates of adolescent substance use and the Healthy People Initiative's designation of positive adolescent development for prevention of risky behavior as one of the emerging issues in health for adolescents (Healthy People, 2010).

The current study was designed to evaluate the effectiveness of a novel and innovative delivery mechanism of an evidence-based prevention program to reduce substance use in at-risk youths. In this study, I examined the efficacy of infusing the Life Skills Training Program into Campus Connections. Campus Connections is an evidence-based mentoring program for at-risk adolescents in Northern Colorado. It takes place on the Colorado State University Campus every semester. During Campus Connections, at-risk adolescents from the community are matched for 12 weeks with a trained and supervised undergraduate student mentor. For four hours, one night per week, the mentor and mentee spend time together – providing an opportunity for the mentee to receive one-on-one attention from a pro-social adult. The Campus Connections venue is ideal for infusing LST because it allows for the delivery of formal LST-lessons (briefly delivered) as well as infused coaching and feedback of skills learned in LST (within the mentor-mentee pairs) during the Campus Connections evening. The primary aim of this project was to reduce substance use in at-risk adolescents by integrating the principles deemed to be effective in LST into the mentoring curriculum in both standardized and spontaneous ways. The results of this

study have the potential to offer important implications for new ways to prevent and/or reduce substance use among a vulnerable population of adolescents.

The next sections of the proposal are arranged as follows. First, I present epidemiological data on adolescent substance use, with a focus on high-risk youths. I then discuss adolescent substance use outcomes and trajectories, as well as predictors and risk factors for substance use in adolescents. Following, I review the critical need for novel interventions, and discuss current prevention frameworks and theories. I provide details on the effectiveness of LST examined over a period of 30 years, as well as literature on the effectiveness of mentoring initiatives. I discuss previous studies that utilize infusion models, and make a case for why an infusion model may be appropriate in this context. Finally, I give a rationale for the current research and an overview of this study.

Adolescent Substance Use: An Epidemiological Approach

Recent epidemiological data provides evidence that there is widespread use of alcohol and other illicit drugs such as marijuana, cocaine, inhalants, and methamphetamine among our nation's adolescents. Over the course of the past ten years, adolescent alcohol use has declined or remained constant, but is still quite common. Upwards of 38% of adolescents in 9th through 12th grade report that they have had at least one drink in the past 30 days, and over 20% report having five or more drinks in a row within the past 30 days (YRBSS, 2011a). Shockingly, 72% of high school students will consume alcohol at some point prior to their graduation from high school (Johnston et al., 2009). Since more than 90% of the alcohol that underage individuals drink is consumed by binge drinking (Office of Juvenile Justice and Delinquency Prevention, 2005), one can see that adolescent alcohol use is a major risk and public health concern and must

be addressed early in order to prevent future substance abuse, as well as the deleterious effects of substance use.

Aside from alcohol use, most other substance use among adolescents has remained considerably steady over the past ten years or has only had slight increases. Currently, almost 40% of adolescents have reported ever using marijuana in their lifetime, and 23% have reported using marijuana in the past 30 days (Johnston et al., 2009). Data from Monitoring the Future (Johnston et al., 2009) indicate that since 2006, marijuana use has been on the rise. Additionally, almost 7% of adolescents report having tried cocaine and almost 4% report having tried methamphetamines (YRBSS, 2011b), and these rates have remained consistent over time. Alcohol remains the most commonly abused substance among adolescents in the United States (CDC, 2012a), but one can see that the nation's rates of other drug abuse among adolescents are concerning. The long-term health risks and costs to the country demonstrate an essential need for treatment and prevention of this issue in an adolescent population.

In Colorado, a state with a reputation of being one of the healthiest in the country, the rates of adolescent alcohol and drug abuse are equally worrisome. Recent data released from the Substance Abuse and Mental Health Services Administration (SAMHSA, 2012) indicate that alcohol, marijuana, and other illegal drug use among young adults ages 18-25 in Colorado is among the highest in the country. Specifically, 61.6% of young adults in the United States drank at least once in the last month, while 69% of young adults in Colorado report the same behavior. There is a similar pattern for marijuana use, with 18.9% of young adults in the United States having reported smoking marijuana at least one time in the past month, while the number jumps to 26.4% of young adults in Colorado. Rates of substance abuse treatment in Colorado are

astonishingly high for young people, with 30% of individuals admitted for treatment being under the age of 24 (Compass of Larimer County, 2011b).

Substance use in at-risk youths. While the rates of adolescent substance use in the United States and Colorado are concerning, at-risk young people, such as adolescents involved in the juvenile justice system, youths vulnerable to school dropout, and youths who do not have a pro-social adult in their lives, are disproportionately affected by this issue. For instance, the National Survey on Drug Use and Health reports that adolescents ages 12 to 17 who had been in a jail or detention center at least once in their lifetime had almost a three times higher rate of substance abuse in the past year (SAMHSA, 2004). Adolescents who do not have parents or guardians consistently monitoring their behaviors have higher rates of alcohol and drug use than adolescents with pro-social adults involved in their lives (Fosco, Stormshak, Dishion, & Winter, 2012).

Importantly, while poverty was not a significant predictor of alcohol or other substance use, a comprehensive study of adolescents who grew up in low-income families (Office of the Assistant Secretary for Planning and Evaluation [ASPE], 2009) showed that these adolescents were significantly more likely to be involved in a trajectory of risky and delinquent behaviors. Approximately 59% of youths in low-income families have sex by age 16, compared to 48% in middle-income families and 39% in high-income families. Twelve percent reported being in a gang, compared with 7% and 5% respectively, and only 44% reported being connected to school or work in young adulthood, versus 67% and 75%, respectively.

Short and Long Term Consequences of Adolescent Substance Use

While rates of alcohol and other substance use in adolescents are worrisome, the potential life-long impacts of early substance use initiation are even more problematic. Behavioral

patterns developed during childhood and adolescence can determine one's trajectory of positive or negative experiences over a lifetime, including one's health status and risk for future negative health outcomes. In this way, adolescent drug and alcohol use is a continually growing public health concern of critical importance.

Early onset of use emerges as a salient predictor of continued problematic use. The results of many studies indicate that adolescent drug and alcohol use predicts a higher rate of drug and alcohol use in adulthood, as well as other future negative health and behavioral outcomes (CDC, 2012a). There is ample evidence to suggest that adolescents who start drinking and using substances at an early age are at heightened risk for life long substance abuse problems. For example, Dawson et al. (2008) reported that 9% of individuals who began to drink prior to age 15 qualified for a DSM-IV alcohol dependence disorder and 15.4% qualified for a DSM-IV alcohol abuse disorder in adulthood while only 4.5% of adolescents who did not begin to drink until after age 18 reported DSM-IV alcohol dependence, and 6.9% reported DSM-IV alcohol abuse. Similar findings have been reported for minority populations. For example, based on data from one longitudinal study of American Indian adolescents, Henry et al. (2011) demonstrated that the earlier adolescents began to use alcohol (i.e., age 14 or prior), the more likely they were to experience heavy alcohol use in later adolescence and have an alcohol disorder in adulthood. Results of additional studies provide evidence that early onset of marijuana use is predictive of later problem-related marijuana use and other illicit drug use (e.g., Ellickson, Tucker, Klein, & Saner, 2004; Odgers et al., 2008). Thus, since early experimentation is such a robust predictor of future substance use, early prevention is key in lowering the likelihood of future problematic substance use for adolescents.

Not only is younger age of one's first drink a significant predictor of future problematic drinking trajectories, adolescent drug and alcohol use is highly correlated with other problem behaviors and outcomes. For example, adolescent substance use is linked with poor academic outcomes, such as higher absence rates and poor grades (Centers for Disease Control [CDC], 2012a) as well as a higher likelihood of being suspended, expelled, or dropping out of school (Brook, Adams, Balka, & Johnson, 2002). Drug use is a salient predictor of truancy (Henry, 2006), which in itself poses a problem as pressure to use substances may increase as a result of unsupervised time with other delinquent peers (Osgood & Anderson, 2004). Importantly, poor school achievement may subsequently lead to low-paying jobs, poverty, and other lifelong challenges.

Adolescent users are also at higher risk for negative health outcomes such as suicide or attempted suicide and risky sexual behavior (CDC, 2012a). Substance and alcohol use in adolescents are consistently identified as risk factors for suicidal thoughts and behaviors, (e.g., Dawson, Mathias, Richard, Hill-Kapturczak, & Dougherty, 2008; Goldston, 2004) and in one study the risk for suicidal behaviors was 2.5 times higher in adolescent substance users than non-users (SAMHSA, 2002). The results of many studies establish a link between substance use and risky sex during adolescence. The direct pathway between a lack of self-regulatory behavior in early adolescence (i.e., substance use) and later sexual risk behavior was established by Crockett, Raffaelli, & Shen (2006). Tapert, Aarons, Sedlar, and Brown (2001) reported that consistent or recurring substance use in youth leads to an increased risk of high levels of risky sexual behaviors. The link between substance use and risky sex during adolescence is problematic; when the two co-occur, one opens doors to unwanted pregnancy, STDs, and a heightened risk for HIV exposure.

Finally, alcohol and other substance use is strongly associated with violence and may be a trigger for aggressive or illegal behavior (Haggard-Grann, Hallqvist, Langstrom, & Moller, 2005). There is sufficient evidence that the association between substance use and aggressive or violent behaviors is reciprocal; that is, early onset of substance use predicts future violence, and continued violence predicts future substance use (White, Loeber, Stouthamer-Loeber, & Farrington, 1999). Substance use is a salient predictor of violence as early as ages 6-11 (Hawkins, Herrenkohl, Farrington, Brewer, Catalano, Harachi, & Cothorn, 2000), which suggests the need to intervene at an early age. Additionally, adolescents who use drugs are more likely to be arrested and experience recidivism (Stoolmiller & Blechman, 2005). Thus, early prevention of substance use may serve to also prevent violent or aggressive behavior and involvement in the juvenile justice system.

Overall, the negative impact that substance use has on an adolescent's life trajectory demonstrates the critical need for early intervention. Potential negative life outcomes such as school dropout, STDs, arrest, or suicide could be avoided if substance use is prevented or reduced. Many underlying risk and protective factors for substance use (for example, self-regulatory behavior; Crocket et al., 2006) may also affect one's likelihood of participating in delinquent or risky behaviors. Successful efforts to prevent and reduce substance use during adolescence may have myriad benefits in the short- and long-term for the individual, the family, and society at large.

Risk and Protective Factors for Adolescent Substance Use

Many effective prevention programs utilize a risk and protective framework both for explaining why adolescents become involved in substance use and for the design of the program. Models such as the social development model (Hawkins, 1985; Catalano, Kosterman, Hawkins,

&, 1998) predict that substance use can be prevented in adolescents by targeting multiple facets of an adolescent's social development, including schools, family, peer groups, and communities. Thus, one must first understand the risk and protective factors in each of these domains in order to advance prevention efforts.

Social and environmental influences as well as individuals' skills and personal characteristics explain a large proportion of variance in adolescents' behavioral outcomes (Griffin, Botvin, Scheier, Doyle, & Williams, 2003). Social influences (non-exclusively) include perceptions of others' delinquent behavior, environmental influences include neighborhood risk factors and violence in the media, individual skills include decision-making skills and assertiveness, and personal characteristics include self-esteem and anxiety (Ellickson et al., 2004). In one study, social and environmental influences explained up to 31% of the variance in aggression, 26% of the variance in delinquency, and over 20% of the variance in both smoking and alcohol use (Griffin et al., 2003).

Importantly, research supports that an individual's skills in both social and personal situations are essential risk factors for substance use and substance use initiation. Considering the relationship between substance use and self-management skills, adolescents who have high levels of these skills have a lesser increase in substance use in future years than adolescents who have low levels of self-management (Lowe, Acevedo, Griffin, & Botvin, 2013). Social skills such as assertiveness play a role in predicting drug use as well (Griffin, Nichols, Birnbaum, & Botvin, 2006), with more assertive adolescents better able to resist substance use. It has also been demonstrated that media resistance skills are negatively associated with alcohol use in youth (Epstein & Botvin, 2008), and this effect holds true for two years. One study found that overall, competence skills (including decision making, resisting media, and refusal skills for

substance use) predict alcohol use as well as future drinking behaviors in inner-city adolescents (Epstein, Zhou, Bang, & Botvin, 2007). Other studies also indicate that drug refusal skills predict one's drug and alcohol use (Epstein, Bang, & Botvin, 2007; Epstein & Botvin, 2008), and that teaching appropriate refusal skills is essential for adolescents to make the decision not to use substances (Wright, Nichols, Graber, Brooks-Gunn, & Botvin, 2004).

Behavioral factors and personal characteristics also significantly contribute to one's likelihood of participating in substance use as an adolescent. For example, behavioral factors such as academic achievement can serve both as a risk (e.g., identifying as an underachiever; Ellickson et al., 2004; Henry, Knight, & Thornberry, 2012; Wheeler, 2010) or protective (e.g., engaging in school bonding; Henry, Stanley, Edwards, Harkabis, & Chapin, 2010) factor in regards to youth substance use. Behaviors such as skipping school or class have a reciprocal association with substance use (Osgood & Anderson, 2004), with truancy acting as a risk factor for current and future use (Hallfors, Vevea, Iritani, Cho, Khatapoush, & Saxe, 2002; Henry & Huizinga, 2007). Not only is poor academic performance a predictor of substance use onset, but a decline in academic performance over time also predicts an individual's likelihood of beginning to use substances such as marijuana (Henry, Smith, & Caldwell, 2006). However, behavioral skills explain a high proportion of variance in aggression, delinquency, and substance use (18%, 16%, and 7%, respectively), thus suggesting an important point of intervention within behavioral factors for reducing adolescent problem behaviors (Griffin et al., 2003).

Family characteristics can predict an adolescent's likelihood of using alcohol and other substances as well. Ineffective parenting, a lack of a substantial, pro-social relationship with a trusted and caring adult, and having an abusive caregiver are all predictors of future problem behaviors in adolescents (NIDA, 2003). Parental attitudes toward alcohol use have been

demonstrated to be a strong predictor of alcohol use in adolescents, with lower levels of disapproval or decreasing levels of disapproval over time increasing an adolescent's likelihood of heavy drinking (Martino, Ellickson, & McCaffrey, 2009). Additionally, parental and sibling use of alcohol and other substances is associated both with earlier onset and higher frequency of use by adolescents (Hawkins et al., 1992).

Importantly, in at-risk populations, a lack of parental monitoring (i.e., when parents or caregivers do not know the whereabouts of their child and whom they are with, or when they do not effectively communicate this to their children) predicts increased substance use, and this effect remains constant over time (Clark et al., 2012; Shillington, Lehman, Clapp, Hovell, Sipan, & Blumberg, 2005). Parental monitoring has consistently been found to have a negative association with substance use in many adolescent populations (e.g., Lac & Crano, 2009; Martins, Storr, Alexandre, & Chilcoat, 2008). This is of concern for many at-risk adolescents, because a one-parent household is often considered to be one characteristic of a youth labeled "at-risk." Single parents or guardians may have a more challenging time monitoring the whereabouts of their children compared with multiple-parent households. For example, Han and Waldfogel (2007) found that adolescents with single mothers working multiple shifts have an increased likelihood of engaging in risky behavior such as substance use and delinquency due to lack of parental monitoring in this situation.

In sum, understanding predictors of problematic behavior in adolescents and specifically in at-risk youths is essential for determining how interventions will be effective. Intervention frameworks should include multiple predictors and risk-factors in order to effectively reduce or prevent substance use in adolescents (NIDA, 2003). Thus, there is a pressing need for innovative

ways to utilize this information to create and test effective substance use interventions for specific target groups.

Prevention Program Frameworks and the Critical Need for Novel and Effective Interventions

The Healthy People Initiative identifies positive youth development interventions for preventing risky behavior as one of its emerging issues in adolescent health (Healthy People, 2010). This demonstrates the need to focus on this problem and rigorously evaluate existing drug and alcohol use interventions. Myriad creative and evidence-based programs have been implemented and evaluated in an attempt to effectively reduce drug and alcohol use within an adolescent population. Programs specifically for at-risk youths must be tailored to this population in order to achieve optimal results (Griffin & Botvin, 2010). Unfortunately, many current prevention-programs do not specifically target at-risk youths (Stagman, Schwarz, & Powers, 2011).

The findings from multiple meta-analyses (e.g., Tobler, Roona, Ochsborn, Marshall, Streke, & Stackpole, 2000) and data from the SAMHSA National Registry of Evidence Based Programs and Policies (SAMHSA, 2013) indicate that there are effective core components and delivery methods/mechanisms for substance use reduction in adolescents. Programs that follow frameworks or models of adolescent substance use prevention (e.g., the social development model; Hawkins, 1985; Catalano et al., 1998) and are theoretically driven and empirically tested are more likely to succeed. The following section details the current evidence on prevention frameworks for effective modes of delivery, mechanisms for delivery, and program components.

Modes of delivery: Schools, families, and communities. Schools offer a primary opportunity to develop, deliver, and evaluate evidence-based programs given the wide access to

all types of students, at-risk or not. Programs in schools can be effective if they do not utilize straight lecture-based approaches or fear techniques (Griffin & Botvin, 2010). Present approaches to the delivery of substance use prevention programs in schools include programs that focus on risk and protective factors as well as skill building (Griffin & Botvin, 2010). Many school-based programs, such as LST, are delivered in classroom settings with teachers as the primary facilitators. Importantly, interactive teaching strategies are more effective than traditional lecture teaching strategies (Tobler et al., 2000).

School-based interventions are typically effective in their ability to access to all youths; however, it could be assumed that young people that are disengaged from school may not benefit from a school-based substance use prevention program. Additionally, schools must overcome many barriers to successful implementation, including insufficient planning, inadequate leadership, lack of integration with the school curriculum, and unpreparedness to deliver the intervention effectively (Greenberg, et al., 2004). Thus, although many substance use prevention programs are initially meant to be delivered in a school setting (e.g., PATHS, LST), schools may not be the ideal setting for successfully reaching all youth.

Delivery of prevention programs can also occur in the family setting, with approaches focused on building parenting skills or improving family function and communication (Lochman & van den Steenhoven, 2002). Effective frameworks include the promotion of parenting skills, family functioning, and family bonding. However, for at-risk youths, a family-based prevention program may not be ideal. This is because one factor that qualifies a youth as being “at risk” is a lack of an adult role model (such as a parent) or lack of parental monitoring (Fosco et al., 2012). Thus, not all adolescents will have the opportunity to participate in a high quality family-based intervention.

A final setting for the implementation of substance use prevention programs is within the community. This can offer a multi-component approach. Effective community programs reach out to schools, families, policy, and local organizations in order to communicate with adolescents regarding substance use prevention (Griffin & Botvin, 2010). The benefits include messages being received by a wider audience of adolescents.

However, the resources needed to successfully implement a community-based approach are astronomical in comparison with resources needed to solely target schools or families (e.g., Blueprints for Prevention, 2014). Given the benefits and limitations of each delivery setting, an integrated contextual model may be more useful and influential in promoting pro-social behavior in adolescents (Kia-Keating, Dowdy, Morgan, & Noam, 2011). An integrated model allows for multiple contexts (e.g., schools, communities, and families) to together promote healthy development and prevent risky behavior by addressing risk and protective factors. Partnerships between these contexts will promote the combination of resources and thus increase the chances of fostering positive change. This model posits that all contexts must be addressed in order to overcome limitations and affect all target populations, such as at-risk youths. Thus, novel delivery mechanisms of current evidence-based programs may be warranted in order to provide a comprehensive prevention service that is affordable and feasible.

Essential components of successful interventions. There are multiple essential components of a successful adolescent substance use prevention program. Program frameworks can be designed to incorporate one or more components in order to effectively reduce substance use. Tobler and colleagues (2000) found that programs with skill building components were more effective than programs targeted to influence knowledge or change attitudes. Social resistance skills should be targeted, and participants should be taught to identify influences from

their peers and build skills to help resist both peer and media pressures (Botvin, 2000). Education regarding social norms is essential in order to correct misperceptions of peers' actual substance use (Botvin, Botvin, Baker, Dusenbury, & Goldberg, 1992). Finally, youths must build competence in the areas of problem-solving and decision-making, self-control, self-esteem, coping with anxiety, and cognitive skills (Botvin, 2000).

The findings from a meta-analysis suggest that programs with interactive components tend to be more effective than straight knowledge-based programs in preventing future drug and alcohol use among adolescents (Lilja, Wilhelmsen, Larsson, & Hamilton , 2003). Additionally, teaching these skills in an applied context is essential in order for participants to translate what they have learned to their everyday lives (Griffin & Botvin, 2010). Programs that combine multiple components, such as family-based programs focused on both parenting skills and family bonding, are more effective than programs with only one component (Griffin & Botvin, 2010).

The need for novel interventions. In a meta-analysis, Ennett, Ringwalt, Thorne, Rohrbach, Vincus, Simons-Rudolph, & Jones (2003) determined that while many program providers had implemented content (i.e., utilized the appropriate components) that was effective, delivery methods did not, the majority of the time, fall into the effective “interactive” category. Thus, while the research behind effective ways to prevent substance use among adolescents is comprehensive and available, many providers do not put this research into practice. Given that many schools do not use evidence-based programs or implement these evidence-based programs in an effective manner (Ennett et al., 2003; Griffin & Botvin, 2010), it is essential for programs to be designed in a feasible and innovative way to effectively reduce substance use. Additionally, given the specific challenges of at-risk youths and the demands for programs targeted specifically at this population, novel programs need to be designed to reach these

youths. Thus, programs should be designed not only utilizing current evidence and theory, but also with an innovative delivery approach to reach target populations.

Life Skills Training as an Evidence-Based Intervention

Program effectiveness. One rigorously evaluated, evidence-based program is Botvin's LifeSkills Training (LST; Botvin, Eng, & Williams, 1980; Botvin, Griffin, & Nichols, 2006). LST is a comprehensive approach to reduction of drug and alcohol use among youths, targeting individual, interpersonal, and environmental risks of problem behaviors. It has been rigorously tested over the course of over 30 years, and has been shown to be effective in reducing tobacco use by 87%, alcohol use by 60%, marijuana use by 75%, and methamphetamine use by 68% (Griffin, Botvin, & Nichols, 2006; Spoth, Clair, Shin, & Redmond, 2006; Griffin, Botvin, Nichols, & Doyle, 2003). The development and consistent evaluation processes of this program allow for it to be an incredibly reliable and often-used intervention for the prevention of youth substance use and delinquent behaviors.

Numerous studies have shown LST to be effective at reducing many adolescent problem behaviors, and the demonstrated treatment effects are typically sustained over time (e.g., Fraguera, Martin, & Trinanes, 2003). Additionally, the program has been tested and deemed effective for multiple cultural and ethnic groups and socio-economic classes, including inner-city youths (Botvin, Eptstin, Baker, Diaz, Ifill-Williams, Miller, & Cardwell, 1997), Hispanic youths (Botvin, Dusenbury, Baker, James-Ortiz, & Kerner, 1989), and middle-class youths (Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995). Many of the LST studies featured a randomized control trial design, comparing participants who receive the LST intervention to a control group of youths who do not receive the intervention. The findings from one study that followed a large cohort of middle-class white adolescents indicated that six years after interventions were

received, there were 44% less substance users and up to 66% fewer tobacco, alcohol, and marijuana abusers compared to control groups (Botvin et al., 1995). In another study of minority adolescents, young people who received the intervention reported significantly lower rates of smoking, drinking, being drunk, using marijuana, and using other substances such as inhalants compared to youths in the control group (Botvin, Griffin, Diaz, & Ifill-Williams, 2001). Dozens of additional studies have been conducted, most demonstrating the effectiveness of this program on substance use, substance use intentions, and long-term benefits (e.g., Griffin et al., 2003; Spoth, Randall, Trudeau, Shin, & Redmond, 2008; see Botvin, 2012 Life Skills Training website for a more complete list of disseminated research).

Additionally, LST has the potential to reduce other adolescent problem, risky, or delinquent behaviors beyond substance use. One study demonstrated its effectiveness in reducing adolescent risky driving, including number of citations and total “points” on one’s license (Griffin, Botvin, & Nichols, 2004). LST is also effective in reducing risky sexual behavior in adulthood, many years after receipt of the program (Griffin, Botvin, & Nichols, 2006), and violence among young people (Botvin, Griffin, & Nichols, 2006), including verbal and physical aggression.

Life Skills Training points of intervention. LST is designed around psychosocial theories of drug use and abuse, including Problem Behavior Theory (PBT; Jessor, 2006) and Social Learning Theory (SLT; Bandura, 1977). As previously discussed, the most effective school based programs are highly interactive (Ennett et al., 2003; Tobler et al., 2000) and target self-management or self-regulation skills, social skills, drug resistance skills, and correcting social norms (Botvin, 2000; Griffin & Botvin, 2010). LST focuses on each of these intervention points.

LST is designed to be flexible and adaptive to the youth's needs, but has typically been implemented in a health education course within a school setting. The curriculum for middle school students consists of 30 sessions, which are taught consecutively to first build personal self-management skills, general social skills, and then drug resistance skills. The general theory (Botvin, 2012) is that first, students develop and practice skills to help enhance their self-esteem, reduce anxiety and stress, as well as learn new problem-solving skills and skills to deal with anger management. After first learning about the self, students move on to develop interpersonal skills such as communication, relationship building, and developing non-violent problem solving techniques. Finally, students learn to effectively protect themselves from pressure to use alcohol, tobacco, and other substances. LST is skill-based and one main component that is stressed in the program is behavioral practice, coaching, and feedback from the trainer.

Aside from demonstrating effectiveness within classrooms over the past 30 years, there is also evidence to support the effectiveness of an infused or modified version of LST in preventing drug and alcohol use (Smith et al., 2004). As discussed below in detail, an infused version of the program may consist of LST lessons being integrated into other activities at the same time, given that the 45 minute lessons may be too time consuming or there may not be enough resources to deliver the program in its entirety. Effects from an infused approach lasted for two years to reduce smoking onset in adolescent females (Smith et al., 2004).

Mechanisms through which LST affects youth outcomes. As described by the LST curriculum (Botvin, 2012), this program is meant to positively influence youths' skill building through structured lessons and activities. Youths develop skills to help enhance self-esteem and reduce anxiety and stress and also learn problem-solving and anger management skills. Youths develop interpersonal skills such as communication, social skills, and non-violent problem

solving techniques. Youths also practice and develop drug resistance skills and skills to better understand media advertisements. The development of these skills will then lead to positive youth outcomes including increased academic achievement, decreased substance use and substance use intentions, and decreased delinquent behavior.

Aside from the extensive research on the effectiveness of the LST program, myriad evidence and longitudinal data support the idea that these skills mediate the relationship between treatment group and youth outcomes. High self-management skills (Lowe et al., 2013), assertiveness (Griffin et al., 2006), decision making skills (Epstein et al., 2007), and refusal skills (Epstein & Botvin, 2007) have all been linked to an adolescent's likelihood of using alcohol, nicotine, and other substances. Thus, these factors are targets for improvement within the LST curriculum.

Theoretical Framework Driving the Life Skills Training Program Framework

The Ecological Model. One theoretical model that is used in evidence-based interventions for adolescent drug and alcohol use (such as LST) is the ecological model (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 1998). This perspective elucidates the reciprocal interactions between individuals, families, neighborhoods, communities, and culture. Human behavior (and thus, health-related behavior such as drug and alcohol use) is affected by five environmental systems: the *Microsystem*, where an individual has direct interaction with other individuals and helps to construct the settings he or she is in; the *Mesosystem*, or the relationships and connections between microsystems—for example, the relationship between one's family and school; the *Exosystem*, or the relationship between an individual's immediate and indirect context; the *Macrosystem*, or the culture in which one lives; and finally the *Chronosystem*, which is the time and history-related events and transitions over one's life. The

ecological model stresses the interdependent relationship between these systems—for instance, between adolescents and their schools, their families, their neighborhoods, and their cultures.

Research utilizing the Ecological Model demonstrates that adolescents use drugs and alcohol for reasons that fall within personal factors, interpersonal factors, and environmental or social factors. For instance, one might be predisposed to drugs and alcohol through sensation-seeking personality traits, or have a positive attitude towards drugs and alcohol (personal factors). Peer pressure and social norms contribute to use on an interpersonal level. Additionally, environmental factors such as availability or lack of appropriate supervision also contribute to drug and alcohol use among adolescents (e.g., Oshri, Rogosch, Burnette, & Cicchetti, 2011). Therefore, in order for interventions to be successful, they should target the multiple factors of drug and alcohol use, rather than be a single-factor program.

The Ecological Model is present in the LST program framework. It is a key component to the structure of the intervention, given that adolescents first learn how to develop their own self-identity before moving on to develop skills necessary to build relationships with others and skills to adequately deal with life challenges that may present themselves (e.g., resisting pressure to use drugs or alcohol). The context of the individual, the interpersonal, the community, and society is used as a building block for the LST lessons and how the program is framed (Botvin, 2012).

Social Learning Theory. Social Learning Theory (SLT; Bandura, 1977) is a foundational theory of the LST program. SLT explains behavior as a result of three reciprocal factors: behavioral factors, such as skills, practice, and self-efficacy; cognitive (or personal) factors, such as knowledge, expectations, and attitudes; and environmental factors, such as social norms, access, and one's ability to influence others or change one's own environment. SLT also

consists of six key components that affect health behaviors: outcome expectancies (i.e., beliefs about the outcomes of behaviors and the value of these outcomes), observational learning (i.e., beliefs about behaviors acquired by observing others), behavioral capacity (i.e., the knowledge and skill set needed to participate in certain behaviors), self-efficacy (i.e., one's confidence in ability to participate or persist in a behavior), reciprocal determinism (i.e., behavior changes resulting from interactions between an individual and the environment), and finally reinforcement (i.e., outcomes of a behavior that increase or decrease the likelihood of that behavior's recurrence).

Life Skills Training utilizes SLT in order to target key components of adolescent drug and alcohol use. For instance, one essential component of LST is behavioral practice. In SLT, one must go beyond observational learning, which is when an individual's beliefs are based on observing others' behavior or observing the results of others' behavior, and actually practice the behaviors oneself, which is captured in the behavioral capacity and self-efficacy components of the theory. LST focuses on practicing all behavioral skills, from decision-making to communication to refusal skills, thus giving students the knowledge and skill set to effectively resist pressure to do drugs and alcohol.

Problem Behavior Theory. One final theory that guides intervention design is Problem Behavior Theory (PBT; Jessor, 2006). PBT indicates that psychosocial factors predict problematic drinking (and other substance use) behavior, and thus must be targeted for effective interventions. According to the theory, drinking is a functional behavior (e.g., it serves a specific purpose) and therefore the behavior is instrumental to attain one's own goals. Additionally, behavior is shaped by culture, social norms, and society's expectations. There are three systems that influence one's drinking behavior. The personality system consists of values, expectations,

and beliefs about the self and others; the perceived environment system consists of perceptions of the social contexts (e.g., whether one is more family- or friend-oriented), and finally the behavior system consists of our attitudes towards both problem behaviors (such as drug and alcohol use) and conventional behaviors (such as academic performance).

The influence of PBT on interventions is such that one can recognize the need to master coping skills in order to overcome problem behaviors. In adolescents, problem behaviors meet short-term functional needs, which are different for every individual. LST thus targets these needs by providing alternative solutions that have outcomes equal to or exceeding the outcomes provided by the problem behavior (Botvin, 2012).

Mentoring as an Evidence-Based Intervention

Mentoring, as defined by the Center for Disease Control (CDC) and prevention, is “the pairing of a young person with a volunteer who acts as a supportive, nonjudgmental role model” (2012b, pp. 163). Mentoring provides a pro-social adult to be present in a youth’s life, thus allowing for the presence of a protective factor that an adolescent may have been lacking. Mentoring programs are typically aimed at adolescents at risk for certain behavioral problems such as school underachievement, violence, aggression, and drug and alcohol use, as determined by risk factors such as learning disabilities, neighborhood safety, family factors, socio-economic status, or family history of drug and alcohol use (Rhodes, Reddy, & Grossman, 2005). One purpose of a mentoring program is to provide a pro-social adult match to an adolescent with one or more of these risk factors present in life, in order to reduce the likelihood of future participation in problem behavior. Mentors may positively influence adolescents’ peer relationships with other youth, given that they may learn more adept social skills such as problem negotiation and friendship building (Rhodes, Haight, & Briggs, 1999). Mentors may

also positively influence mentees' feelings of self-worth and provide a positive role model for adolescents, demonstrating that the best thing to do is to refrain from engaging in drug and alcohol use. Importantly, mentoring programs have been shown to have positive effects for at-risk youths, including young people who have been involved in the justice system (Greenwood, 2008).

Rhodes' (2005) and Rhodes & Lowe's (2008) framework for youth mentoring helps intervention program developers understand how mentoring works. For example, mutuality, trust, and empathy lead to higher quality mentor-mentee relationships, which in turn predict positive mentee outcomes, such as lower rates of risky health behaviors and drug and alcohol use. This reduction in negative behaviors (and increase in positive behaviors) is predicted through the mentors' direct effect on social-emotional development, cognitive development, and individual identity development. Thus, mentors can positively influence mentees' social skills and competence, decision-making skills, and sense of responsibility, for instance, which leads to future decreases in problem behaviors such as drug and alcohol use (Rhodes & Low, 2008; Rhodes, Reddy, & Grossman, 2005).

More specifically, Rhodes' (2005) model of adolescent mentoring details exact ways in which mentoring relationships positively affect the target group. On a social level, mentoring relationships allow for new experiences with new people and opportunities to have fun, along with the opportunity to learn to participate in pro-social activities. On an emotional level, a positive adult role model may allow for the development of a healthy relationship as well as an adult to give support to the mentee. Cognitively, youths will learn from their mentors through new experiences, guidance through decision making, and promotion of academic achievement or even tutoring through classes. Finally, individual identity development may occur given that a

mentor may be non-judgmental to youths' interests, mentees may identify with mentor interests, and mentees may receive positive feedback from their mentors.

Evidence overall supports the use of mentoring as an effective intervention for outcomes related to at-risk adolescents, including substance use, violence, and academic achievement. It has been demonstrated that the absence of a role model in at-risk youths' lives has been associated with negative outcomes such as academic underachievement, substance use, and risky behavior (Beier, Rosenfeld, Spitalny, Zansky, & Bontemp, 2000). Conversely, it has been demonstrated that the presence of a positive adult role model serves as a protective factor against these negative outcomes (CDC, 2012b). In a recent meta-analysis, DuBois, Portillo, Rhodes, Silverthorn, & Valentine (2011) concluded that mentoring was an effective intervention for improving youth outcomes across domains including academic achievement, substance use, violence, and risky behavior.

Knowing that evidence supports mentoring as an effective strategy for improving positive youth outcomes and preventing negative outcomes, the CDC (2012b) proposes best practices for mentoring interventions. The steps to effective mentoring interventions include: 1) Identifying the target population (which includes youths who demonstrate commitment, given that successful mentoring includes relationship development, which happens over time); 2) Considering the context of one's culture and/or demographic (mentors must be able to bridge gaps); 3) Selecting either community-based mentoring (i.e., the venue changes based on the mentor-mentee session) or site-based mentoring (i.e., there is one location where mentors and mentees consistently meet for sessions); 4) Involving parents or guardians and involving community members or organizations (parents or guardians must want a mentor for the child, and the community must have the infrastructure to support the program and understand the

need); 5) Setting goals (i.e., what are the intended accomplishments or outcomes for the mentoring sessions as well as for the program in its entirety?); 6) Selecting the appropriate intervention and activities for mentor-mentee pairs; 7) Selecting staff or personnel appropriate for the mentoring initiative; 8) Appropriately training staff and mentors (not everyone is meant to be a mentor—it requires specific skills and patience); 9) Recruitment of participants; 10) Time, quality, consistency, and interactions of interventions must be implemented appropriately, and mentors must be matched with mentees based on interests and other commonalities, including cultural background, gender, and race; 11) Monitoring of the intervention must occur; 12) Outcomes should be evaluated; and 13) Results should be sustained after the intervention is over.

Campus Connections Mentorship Program: Effectiveness and Outcomes. One mentorship program of importance to the current project is Campus Connections (CC). CC is an evidence-based youth mentorship program at Colorado State University in which at-risk teens from the community are matched with university students for 12 weeks of structured activities and mentorship. In order to participate, youths had to be referred through the juvenile justice system, school counselors, or other local agencies. The mentorship initiative was designed using Rhodes' framework for mentorship programs, and targeted social, emotional, cognitive, and identity development in the youth participants (Weiler, 2014). In addition, aspects of Social Learning Theory and Problem Behavior Theory were incorporated in the intervention design to positively impact role modeling, environmental support, and promotion of positive behaviors (Weiler, 2014). Importantly, CC has been thoroughly evaluated and has demonstrated positive impacts on at-risk participants.

A comprehensive analysis of the mentorship program revealed that at-risk youth participants in CC, compared to at-risk youths not enrolled in the program, experienced lower

levels of problem behavior, including alcohol and substance use as well as delinquent behavior (Weiler, Haddock, Zimmerman, Henry, Krafchick, & Youngblade, 2015). In addition, participants reported more negative attitudes about substance use and an increase in levels of autonomy for substances (Weiler et al., 2015). Finally, youth participants had a lower level of truancy compared to the comparison group, with overall significantly lower rates of missing class (Weiler, 2013). Importantly, mentors in the program also reported significant benefits compared to other university students that did not participate in mentors. These positive outcomes included an increase in civic attitudes, self-efficacy for serving one's community, and both interpersonal and problem-solving skills (Weiler, Haddock, Zimmerman, Krafchick, Henry, & Rudisill, 2013). Overall, Campus Connections has many positive implications for the youth participants, the university mentors, and the broader community.

Enhancing Mentorship Outcomes. While mentoring may be effective in reducing negative outcomes for many youths, in some cases, the inclusion of additional evidence-based practices may serve to enhance these outcomes to a larger degree and thus help adolescents refrain from using alcohol and other substances. The following sections indicate how mentoring programs might be the ideal venue for the delivery of evidence-based substance use prevention programs and lead to the rationale of the current study.

Infusion Models

Innovative intervention techniques are needed to effectively reduce and prevent substance use for targeted groups of adolescents. Innovative delivery mechanisms of the LST program may hold promise for an effective substance use prevention program for at-risk young people. One idea is to create an infusion model in which principles from LST are infused into an existing prevention program (such as a mentoring initiative) and delivered through multiple mechanisms.

An infusion model approach is one in which the content of an evidence-based program and the skills that one learns over the course of that program are spread out across different instructors, learning opportunities, or activities (Swisher, Bechtel, Henry, Vicary, & Smith, 2001). Infusion models are oftentimes used in an educational context (known as curricular integration; Cinelli, Rose-Colley, & Bechtel, 1995; Gatewood, 1998); content of a substance use program is taught across multiple school subject areas and the content is made relative to that specific school subject. Importantly, infusion requires a more interactive approach from program facilitators and deliverers of content. In schools, teachers are thus responsible for designing and delivering the content of the prevention programs in meaningful ways in order to integrate the essential principles of the program into the course curriculum (Swisher et al., 2001).

Limited numbers of studies have utilized infusion models or integrated curriculum in the area of substance use prevention, but studies have shown support for this innovative technique. Specifically, researchers have utilized Botvin's Life Skills Training program, as described above, and integrated the core concepts into school curricula in order to allow for consistent and comprehensive substance use prevention skills and knowledge to be an integral part of students' learning, rather than a substance use prevention class taking time out of the school day (Swisher et al., 2001). In this study, teachers participated in LST training and were given the freedom to choose their own topics relative to substance use in order to utilize the material in their own courses. Researchers concluded that an infusion method was an excellent option for schools to adopt in order to allow students to participate in substance use prevention programs at schools.

An additional study attempted to examine the effectiveness of an alternative delivery method for LST. Smith and colleagues (2004) infused the LST curriculum into the regular school curriculum (the Adoption of Drug Abuse Prevention Training, or ADAPT). All teachers

in the grade were trained on the LST curriculum and they worked with project staff to develop modified versions of the LST lessons that fit in with their course material. Students then participated in these lessons in each of their classes. The study found that the infused method was equally as effective as the traditional method. Both the traditional and infused methods decreased substance use in comparison to a control. In a follow-up study, Vicary et al. (2006) specifically assessed the effectiveness of the three-year LST curricula for both the traditional and infused delivery methods. ADAPT utilized low-income rural school districts. In the infused-LST condition, LST components were integrated into the school's classes and learning objectives to provide repeated exposure in multiple classrooms. The study found that girls were positively affected by both the LST and infused-LST treatments; girls had improved knowledge, coping, and perspectives of social norms. Interestingly, although the infused model in this study did not produce expected results for boys, teachers continued to utilize LST-components in their own classrooms. This indicates that an infused-LST program may be more sustainable over time and allow for continued positive influence on youths' health outcomes.

This novel approach to substance use prevention in adolescent populations is one potential solution to effectively preventing or reducing substance use rates among adolescents, given its potential to expose adolescents to knowledge, social skills, and behavioral skills related to substance use in an already existing context. An innovative delivery mechanism of the LST principles may hold promise to help reduce substance use among adolescents. Specifically, youths can be taught formal principles of behavior (e.g., socially appropriate methods for communication, problem solving, and anxiety reduction) in a relaxed classroom setting for a short period of time, and then allowed time away from the classroom to practice behavioral skills and discuss issues related to substance use and the specific topic covered. In this way, youths

can be exposed to multiple pro-social adult figures that demonstrate the knowledge and skills needed to resist pressure to use drugs and alcohol. Participants will also be able to practice these behaviors in a real-life setting with a supervising adult, rather than only practice behaviors in a classroom-type setting. The content of a substance use prevention program can be delivered in a way that complements an existing initiative for at-risk youth in the community. In this way, LST principles can be instilled into the youths in multiple contexts and may allow for an effective, evidence-based intervention to be utilized innovatively in order to lead to a reduction of youth substance use.

Rationale for the Infusion of LST into Campus Connections

This study represents a novel coupling of an evidenced-based program (LST) and an evidence-based practice (mentoring). This study has the potential to inform both theory and practice. LST may add to mentoring because while contact with a pro-social adult may improve youths' behavioral skills such as decision making and social skills (Rhodes & Low, 2008; Rhodes, Reddy, & Grossman, 2005), mentoring programs do not typically provide a controlled way to influence these essential developments in adolescents' lives. Mentoring may add to LST because it provides a setting in which the lessons can be reinforced and the skills practiced with a pro-social, caring adult. LST may improve outcomes in a mentoring setting by providing more structured topics for mentors to discuss with their mentees, and a more personal relationship from which mentees may learn pro-social skills (rather than in a classroom setting). Adapting and systematically testing an evidence-based Life Skills program to fit within a mentoring framework will address a gap in the literature and move the field of adolescent drug and alcohol abuse prevention forward substantially. Additionally, it may provide a new evidence-based

initiative for other programs around the country to adopt in order to bolster their adolescent drug and alcohol prevention efforts, with minimal cost to the programs already in existence.

I hypothesize that the infusion of Life Skills Training into a mentoring program may affect some of the mediating variables that mentoring alone may not always influence, such as coping skills, decision making, and problem solving. Mentoring in itself is an excellent source of social support, increasing adolescents' positive values and attitudes, and having a pro-social role model, and adding a structured Life Skills component may serve to boost the positive effects that already consistently occur. Finally, infusion of Life Skills Training into a mentoring setting will allow for the development of positive behavioral skills and attitudes for juvenile offenders attending mentoring programs, which may reduce the disproportionate use of drugs and alcohol by these adolescents. Overall, the evidence detailed in the literature review above supports the idea that an infused LST program will be effective in similar ways as the original program; positively affecting youths' social skills, self-management skills, and drug resistance skills will lead to an increase in positive outcomes and a decrease in negative outcomes. See Figure 1 for a logic model of the current study.

Overview of the Current Study

The current project design tests the effectiveness of LST-infusion into an existing mentoring program at Colorado State University called Campus Connections (CC; Weiler et al., 2013; Weiler et al., 2015). A summary of the CC curriculum is located in the Method section. For the current project, Human Development and Family Studies (HDFS) undergraduate facilitators completed Botvin's online Life Skills Training course, and each intern was responsible for delivering the program to one of three age-determined mentor family groups (roughly equivalent to elementary, middle, and high school ages). Every week for a 20-minute

period, mentor families grouped together and had a formal abbreviated “lesson” in LST. Every week, mentors and mentor coaches had one hour of time to discuss strategies for practicing the skills and behaviors relevant to the current LST lesson before the participants arrived.

Additionally, every week, the mentors provided in-the-moment coaching and behavioral practice for mentees utilizing the LST principle that was formally discussed.

CC sessions take place on the Colorado State University campus four nights per week for six hours per night. Four of these six hours are spent with the mentees, with the remaining hours used to train mentors and debrief each session. CC sessions, and thereby mentees, were randomly assigned to either participate in CC with the LST infusion, or participate in a comparison group (the original CC curriculum without the LST infusion—which served as a control group in the study). Over the course of one year (Jan.-Dec. 2013), 85 mentees received the infused-LST and 81 received CC as usual. CC participants were able to choose which night of the week (Monday through Thursday) they preferred to attend CC without any knowledge of the LST-infusion intervention trial. A controlled experiment was then implemented— with nights being assigned to each condition through December 2013. Therefore, participants either received the original CC curriculum or the CC curriculum plus the LST-infusion. A pre-and post-test design was utilized to assess treatment effects from survey data from the participants.

Objectives and Hypotheses

The objectives of this project were twofold: first, to adapt and infuse Life Skills Training into Campus Connections (CC), a Colorado State University-based mentoring program for at-risk and offending youths in the community; and second, to rigorously evaluate this new version of LST within CC by completing a controlled experiment. The central hypothesis for this experiment was that adolescents randomly assigned to CC with LST infused into the program

would have significantly reduced negative outcomes compared with adolescents randomly assigned to the usual CC program. Given that there was not a no-treatment control group, even a small effect would be meaningful.

Within CC, mentees were assigned to work one-on-one with a University student mentors, and were also assigned to “mentor families” to foster a sense of community and create a safe environment for mentor-mentee interaction. Adolescents who were assigned to the LST condition experienced a shortened version of LST within their mentor families, delivered by LST trained and certified human development and family studies facilitators from Colorado State University. Their mentors were also trained and instructed to practice the skills and behaviors over the course of the evening with their youth that were taught each week during the formal LST lesson, and mentees received take-home activities to facilitate their learning and practice. Thus, LST was infused into the CC curriculum, and was rigorously evaluated for the first time in order to optimize the CC program. The hypotheses for the current study were as follows:

1. Youths randomly assigned to CC with LST infused into the program would have significantly reduced alcohol and substance abuse and intentions to use compared with youths randomly assigned to the original CC program.
2. Youths randomly assigned to CC with LST infused into the program would report significantly less delinquent or risky behavior than youths randomly assigned to the original CC program.
3. The relationship between LST and positive outcomes would be mediated by social skills (a combination of communication, refusal, and assertiveness skills), self-management skills (a combination of coping skills for anxiety, decision-making skills, and advertising skills), and drug resistance skills (a combination of knowledge of risks, normative beliefs

about peers, and attitudes about alcohol and other substances). In other words, LST would increase these skills in youth, which would in turn decrease youths' negative outcomes.

4. Program fidelity from the LST facilitators and program-infusion fidelity from the mentors would influence youths' social skills, self-management skills, and drug-resistance skills such that youths whose facilitators and mentors reported higher levels of fidelity would have significantly better skill levels overall.

Additionally, potential differences between genders, age groups, and youths with and without previous experience utilizing substances were assessed, given that the LST-infusion may be more successful for certain groups. No specific hypotheses are offered for these potential moderating effects, rather, these are considered exploratory research questions.

CHAPTER II: METHOD

Participants

The youth participants for this project consisted of 166 11-18 year olds ($M=13.90$, $SD=1.79$) who participated in CC during the Spring, Summer, and Fall sessions of the 2013 academic year. Participants were assigned to either the LST-treatment group ($n= 85$) or the comparison group ($n=81$), which was Campus Connections as normal. More participants identified as male than female (67.79% and 32.21%, respectively). The majority of youths identified primarily as white (55.63%), while 5.63% identified as primarily American Indian or Alaskan Native, 10.56% identified primarily as African American, 23.94% identified primarily as Hispanic, and the remaining 4.24% identified as either Asian American, Hawaiian, or Other. It should be noted that 14.05% of participants indicated they identified with more than one ethnicity. The majority of youths (70.63%) qualified for free and reduced lunch.

Recruitment. The existing CC program allowed for at-risk adolescents to be referred from youth and family community agencies, local schools, Office of the District Attorney, Juvenile Probation, or the Department of Human Services and matched with University students who were selected through an application process and trained as a mentor. If there were not enough youths referred to CC for the general program, recruitment took place at local middle and high schools. Specifically, CC recruited adolescents who were at risk due to poverty, involvement in the juvenile justice system, and academic underachievement.

CC and LST Participation. Although participation in the LST portion of CC was not mandatory, CC was designed around structured activities in which the youths and mentors participate together. Therefore the likelihood of mentees “opting out” of LST was very low, but

mentees could have chosen to sit out for a portion of a night's LST lesson. Mentors were then instructed to indicate this on their nightly fidelity survey. In addition, it is CC's policy to allow youths to return to CC for subsequent sessions. For the duration of this project, youths were only included in the eligible participant list if they had never before participated in the LST-treatment group. Therefore, no youth could be included in the comparison group if they had already been exposed to LST lessons. It was possible that repeating youths who had not previously been exposed to the LST-infusion could return for another CC session and be assigned to either the comparison or LST-infusion group. Given the lower-than-expected participant numbers (based on a power analysis of 120 participants per condition to detect a small to medium effect), this was allowed for the current project. Participants that had previously been assigned to the LST-infusion night and then returned to CC for a future semester were not included in this analysis.

Research Design and Procedure

Campus Connections curriculum. Initially upon admittance to CC, the youths were all matched one-on-one with a University student for the entire duration of CC. Within the one-on-one matched pairs, each mentor-mentee pair was assigned to a "mentor family" that allows for youth of similar ages to have access to small trusted family groups, led by a mentor coach. Pairs participated in weekly walk-and-talks to allow for the pair to catch up on the past week. Mentors provided support and advice to the mentee and also to exposed mentees to different buildings around campus. The pairs then participated in "supporting school success," in which the mentor provided academic support and individual tutoring. Next, all pairs in the treatment condition participated in a formal LST "course" that ranged from 20 to 30 minutes long, delivered by trained LST facilitators. All participants received a group dinner, followed by participation in two pro-social activities with their mentor.

Designing the Life Skills Training infusion. The LST infusion was designed with consideration of the existing CC curriculum, the requirements of the LST program in order for the program to be effective in producing desired results, the resources available through CC, and the needs of the youth. I first attended an online LST training course in which I became a certified Life Skills Instructor (see *Training of Life Skills Training Facilitators* for more details on this course). Additionally, I spent extensive time meeting with the CC leadership team and sitting in on CC nights in order to fully understand the initiative’s goals, components, curriculum, and mentor/youth interactions. The CC leadership team and I decided to fit a weekly LST “lesson” into the existing curriculum during 20 minutes of “supporting school success,” cutting the “supporting school success” time down from one hour to approximately 40 minutes. During that twenty minutes, LST facilitators delivered the core concepts of each lesson to the mentor-mentee pairs. The “infusion” of LST took place at the mentor-mentee level; mentors were expected to facilitate further discussion, provide feedback, and practice behavioral skills throughout the night with their mentees.

LST is designed to be delivered by age group, and CC has participants ages 10-18. We determined the “middle school” level lessons would be the most appropriate to deliver to all youths; however, each mentor-mentee pair was assigned to a LST facilitator based on the age of the mentee upon CC intake. For each LST treatment night, we had three different age groups of LST delivery (each with one LST facilitator) that roughly correspond with elementary, middle, and high school levels. The LST facilitators delivered the same core concepts for each of the lessons, but examples and behavioral practice activities were tailored to be age appropriate for each group. Thus, modified lesson plans were developed merging the LST curricula with the CC mentoring model, and facilitators were instructed to utilize examples and behavioral practice

appropriate to their group's average age. Additionally, modified versions of the LST "Student Guide" or workbook were designed and given to mentors and mentees that included mentor-mentee interactive practice activities. These workbooks were designed to be used during the lesson, during the rest of the CC night, as well as at home for the mentees. It is important to note that the content of the lesson plans and the workbooks was not changed, only the way that the content was delivered (by both facilitators and mentors) as well as the focus on mentor-mentee interactions and discussion during behavioral practice and skill building.

Training of Life Skills Training facilitators. Four LST facilitators were responsible for facilitating the formal LST lessons during treatment evenings of CC. The facilitators received Life Skills provider training offered in an interactive, instructor-led online workshop format (Botvin, 2012). At the end of this online course, each facilitator received certification that they were an officially trained LST instructor. Facilitators each completed one live online class with an instructor, completed three self-paced modules, and then completed a final live online course. The purpose of the training is to prepare facilitators to effectively implement the program to the population of choice. Not only does the training thoroughly cover what to teach, it also covers how to teach the material using facilitation (i.e., making conversation or discussion easier for mentees during class), feedback (i.e., positive reinforcement for mentee's participation or response), coaching (i.e., demonstration and encouragement of mentee participation), and behavioral rehearsal (i.e., allowing mentees to rehearse the skills discussed in the lessons). All facilitators were required during training to review theory and relevant research behind this evidence-based program, become familiar with the LST curriculum, learn skills necessary to teach the curriculum, discuss any implementation issues specific to the population, and practice teaching one LST lesson to receive instructor feedback.

LST facilitators received additional training relevant to the LST infusion. Specifically, LST facilitators were instructed as to which material in each lesson to cover during the “formal” LST lessons, which activities to complete, and teaching strategies for each lesson. Lesson plans were developed for each lesson so that all LST lessons were standard between facilitators.

Training of mentors. Mentors in the treatment nights only were required to attend a 1.5 hour training session prior to LST implementation. Mentors received information about the importance of Life Skills Training, the theory and evidence behind the program, the LST curriculum, how LST was to be infused into CC, and their expectations as mentors. They were provided with examples of how to “infuse” the skills learned in the LST lesson into the nightly activities with their mentees, and provided opportunities to ask questions. Additionally, they were provided with a handout of resources related to LST and continual training during their weekly CC pre-lab sessions.

Mentor and facilitator responsibilities. Mentors and facilitators played very important but different roles in the current project. Facilitators were responsible for the delivery of the lesson content each night for approximately 20 minutes. Facilitators allowed time for behavioral practice, coaching, and feedback as it relates to each principle discussed for the night. Mentors were expected to infuse the current lesson as well as principles from past lessons into discussion and activities with their mentees. Specifically, mentors were expected to facilitate one-on-one discussion with mentees, correct any misinformation that their mentee might believe, model positive, prosocial behavior (not problem behavior), give explicit instructions if/when they practice the skills learned, and spend twice as much time processing the skills (i.e., feedback and discussion) as they did practicing them. Additionally, mentors were expected to give their mentees positive and encouraging feedback, reinforce effective behaviors, use positive real-life

or personal examples that mentees can relate to, discuss any concerns or questions that the mentee might have, and create weekly goals with mentees to re-visit in the following weeks. Mentors were also expected to complete all take-home portions of the lessons and bring them back to discuss with their mentees.

Both facilitators and mentors were responsible for completing weekly fidelity checks. Every week, they completed standardized fidelity checks as it relates to program implementation (e.g., for facilitators: “During tonight’s lesson, did you complete at least one activity together as a group?” and for mentors: “To infuse tonight’s lesson, did you facilitate one-on-one discussion with your mentee?”) as well as fidelity checks as it relates to the specific weekly lesson (e.g., during Lesson 1: Self-Image and Self Improvement for facilitators: “During tonight’s lesson, did you discuss how self-image is formed?” and for mentors: “Please indicate if you discussed your mentee’s self-image, gave positive encouragement of your mentee’s description, and gave positive suggestions for how you see your mentee.”). Additionally, mentors were given a list of suggestions of additional activities specific to each lesson that they could complete with their mentee if they had time, and they were instructed to indicate if they completed any of these activities (e.g., “Please indicate if you asked your mentee how his/her self-image affects behavior.”).

Experimental design. CC participants and their parents or guardians were allowed to choose the night in which they attend the program based on availability and scheduling. During the 2013 CC sessions, approximately 20-35 youths attended each night and were matched one-on-one with a University student mentor. CC ran four nights a week (Monday through Thursday) during each of the Spring and Fall semesters, and two nights a week (Tuesday and Wednesday) during the Summer semester. Given that it was not feasible for participants within

CC sessions to be randomly assigned to receive LST or not receive LST, CC nights were assigned to be treatment or comparison nights, with consideration that treatment and comparison groups should be approximately equal. Three nights in Spring 2013 and one night in Summer 2013 were assigned to be LST-infusion nights, and one night in each semester was assigned to the comparison condition.

Participants in the treatment condition were assigned to LST (treatment) groups based on age at intake so that three separate groups received formal LST lessons each night. These groups roughly corresponded with elementary, middle, and high school ages. All participants in CC, if they volunteered to participate in research (i.e., take the pre- and post- surveys offered by CC), upon intake signed a consent form or have a legal guardian sign, if under the age of 18. All consenting participants then received a pre- and post- survey, taken on the first day of CC and on the last day of CC, if they were in attendance on that particular day.

Materials

Measures. The survey collected self-report data for a variety of demographics and outcome variables detailed in the following paragraphs. The outcome variables fell under the constructs of alcohol and drug use, normative beliefs, attitudes and beliefs, and LST knowledge, which included personal self-management skills, positive social skills, and drug resistance. The scales chosen for this assessment were, when possible, ones previously used to evaluate LST interventions. Additionally, school data (current class grades) was collected when possible (per agreements with the schools).

Alcohol and drug use: Frequency of alcohol and drug use. Eleven items on a scale of 1 (*never*) to 9 (*more than 1 time/day*), indicated frequency of alcohol, tobacco, and other drug use. Sample items include “How often (if ever) do you smoke cigarettes?” and “How often (if

ever) do you drink until you get drunk?" Two of the items in the scale were questions to assess participants' lying or exaggeration of drug use (i.e., they asked about fake drugs). Zero participants answered that they ever used the two fake drugs. Reliability analyses of the scale at pre- and post- test thus included the first nine questions, with Chronbach's alpha = .89 and .92, respectively.

Alcohol and drug use: Intentions to use alcohol and other drugs. Five items on a scale of 1 (*definitely not*) to 5 (*definitely will*) indicated one's intentions to participate in the behavior in the next year (Botvin, Batson, Witts-Vitale, Bess, Baker, & Dusenbury, 1989). Sample items include "Do you think you will do any of the following in the next year? 1. Drink beer, wine, wine coolers, or hard liquor?" and "Do you think you will do any of the following in the next year? 2. Smoke marijuana?" Reliability was assessed at pre-test ($\alpha = .75$) and post-test ($\alpha = .80$).

Normative beliefs: Normative beliefs scale. Six items on a scale of 1 (*none*) to 5 (*almost all*) indicated one's normative beliefs about other's drug and alcohol use ($\alpha = .87$ at pre-test and .90 at post-test). Higher values indicated misperceived norms (Botvin et al., 1992). Sample items include "How many people your age do you think smoke cigarettes?" and "How many people your age do you think use cocaine or other hard drugs?"

Attitudes and beliefs: Attitudes scale. Attitudes towards alcohol and drug use were assessed at pre-test ($\alpha = .93$) and post-test ($\alpha = .96$) using a ten-item Attitudes Scale (Botvin, Baker, Dusenbury, Tortu, & Botvin, 1990). Ten items on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*) indicated one's attitudes toward alcohol and drug use. Higher values indicated positive attitudes toward drug and alcohol use. Sample items include "Smoking marijuana lets you have more fun" and "smoking cigarettes makes you look cool."

Life Skills Training knowledge: Knowledge about alcohol and other drugs.

Participants were asked to indicate whether or not 14 statements are true or false. The scale's summative score indicated the number of items answered correctly (Botvin, Baker, Renick, Filazzola, & Botvin, 1984). Higher scores indicated more knowledge about alcohol and other drugs. Sample statements include "Most adults drink alcohol every day" and "Drinking beer, wine, or liquor makes you more pepped up and alert."

Life Skills Training knowledge: Knowledge about risks scale. Four items on a scale of 1 (*no risk*) to 4 (*great risk*) assessed participants' knowledge about the risks of drug and alcohol use (Botvin et al., 1984). Higher scores indicated higher perceived risk. Chronbach's alpha at pre-test was .80 and pos-test was .91. Sample items include "How much do you think a person risks harming themselves if they smoke 1 or more packs of cigarettes per day?" and "How much do you think a person risks harming themselves if they have 5 or more drinks 1-2 times per weekend?"

Life Skills Training knowledge: Refusal skills scale. Participants were asked to indicate what they would do if someone would ask them to smoke, drink, use marijuana, or use other hard drugs for five different response statements (Botvin et al., 1989; Epstein, Botvin, Diaz, Baker, & Botvin, 1997). Participants responded on a scale of 1 (*definitely wouldn't*) to 5 (*definitely would*), with higher scores indicating higher levels of refusal skills ($\alpha = .77$ at pre-test and .85 at post-test). Sample statements include "Change the subject" and "Tell them not now."

Life Skills Training knowledge: Assertiveness skills scale. Participants answered seven items that indicated how likely they would be to do certain things in social situations. The responses were on a scale of 1 (*definitely wouldn't*) to 5 (*definitely would*), with higher scores indicating more assertiveness (Botvin et al., 1990). Sample items include "How likely would

you be to ask people to give back the things that they borrowed, if they forgot to return them?" and "How likely would you be to start a conversation with someone you would like to know better?" Chronbach's alpha was relatively low at pre-test ($\alpha = .54$) but increased to an acceptable range at post-test ($\alpha = .88$).

Life Skills Training knowledge: Decision making skills. Participants were asked to respond to seven statements that indicated what they do when they have a problem or need to make a decision. Responses were on a scale of *1 (never)* to *5 (always)*, with higher scores indicating better skills (Botvin et al., 1990). Reliability for this scale was lower than the expected range of .82 (Botvin et al., 1990) to .89 (Epstein et al., 1997), with pre-test reliability $\alpha = .65$ and post-test $\alpha = .59$. Removal of the opposite-worded items improved reliability to $\alpha = .83$ at pre-test and $\alpha = .85$ at post-test, which is within the acceptable range. Review of the literature indicated acceptability in using the 4 positively-worded items for the decision-making scale (e.g., Botvin et al., 1990), and thus, four items were retained for the current study. A sample item includes "When I have a problem or need to make an important decision, I get the information needed to make the best choice."

Life Skills Training knowledge: Advertising skills scale. Participants were asked to respond to six statements that indicate their skill level in responding to media advertisements. The response options were on a scale of *1 (never)* to *5 (always)*, with higher scores indicating better skills (Epstein et al., 1997). Chronbach's alpha for the scale at pre-test was .73 and at post-test was .84. Sample items include "When I see or hear an advertisement, I remind myself that the ad is trying to get me to buy what it is advertising" and "When I see or hear an alcohol ad, I tell myself that drinking will not make my life better."

Life Skills Training knowledge: Coping with anxiety scale. Participants' ability to cope with anxiety was measured with a 12-item coping with anxiety scale (Botvin et al., 1990). Responses were on a scale of 1 (*never*) to 5 (*always*), with higher scores indicating better coping skills. In the literature, reliability for this scale ranges from .63 (Botvin et al., 1990) to .80 (Epstein et al., 1997). However, in the current sample, reliability was not acceptable (Chronbach's alpha = .42 and .49 at pre- and post-test, respectively). Sample items include "When I feel anxious, I tell myself to feel calm and confident" and "When I feel anxious, I imagine myself in a peaceful place."

Life Skills Training knowledge: Communications skills scale. Participants' communication skills level was assessed with a six-item communication skills scale. Response options ranged from 1 (*never*) to 5 (*always*), and higher values indicated better skill level (Epstein et al., 1997). Chronbach's alpha for this sample was .83 at pre-test and .90 at post-test. Sample items include "When I want people to understand me, I make sure that what I say matches my tone of how I stand, and the expression on my face" and "When I want to understand other people, I ask questions if they say something unclear."

Delinquent Behavior. Participants were asked to indicate which risky behaviors they have taken part in within the past month (circle all that apply). Behaviors included skipping class, getting into a physical fight, belonging to a gang, and stolen from a store. A summative score on the 22-item scale indicated how many different types of negative behaviors each youth participated in within the past month.

All survey data was collected immediately prior to the start of the intervention and immediately after the completion of the CC program. Participants completed a paper-and-pencil survey during the first and last CC session. Participation in the research was not a requirement in

order to be a CC participant; consent for the study was obtained during each youth's intake procedure.

Analytic Strategy

Mplus and R were used for all data analyses. Prior to hypothesis testing, data inspection and preliminary checking was completed in R. Descriptive data were evaluated in order to check assumptions of normality of data and assess preliminary relationships between variables. Independent samples *t*-tests and one-way analysis of variance tests were utilized to assess mean level differences on pretest variables for the treatment and comparison groups. Additionally, the observed distributions of the outcomes (both ordered categorical and censored inflated) were studied using histograms.

Hypotheses 1 and 2 (H1 and H2): H1 and H2 were tested in Mplus utilizing regression modeling specific to censored inflated data by building a model that included the essential control variables of gender, age (mean-centered), number of days absent, any other relevant control variables based on the ANOVA output (i.e., if the ANOVA output indicated treatment and comparison group differences on pre-test levels of any demographic or mediating variables, then that variable was also included in all analyses as a control variable), pretest scores for the outcome variable of interest, and the treatment indicator. The final model determined if the treatment (i.e., receipt of the LST program infusion) had any effect on youths' substance use, substance use intentions, and delinquent behaviors (the direct effect for each outcome variable). This analysis also served as path *c* for each mediation model (H3).

Hypothesis 3 (H3). Hypotheses 3 was evaluated using a multiple mediator model for each outcome variable using a SEM framework. MacKinnon and Lockwood's (2003) guide for assessing mediators in prevention research was followed. SEM was the most appropriate analysis

type given that it allowed for a confirmatory approach to data analysis, for the ability to examine the effects of both latent and observed variables, and for the specification of multiple group models (Byrne, 2001; Schumacker & Lomax, 1996). First, a Confirmatory Factory Analysis (CFA) was fit to determine if each scale for the mediating variables – social skills, self-management skills, and drug resistance skills- had acceptable fit. Second-order CFAs were utilized to determine the overall fit of the large skill set, as designated by the logic model for the current study (Figure 1). Second-order CFAs allow for more parsimonious models to be estimated.

Next, the structural paths for the mediation model were included, with each skill set (social, self-management, drug resistance) skill set tested individually to start. After modeling the direct effects (H1 and H2), an additional model was estimated to determine if path *a* for each mediator was significant. Path *a* for each mediator looked at the relationship between the LST treatment and the mediating variable and determined if participation in the LST program was associated with higher skills in the participants. If the *a*-path was significant, a final model was then estimated for each outcome variable to assess paths *b* and *c'*. Path *b* indicated the relationship between the mediators and the outcome variable, holding constant treatment group (LST or comparison). Path *c'* indicated the effect of the treatment variable holding the mediating variables constant—thus considering the effects of all mediators simultaneously. Mediating variables only remained in the model if they were significantly affected by the treatment indicator (if path *a* was significant). If *c'* remained significant with the mediators in the model, then the mediation was only partial (that is, a direct effect remained). To calculate the indirect effect, or the effect of the treatment on the outcome that goes through the mediating variables, I then would multiply the coefficients for the *a* and *b* paths.

Each of these models were specified for each outcome variable following Preacher and Hayes' recommendations for comparing indirect effects in multiple mediator models (Preacher & Hayes, 2008). It was advantageous to specify a single mediation model with multiple mediators rather than multiple simple mediation models for myriad reasons: all predictors could be included in the regression model to determine if an overall effect exists; one could conclude that the set of mediators mediates the effect of treatment on substance use outcomes; one could assess the indirect effect of each individual mediator while controlling for other mediating variables in the model; and finally more variables were accounted for in the model, reducing the likelihood of bias due to omitted variables (see Figure 2 for a diagram of the analysis strategy). The *products-of-coefficients approach* was used ($a*b$ for the indirect effect), and residuals for mediators were allowed to covary. Bootstrap confidence intervals were calculated to determine if indirect effects were statistically significant.

Additionally, important moderators were assessed for all models. The effects of LST on the outcome variables may have differed based on gender, age, and past experience with drugs and/or alcohol. Regression models with moderation were specified for these analyses.

For all SEM models, five indices were used to assess model fit: chi-square test of overall model fit, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Standardized Root Mean Square Residuals (SRMR), and Non-Normed Fit Index (NNFI). RMSEA below .05 in combination with SRMR below .09 indicated excellent model fit, whereas values below .08 and .10, respectfully, indicated good model fit (Hu & Bentler, 1995). Finally, CFI and NNFI values larger than .90 indicated good fit, while values above .95 indicated excellent fit (Bentler, 1990).

Hypothesis 4 (H4). Finally, LST-infusion program fidelity was assessed (H4). LST instructor fidelity (mentees are assigned to one instructor based on age) was tracked weekly to make sure all content was delivered systematically over the course of all LST sessions. Weekly fidelity scores were calculated within facilitators for each night of the LST program. For example, in the “Assertiveness” lesson, facilitators were asked to indicate (yes or no) whether they met five objectives (e.g., “During tonight’s lesson, did you identify and practice verbal assertiveness skills?”). All youths in the same LST group had the same facilitator, and thus the same fidelity score. Additionally, mentor fidelity information was collected and tracked weekly to ensure that mentors were infusing all LST principles, completing all mentor-mentee LST activities, and practicing all skills and behaviors with their mentees. Each youth received three individual fidelity scores based on mentor-reported fidelity. Mentors were asked to report fidelity for 1) their support of their mentee during the LST lesson (e.g., “During class, did you encourage your mentee to actively participate?”), 2) infusing *required* components of the lesson into the rest of the night’s activities (e.g., did you “Practice solving conflicts together and give feedback about your mentee’s practice?”), and 3) infusing *suggested* components of the lesson into the rest of the night’s activities (e.g., did you “Relate assertiveness to social skills from last week?”). The three scores over the 12 weeks for each mentor were calculated and paired with the matching mentee. Every mentee therefore had four fidelity “scores,” one for the instructor and three for the mentor. In a separate analysis, scores were input as predictors in regression models while controlling for baseline scores of the outcome variable of interest, days absent, and age. Higher fidelity to the LST program was expected to predict more positive outcomes for youths. Mentees in the comparison group were not included in these fidelity analyses.

CHAPTER III: RESULTS

Descriptive Statistics

Descriptive statistics, including pre- and post-test means for the LST-infusion group and the comparison group, are presented for all survey variables in Table 1. Prior to hypothesis testing, trends in the data were assessed to determine 1) the relationships between variables of interest (i.e., the mediating variables as well as all outcome variables and important covariates); 2) whether there were significant group differences at baseline for youths in the treatment LST condition versus comparison condition; and 3) whether the mediating variables and outcome variables changed within groups over the course of the 12-week intervention. In addition, histograms were plotted for each of the outcome variables in order to study the observed distribution of the outcomes, for both ordered categorical and censored inflated variables.

Correlations between all variables of interest can be found in Table 2. Not surprisingly, frequency of substance use was significantly positively correlated with intentions to use substances, normative beliefs about peers (at pre-test only), positive attitudes about substances, and self-reported delinquent behavior. Frequency of substance use was also negatively correlated with refusal skills (except at post-test) and coping skills. Delinquent behavior was significantly positively correlated with substance use intentions, normative beliefs about peer substance use (except at post-test), positive attitudes towards substances, and surprisingly, communication skills. Delinquent behavior was negatively associated with refusal skills, and at post-test, with coping skills.

Pre-intervention differences between youths participating in the LST-treatment versus comparison groups for essential demographics and variables of interest were assessed using

independent samples *t*-tests. No significant differences ($p < .05$) were found between comparison and LST-infusion (treatment) groups at baseline for any variables of interest in the model, thus indicating that the two groups were similar on frequency of substance use; $t(144) = -.160, p = .873$, intentions to use substances in the future; $t(144) = .053, p = .958$, normative beliefs about their peers; $t(144) = -.274, p = .785$, substance use attitudes; $t(144) = -.317, p = .752$, knowledge of substances; $t(143) = -.849, p = .397$, knowledge about risks; $t(144) = .677, p = .499$, refusal skills; $t(144) = -1.251, p = .213$, assertiveness skills; $t(143) = -.856, p = .393$, decision-making skills; $t(143) = -1.291, p = .199$, advertising skills; $t(143) = -.842, p = .401$, coping skills for anxiety; $t(146) = -1.580, p = .116$, communication skills; $t(143) = -1.547, p = .116$, and self-reported delinquent behavior; $t(113) = .239, p = .812$. There was also not a significant difference in each of the above mentioned variables between any of the Campus Connections nights ($p > .05$ for ANOVA analyses), indicating that youths in each CC night over all three semesters began the program with similar levels of skills and knowledge.

Trends over time were assessed to simply determine if scores on mediating variables and outcome variables changed over the course of the intervention period. Paired-samples *t*-tests were conducted to determine if there were significant pre-post differences for mediating and outcome variables of interest. In the comparison group, the only variable that was significantly different at pre- and post-test was delinquent behavior, with a mean score of 2.40 ($SD = 1.95$) at pre-test and 1.56 ($SD = 1.76$) at post-test (cases deleted pair-wise; $t(30) = 2.679, p = .012$). Paired-sampled *t*-tests indicated no significant changes in variables for the LST-infusion group over time. Note this analysis was completed to simply look at trends in data; further analyses were conducted to assess true differences between LST-infusion and comparison groups (see below).

Assumptions

Before continuing with hypothesis testing, all assumptions for utilizing a multiple linear regression analysis with an SEM framework were assessed. This included assessing linearity through partial regression plots, assessing normality of residuals through histograms (visual inspection) and normal probability plots, checking for outliers using studentized deleted residuals with a cutoff of +/- 3, assessing multicollinearity with the Variance Inflation Factor, and also assessing Homogeneity of Variance. As expected, the left-censored data for each of the outcome variables was problematic. Participants' self-report of substance use, substance use intentions, and delinquent behavior was non-normal with a preponderance of zeros (reporting not using substances, intending to use substances, or participating in delinquent behavior). The distributions of the outcomes were also observed with histograms for each variable at pre-and post-test, and this finding was confirmed. All primary outcome variables of interest, aside from LST-knowledge, had a significant positive skew and kurtosis as well as a visually non-normal distribution of data. To account for this type of data, censored-inflated models were estimated for all regression, CFA, and SEM analyses for these three outcome variables.

Missing Data

Before conducting the primary analyses, a review of missing data was conducted. Across all mediating and outcome variables at baseline, 12.22% of questions had missing data. Across all mediating and outcome variables at post-test, 26.06% of all questions had missing data. One hundred percent of all individual survey questions (for mediating and outcome variables) had some missing data points, and in addition, 100% of variables had participants that did not complete the entirety of the scale. This indicates that participants were both skipping individual questions and missing taking the pre-test or post-test all together. The increase in missing data at

post-test compared to pre-test indicates that participants may have chosen not to complete the follow-up survey, were absent on the day of the final post-test survey, or dropped out of the program. Absentee rates ranged from zero to six days; $M = 1.49$, $SD = 1.38$.

Because of the high rates of missing data in the set in both the pre- and post-surveys, listwise deletion (the standard for most types of analyses) of cases would result in many participants being deleted from analyses. Therefore, the full information maximum likelihood (FIML) approach was implemented in order to take advantage of all available data and estimate the covariance matrices for individuals with missing data points (Heck & Thomas, 2015).

Evaluation of the direct effect for each outcome variable (H1 and H2)

Hypotheses one and two assessed the direct effect (the c path in the mediation model) of the LST treatment on self-reported drug and alcohol use, intentions to use substances, and delinquent behavior, holding constant the control variables of gender, age (mean centered), days absent, and the pre-test levels of the variable of interest for each model. A separate final model was estimated for each outcome variable. Due to the significant floor effect of the three outcome variables, a two-part censored-inflated model was used for all analyses. In the two-part model, the first step is to estimate the effect of the LST-infusion intervention on the continuous part of the outcome variable, holding all other variables constant. This allows for the prediction of the value of, for example, frequency of substance use for individuals who hold a value on that variable above the censoring limit. The second step is to estimate the logistic regression – did the LST-infusion intervention influence the probability of reporting any (for example) frequency of substance use.

H1 Results. Contrary to the hypothesized effects of the LST-infusion, analyses for the direct effects of LST on frequency of substance use and substance use intentions (H1) did not

show significant effects (see Tables 3 and 4 for full model results for Frequency of Substance Use and Substance Use Intentions, respectively). Overall, analyses indicated that the participants in the LST-infusion treatment group did not report significantly lower overall use or intentions to use (results of part 1 of the censored-inflated model). In addition, participants did not report significantly lower log odds of substance use or intentions to use in the future versus not using or not intending to use in the future (results of part 2 of the censored-inflated model).

Overall, the models did show some significant predictors of the outcome variables. For frequency of substance use, the strongest predictor was past frequency of substance use. Days absent also significantly predicted frequency and probability of use at post-test—for every one additional day a participant was absent from CC, their self-reported frequency of substance use increased by .392. However, days absent did not predict the probability that a participant was using substances at post-test, only how often they reported using. For intentions to use substances in the future, the only significant predictor was the baseline level of intentions reported by participants.

H2 Results. Results of the analysis for the direct effect of LST-infusion on delinquent behaviors (H2) also did not support the hypothesis. For the two-step model, the LST-infusion group did not show significantly improved outcomes (i.e., significantly lower reported delinquent behavior or probability of delinquent behavior) compared to the comparison group. See Table 5 for full model results. Overall, the LST-intervention had no significant effect on any of the hypothesized outcomes.

Despite the lack of a significant *c*-path for the mediation model, the next steps in the analysis were still completed to determine if individual knowledge and skills mediated the relationship between LST-infusion and the three outcome variables. According to Rucker,

Preacher, Tormala, and Petty (2011), the relationship between the predictor variable (in this case, the LST-infusion) and the mediator (the *a*-path) might be stronger than the relationship between the predictor variable and the outcome. This could mean that, despite a non-significant *c*-path, the *a*b* indirect effect may be strong enough to be significant.

Evaluation of the mediating effects of social skills, personal self-management skills, and drug resistance skills for each outcome variable (H3)

Confirmatory Factor Analyses. Before the evaluation of H3, measurement models were specified to examine goodness of fit. Specifically, three separate measurement models were specified to evaluate fit for each of the hypothesized mediators. There were nine scales used to evaluate three mediating variables, thus, the latent variable for social skills consisted of three survey scales: Assertiveness, Communication Skills, and Refusal Skills. The latent variable for personal self-management skills consisted of three survey scales: Coping with Anxiety, Decision Making, and Advertising Skills. Finally the latent variable for Drug Resistance was comprised of three survey scales: Normative Beliefs, Substance Use Attitudes, and Knowledge of Risks. Thus, second-order CFAs were used given that the three indicators for each mediating variable were latent variables themselves. This creates a more parsimonious model and allows for assessment of multi-dimensional constructs (Kenny, 2016).

The measurement model 1a for Social Skills overall had reasonably good fit; $\chi^2_{[132]} = 1422.911$. The RMSEA indicated acceptable fit: .093 [95% CI = .077, .109]; CFI indicated acceptable fit: .889, NNFI indicated acceptable fit: .871; and SRMR indicated excellent fit: .070. Examination of the model modification indices (MIs) indicated that item numbers 2 and 3 on the Assertiveness Skills scale as well as item numbers 1 and 2 on the Assertiveness Skills scale had large MIs for residual covariances. Thus, a second model, 1b (Figure 3), was specified that

allowed these residuals to covary, resulting in good overall model fit: $\chi^2_{[132]} = 1422.911$. RMSEA = .075 [95% CI = .058, .092]; CFI = .928, NNFI = .915; and SRMR = .069. All factor loadings for the three scale variables (Refusal Skills, Assertiveness Skills, and Communication Skills) were significant at the $p < .001$ level, while the factor loadings for the composite variables onto the final latent Social Skills variable were all significant at the $p < .01$ level.

The measurement model 2a for Personal Self-Management Skills indicated poor model fit: $\chi^2_{[171]} = 1295.108$; RMSEA = .118 [95% CI = .104, .132]; CFI = .771, NNFI = .737; and SRMR = .118. After examining the model modification indices, it was determined that item numbers 10 and 11 for Coping with Anxiety, item numbers 5 and 6 for Advertising Skills, item numbers 3 and 4 for Advertising Skills, as well as item numbers 1 and 3 for Decision Making Skills had large MIs for the residual covariances between these variables. A revised model, 2b, allowed these residuals to covary, which resulted in good model fit: $\chi^2_{[171]} = 1295.108$; RMSEA = .069 [95% CI = .052, .086]; CFI = .923, NNFI = .909; and SRMR = .080. The revised model had significant factor loadings for all scale variables at the $p < .05$ level, except for item number 11 on the Coping with Anxiety scale ($p = .109$). All factor loadings for the second order variable were significant at $p < .01$. However, the model also indicated that the latent variable covariance matrix was not positive definite, and upon further review, it was discovered that there was a small but significant negative residual variance for the Decision Making Skills scale (-.06). This could potentially be because of small sample size or a misspecified model. Thus, a final model was specified, 2c, that constrained this residual variance to zero. The model had almost identical fit: $\chi^2_{[171]} = 1295.108$; RMSEA = .069 [95% CI = .052, .085]; CFI = .923, NNFI = .910; and SRMR = .080. The final model had significant factor loadings for all scale variables at the $p <$

.05 level, except for item number 11 on the Coping with Anxiety scale ($p = .112$). All factor loadings for the second order variable were significant at $p < .01$. See Figure 4.

The final measurement model 3a for Drug Resistance indicated convergence problems. According to Muthén and Muthén (2010), convergence problems can happen because of various reasons, including “variables in the model being measured on very different scales, poor starting values, and/or a model being estimated that is not appropriate for the data” (pp. 415). After review of the model output, it was determined that the Normative Believe composite variable (made up of six scale questions) had a large negative residual variance of -1.852, not allowing the model to converge. Thus, the recommendation to estimate the model parts separately rather than complete a second-order CFA was followed (Muthén & Muthén, 2010).

The CFA for the Attitudes about Alcohol and Substances, model 3.1a, indicated poor model fit; $\chi^2_{[45]} = 1488.455$; RMSEA = .240 [95% CI = .215, .267]; CFI = .828, NNFI = .779; and SRMR = .050 (the only fit index that indicated excellent model fit). A revised model (3.1b), after review of MIs, allowed for the residuals for items 1 and 3, 4 and 8, as well as 7 and 8 to covary. This new model (Figure 5) indicated overall good model fit: $\chi^2_{[45]} = 434.489$; RMSEA = .093 [95% CI = .061, .125]; CFI = .912, NNFI = .876; and SRMR = .038.

The CFA for the Knowledge of Risks scale (model 3.2, Figure 6) indicated overall good model fit; $\chi^2_{[6]} = 292.259$; RMSEA = .072 [95% CI = .00, .207]; CFI = .996, NNFI = .987; and SRMR = .019.

Finally, the CFA for Normative Beliefs (model 3.3a) indicated poor model fit: $\chi^2_{[15]} = 310.049$; RMSEA = .246 [95% CI = .197, .299]; CFI = .773, NNFI = .621; and SRMR = .090. Examination of the MIs indicated that a revised model should allow the residuals for items 1 and 2, 1 and 3, 2 and 3, and 5 and 6 to covary. Revised model 3.3b (Figure 7) had improved but poor

fit: $\chi^2_{[15]} = 310.049$; RMSEA = .162 [95% CI = .101, .230]; CFI = .934, NNFI = .835; and SRMR = .060.

Structural Models. The second step to mediation analysis, after assessing the direct relationship between the predictor of interest and outcome of interest, was to assess the relationship between the predictor of interest (LST-infusion treatment indicator) and the mediating variable. Therefore, the *a* path of each mediation model (LST-treatment indicator predicting significant increases in each mediation variable in separate models) needed to be established. Each mediator was tested individually to start to determine if participation in the LST program was associated with higher skills in the participants. For all models assessing the *a*-paths, gender, age (mean-centered), number of days absent, and the baseline score of the mediating variables were held constant. SEM was used to assess all models in this step.

Model 1 estimated the *a*-path for the mediating variable of Social Skills. Overall the model had acceptable fit, with : $\chi^2_{[249]} = 398.156$; RMSEA = .077 [95% CI = .063, .091]; SRMR = .089. However, other fit indices indicated poor model fit: CFI = .868, NNFI = .852. The parameter estimate for the treatment indicator was .030 ($SE = .072$, $p = .681$), indicating that the treatment group for the LST-infusion, while holding constant covariates, did not show a significant improvement in social skills. The only significant predictor of social skills was Time 1 communication skills, $b = .331$, $SE = .104$, $p = .001$. Thus, the *a*-path was non-significant and Time 2 Social Skills did not mediate the relationship between LST-infusion intervention and frequency of substance use, substance use intentions, or delinquent behavior.

Model 2 estimated whether LST-infusion predicted an increase in Personal Self-Management Skills—the *a*-path of the second mediation model. The structural paths for the LST indicator variable and all covariates (including Advertising Skills, Decision-Making Skills, and

skills for Coping with Anxiety at Time 1) were included in the model. The model had poor fit: $\chi^2_{[271]} = 441.440$; RMSEA = .079 [95% CI = .065, .092]; CFI = .831, NNFI = .811; and SRMR = .100. Structural paths of the model indicated that the LST treatment group did not have improved Personal Self-Management Skills; $b = -.052$, $SE = .072$, $p = .470$. Expectedly, Advertising Skills at Time 1 and Decision Making Skills at Time 1 both significantly predicted Personal Self-Management Skills at Time 2; $b = .149$, $SE = .053$, $p = .005$ and $b = .245$, $SE = .079$, $p = .002$, respectively. No other pathways were significant; $p > .05$. Given that the a -path was non-significant, Time 2 Personal Self-Management Skills did not mediate the relationship between LST-infusion intervention and frequency of substance use, substance use intentions, or delinquent behavior.

Models 3a, 3b, and 3c assessed the hypothesized factors for Drug Resistance independently, given the results of the CFAs. First, 3a evaluated the a -path for the effect of the LST-infusion on Attitudes about Alcohol and other Substances. Time 1 attitudes along with the other aforementioned covariates were included in the model. Overall, the model had adequate fit, with RMSEA indicating poor model fit; $\chi^2_{[77]} = 205.240$; RMSEA = .128 [95% CI = .107, .150]; CFI = .887, NNFI = .861; and SRMR = .044. The structural path for the a -path of the mediation model was non-significant: $b = -.099$, $SE = .113$, $p = .381$, indicating that the LST-infusion group did not show a decline in positive attitudes about substances compared to the comparison group, holding all other variables constant. The only significant path was for the pre-test score of Attitudes; $b = .689$, $SE = .092$, $p < .001$.

Second, Model 3b evaluated the relationship between LST and Knowledge of Risks, holding constant all other variables and Time 1 Knowledge of Risk. This model also had adequate fit, with RMSEA indicating poor model fit; $\chi^2_{[77]} = 42.532$; RMSEA = .121 [95% CI =

.076, .168]; CFI = .921, NNFI = .879; and SRMR = .049. The *a*-path of the model was non-significant, indicating that LST-infusion did not significantly increase participants' knowledge of risks, holding constant Time 1 Knowledge and all other covariates; $b = -.073$, $SE = .167$, $p = .662$. Time 1 Knowledge of risk was the only significant predictor; $b = .534$, $SE = .104$, $p < .011$.

Third, Model 3c assessed the *a*-path for Normative Beliefs about Substances, holding constant all other covariates and Time 1 Normative Beliefs. The model had overall poor fit, $\chi^2_{[31]} = 107.944$; RMSEA = .157 [95% CI = .125, .190]; CFI = .864, NNFI = .803; and SRMR = .104. Further examination of MIs indicated that the residual covariances between items 1 and 2 on the Normative Beliefs scale should correlate, and thus a new model, 3d, was specified. The new model indicated slightly better but still poor fit; $\chi^2_{[30]} = 82.371$; RMSEA = .131 [95% CI = .098, .166]; CFI = .908, NNFI = .862; and SRMR = .101. The structural path to estimate *a* in the mediation model was non-significant; $b = -.193$, $SE = .140$, $p = .169$, indicating that LST-infusion did not correct misinformation about norms around substance use compared to the comparison group. Time 1 Normative beliefs ($b = .262$, $SE = .103$, $p = .011$) and number of days absent ($b = -.127$, $SE = .054$, $p = .020$) both significantly predicted Normative Beliefs at post-test. Despite testing all components of the Drug Resistance variable separately, none were significantly higher at post-test for the LST-infusion group compared to the comparison group, controlling for all other variables. Therefore, no significant *a*-paths for this mediating factor were established.

After all SEMs were estimated, I confirmed the results using regression analysis. Given the relatively poor model fit for some of the structural models, the estimates may not have been trustworthy. SEM may not have been the appropriate modeling technique due to the scales used,

the participant numbers, or a combination. Thus, all models were re-run using multiple linear regression models. No a paths in any of the regression models were significant (all p -values $< .05$), and thus, the conclusion remains that skills did not mediate the relationship between LST infusion and substance use, substance use intentions, or delinquent behavior.

H3 Conclusion. A series of structural equation models were estimated to determine if mediation exists for each outcome variable (H3) with one of the latent mediating variables regressed on the treatment indicator. Results were confirmed with regression analyses. Despite the c paths for each outcome variable being non-significant, I continued to evaluate the a paths of the mediation models, given the guidelines of Rucker *et al.* (2011). Each mediator was tested individually first, and if the a path was non-significant, it would not be included in the final model. Results from the SEM models specified in this analysis indicate that no a paths were significant, and thus, results indicate that the hypothesized variables did not mediate the relationship between LST-infusion and frequency of substance use, substance use intentions, or delinquent behavior.

Fidelity assessment (H4)

Facilitators and mentors were all asked to self-report fidelity to each night's lesson and lesson infusion over 12 weeks. Facilitators reported very high fidelity ratings, ranging from .88 to 1 (88% of lesson completed to 100% of lesson completed). As detailed above, each mentee received three scores for mentor fidelity. Mentors reported high fidelity ratings during lesson time (that is, for assisting their mentee while the actual LST lesson was going on) -- .63 to 1 with an average score of .89 ($SD=.084$). Mentors struggled with the actual infusion of the LST lesson, with fidelity scores for required components ranging from .21-.94 (21% of the goals for infusion

were reached to 94% of the goals were reached; $M=.61$, $SD=.21$) and fidelity scores for suggested components ranging from .13 to .93 ($M=.60$, $SD=.23$).

To evaluate whether higher mentor fidelity to the LST program lead to more positive outcomes in youth, multiple linear regression modeling was used. First, ten models were estimated to determine if higher levels of infusion fidelity (mentor required and mentor suggested LST infusion) predicted an increase in skills in the youth, the predicted outcome. In all models, number of days absent, mentee age (centered), and baseline scores of the outcome variable were included as control variables. Results of all models indicated that mentor fidelity to infusing the LST lesson into the activities was not significantly associated with any youth skills, knowledge, or attitudes at post-test (see Table 6). For six of the models, the only significant predictor was the baseline score of the outcome variable: Communication Skills pre-test $b=.901$, $SE=.185$, $p<.001$; Decision Making Skills pre-test $b=.642$, $SE=.163$, $p=.001$; Refusal Skills pre-test $b=.660$, $SE=.237$, $p=.012$; Advertising Skills pre-test $b=.922$, $SE=.135$, $p<.001$; Attitudes about Substances $b=.595$, $SE=.134$, $p<.001$; Normative Beliefs about Substances $b=.540$; $SE=.174$, $p=.006$. Four of the models had no significant predictors – models with outcomes of Assertiveness, Knowledge of Risks, Coping with Anxiety, and general Life Skills Knowledge. Overall, mentor fidelity for LST-infusion (either the required components of the LST lesson or the additional suggested components of the LST lesson) did not predict an increase in skills or knowledge.

Evaluation of moderation effects by gender and age

The analysis plan above indicates that moderation effects by gender and age would be assessed for these data. However, given the lower-than-expected participant numbers, power

levels were too low to detect significant effects. Therefore, the evaluation of moderation effects was abandoned.

Exploratory Evaluations

Was the LST infusion successful for youth that already had begun experimenting with drugs and alcohol? To continue to explore the effectiveness of the LST-infusion intervention, youths who had previously experimented with drugs and alcohol were included in separate analyses of effectiveness. In order to be included in the analysis, the participants (LST-treatment group only) had to have reported, at pre-test, using drugs or alcohol at least one time in the past 30 days on the Frequency of Substance Use scale. A total of 28 participants in the treatment group had reported some past experience with alcohol or other drugs, $M = 2.21$, $SD = 1.36$, and 24 participants in the comparison group reported some past experience with alcohol or other drugs, $M = 2.13$, $SD = 1.26$.

Twelve hierarchical linear regression models were estimated to determine the treatment effects of LST on the three outcome variables (frequency of substance use, substance use intentions, and delinquent behavior) or the levels of skills and knowledge varied based on group membership. First, for each dependent variable, a model was specified with all control variables (gender, age, days absent, frequency of past substance use, and the Time 1 score of the dependent variable). Second, the treatment indicator for LST was added. – LST and the Time 1 score of the dependent variable – and covariates. The final models specifying whether the LST-infusion was effective for participants with previous experience using substances are given in Table 7 (the three outcome variables), Table 8 (Social Skills), Table 9 (Personal Self-Management Skills), and Table 10 (Drug Resistance Skills).

Results of these analyses indicate for participants that had past history of substance use, the LST-infusion did not significantly increase skills or decrease substance use, intentions to use, or delinquent behavior. For all skills and outcome variables, the baseline level of that particular variable was a significant predictor of the post-test score, with the exceptions of Refusal Skills and Advertising Skills. Surprisingly, Advertising Skills actually significantly decreased for individuals in the LST-infusion group (refer to Table 9). Overall, results indicate that participants with past experiences using substances did not benefit from the LST-infusion.

Did the LST-infusion increase general Life Skills Knowledge for Treatment versus Comparison groups? In order to determine if general knowledge about life skills had a significantly higher increase in the treatment versus comparison groups, a multiple linear regression model was specified. Gender, days absent, age (mean-centered), and Time 1 knowledge were included as covariates, with the LST-treatment indicator then added to the final model. The final model indicated that controlling for all covariates, LST did not predict an increase in knowledge over the 12 weeks, $b = -.044$, $SE = .664$, $p = .947$.

CHAPTER IV: DISCUSSION

Overview

The purpose of the current project was to design, implement, and evaluate an evidence-based Life Skills Training Infusion into the context of an existing evidence-based mentorship program, Campus Connections. The primary goal of the LST-infusion was to teach the at-risk youth participants the knowledge and skills they need in order to prevent substance use or substance use initiation, as well as reduce or prevent delinquent behaviors. Considering over 70% of high school students report at some point having tried alcohol by grade 12, 20% report being current binge drinkers, and 40% have at some point tried marijuana (Johnston et al., 2009; YRBSS, 2011a), it is critical for researchers and practitioners to develop new and innovative ways to reduce substance use and substance use initiation within this population.

Past studies have successfully utilized infusion models (e.g., Swisher et al., 2001, Smith et al., 2004) to achieve positive outcomes such as substance use reduction or prevention. An infusion model approach allows for researchers and practitioners to take an evidence-based program and re-design the delivery so that the content is spread across different instructors, learning opportunities, or activities (Swisher et al., 2001). However, research has yet to identify best practices for designing infusion models. The current project added to the existing body of literature about infusion model methodology by designing a novel intervention to infuse LST-curriculum into an existing mentorship program. No other known studies have attempted to accomplish this.

This LST-infusion intervention was designed to impact participants' social skills (assertiveness, refusal skills, and communication skills), personal self-management skills

(decision-making, advertising skills, and skills for coping with anxiety), as well as drug resistance (decrease positive attitudes, correct any misinformed normative beliefs about peer substance use, and increase knowledge of risks). In turn, it was expected that youths who went through the LST-infusion condition would have reduced self-report substance use, reduced substance use intentions, and lower rates of self-report delinquent behavior. Unexpectedly, the hypotheses were not supported for this study. Youths in the LST-infusion group did not show an increase in any of the expected knowledge sets or skills (Hypothesis 3), nor did they show a decrease in substance use, intentions to use, or delinquent behavior (Hypotheses 1 and 2). In addition, the overall fidelity of the LST infusion did not predict positive changes in the youth's skills, attitudes, or knowledge about substances (Hypothesis 4). This indicates that the lack of significant findings was not necessarily because of program delivery, because it would be expected that participants with higher fidelity scores would have significantly better results (i.e., they would have had higher skills after the intervention, and lower levels of substance use, intentions to use, and delinquent behavior). In addition, the current study did not find that results varied based on age or gender, nor did the LST-infusion have an impact on adolescents that have already begun experimenting with drugs or alcohol. While these findings may have come as a disappointment, many practical and theoretical implications can be drawn and applied to future research.

Practical Implications

Despite LST being an evidence-based program, administering it in this particular method of infusion did not lead to the expected positive outcomes. This does, however, demonstrate that evaluation of prevention programs, even evidence-based ones, should be an essential part of practice (both in research and in the community). According to a recent report by the U.S.

Department of Education (2011), elementary, middle, and high schools across the country implement up to 20 prevention programs each year. However, only around 8% of these prevention programs are evidence-based, and less than half (44.3%) of the evidence-based programs implemented were implemented correctly. In particular, time dedicated to the program was a large barrier, as well as providing rewards and skill mastery for participants. The report cites a few additional barriers, including training quality for administrators and staff, and ongoing training for facilitators. As demonstrated by the current study, one process that could greatly help our schools' prevention programs is evaluation of those programs in the setting with which they are implemented. That way, schools are able to improve program fidelity and save time and money by not implementing programs that are not working for their student demographic or particular circumstance. If schools are using their own version of "infusion" models of these programs (i.e., changing the program to fit within time constraints or delivery mechanisms), it is especially essential to evaluate the effectiveness of the program.

Another implication of the current study is that it confirms more is needed to affect those key mediators that ultimately lead to lower levels of substance use, including knowledge, skills, and attitudes. Current research is exploring the effects of improving executive functioning skills on substance use in youth, including inhibitory control, emotional control, working memory, planning skills, and mindfulness (e.g., Pentz, Riggs, & Warren, 2016). Other research has shown that stressful life events and deviant peers are predictive of more substance use in youth (Whitesell, Asdigian, Kaufman, Crow, Shangreau, Keane, Mousseau, & Mitchell, 2014). Perhaps teachers, parents, practitioners, and community members need to be building behavioral skills of adolescents, including stress-management at a young age, and working to improve cognitive skills well before the age that adolescents may be given the opportunity to make their own

decisions about drugs and alcohol. In addition, past studies have shown that earlier substance use initiation is associated with a greater likelihood of substance use disorders in adulthood (e.g., Windle et al., 2008). Given that the average age of the current study was just under 14 years old, earlier intervention than eighth grade (on average) may be the key to the success of substance use prevention programs, before the adolescents are exposed to opportunities to use alcohol and other substances.

The lack of significant findings demonstrates that improvements could be made to the current project. One implication of this in particular involves training and support for mentors. Three facilitators delivering the content of the LST lessons were trained using Botvin's training program online. However, mentors, who were interacting personally with the mentees every session, did not receive this official training. Many other prevention programs in schools cite facilitator training as a challenge or barrier to successful implementation of a program (U.S. Department of Education, 2011). Training mentors extensively rather than just training LST facilitators may have improved the outcomes for the project.

Another practical implication of the current project is the generalizability of results. The current project had a very specific population – at-risk adolescents that were already enrolled in Campus Connections, a youth-mentoring program that had in the past demonstrated positive effects (Weiler et al., 2013). The idea of an infusion-model is that an evidence-based intervention is adapted and infused into an existing curriculum of another program – thus, by definition, the effectiveness of the tested infusion model is limited to that particular circumstance. In other words, just because the designed intervention did not work for this particular project does not mean that Botvin's Life Skills Training would not be effective as an

adapted program in another circumstance. The results of the current project cannot be generalized to other populations given the very specific design of this LST-infusion.

A final practical implication of this study is that the lack of significant findings could, simply stated, mean that the addition of LST components to Campus Connections did not add value in terms of advancing youths' skills. Given that CC is already an evidence-based program with demonstrated effectiveness in reducing substance use, decreasing positive attitudes about substances, and increasing support-seeking behavior among participants (Weiler, 2014; Weiler et al., 2015). It is possible that youth participating in the CC program already are benefitting at a maximum level and increasing skills through other structured activities. In that regard, the addition of LST may not provide any additional benefit above and beyond the benefits of CC itself.

Advancing Theory

One major contribution this study has made to advance theory includes the systematic assessment of infusion models. The design of this project allowed for the comprehensive evaluation of the Ecological Model and multiple different factors that contribute to substance use, substance use attitudes, and delinquent behaviors. The longitudinal data provided by this study allowed for a mediation-type assessment. In this way, I could evaluate whether receipt of the LST-infusion program led to changes in skills, knowledge, and attitudes, which then led to a decrease in substance use or intentions to use. Given this type of design and evaluation, we can be confident in the conclusions drawn compared to a simple correlational study. However, given the lack of significant findings for this particular intervention, one might also conclude that attempting to affect too many factors from the Ecological Model may not lead to the

hypothesized changes in behaviors and skills. A twelve-week program simply may not be enough time to accomplish skill-building in myriad areas.

Additionally, the current study demonstrates that there is a need to continuously study evidence-based interventions that may be delivered in a novel way. The fact that the current LST infusion did not produce significant results – i.e., participants receiving the intervention did not have increased skills, decreased positive attitudes, or decreases substance use/substance use intentions—means that researchers and practitioners need to be diligent in assessment of evidence-based programs that are implemented under their watch. Just because a program is labeled “evidence-based” does not mean that all implementation procedures will be followed properly, that it will work for the current population, or that a new delivery mechanism will allow for the same outcomes to be achieved.

Strengths

The current study had several strengths that show both rigor of experimental design and expansion of the previous literature. First, the novel design of the intervention demonstrates that new ways of delivering evidence-based programs are viable. Evidence-based programs can and should be adapted and customized to fit within the context of a specific need (and, of course, evaluated throughout the process). A canned program, while demonstrated to be effective, may not be feasible for every circumstance. The current study describes and evaluates one methodology for adapting evidence-based programs and integrating them into existing frameworks. Hopefully, the study will pave the way for new innovation, tweaking of delivery, and ultimately a successful intervention to infuse LST into existing programs and thus reduce substance use among adolescents.

Another strength of the study includes the comprehensiveness of assessment of the youths, mentors, and facilitators. Participants were evaluated at two time points, while mentors were asked to provide fidelity information weekly and facilitators nightly. This allowed for a more fine-tuned analysis of the effectiveness of the program, given that I could include program fidelity, specific to each and every mentee, into the analysis.

A final strength includes the interdisciplinary and collaborative nature of the current project. The LST-infusion intervention was implemented in a field setting, with researchers from other disciplines as well as practitioners within Marriage and Family Therapy. There are many barriers to collaborative program design, implementation, and evaluation within the research/practice setting, including achieving the level of rigor in research as wanted by the researchers and integrating research into a setting that still achieves goals for clients, and parties focusing on their own agendas and goals (Secret, Abell, & Berlin, 2011). The current project overcame these barriers, focused on common goals and objectives, allowed for collaborative design of the project and methodology, and produced a successful implementation of the LST-infusion.

Limitations

This investigation on the effectiveness of an infusion model of delivery for an evidence-based intervention to reduce substance use initiation, decrease positive attitudes towards substances, and increase knowledge about the risks associated with substance use has a few limitations that warrant discussion. Limitations fall into a few categories: limitations with reporting, training, program design, research design, participants, and situational limitations.

Limitations with reporting. First, when working with adolescents, trust is a major issue for self-report of substance use. Past research has demonstrated self-report to have fair validity

at best. For example, one study's results included 26% of youth participants reporting no current substance use but urinalysis with a positive result (Williams & Nowatzki, 2005). Specific to this project, youths begin the mentorship program not knowing the adults in charge, and are immediately asked to take a self-report survey that has them reflect on substance use, substance use attitudes, and other delinquent behaviors. The youths may not have felt comfortable disclosing substance use behaviors, even though they were assured confidentiality. After being involved in the program for 12 weeks, the youths may then have been more at ease with the adults. During the exit survey, then, the participants may have felt more comfortable disclosing their substance use and other negative behaviors. This may have created an artificial inflation of scores; i.e., it looks like the program actually increased substance use behaviors or promoted positive attitudes toward substances, when in fact, the program may not have done that. Self-report measures may be limited in this respect compared to more objective measures such as GPA or truancy. However, when assessing behaviors that are inherently personal and private, and involve attitudes and feelings, self-report (although biased) is arguably the best way to conduct research. The current survey tool asks a single question about honesty of answers both at pre- and post-test. Unfortunately, this is not always sufficient protection against this particular challenge of research with sensitive topics.

Secondly, within-person longitudinal reports also are affected by maturation. In other words, as adolescents grow older they are more likely to have experimented with substance use or increase use. Given the relatively short duration of the study (12 weeks) and the comparison group, developmental effects should have been limited.

In addition, the survey tool itself had a few limitations. The self-report delinquent behavior scale in the survey asked participants to rate how often they had participated in various

behaviors within the past month (e.g., *how often in the past month have you stolen from a store?*). The participants took the pre-test survey at intake, reflecting on the past month before starting the program. However, when they took the post-test survey at program's end, they were reflecting on the past month which was still a timeframe that they were receiving the LST lessons. Questions on the Frequency of Alcohol and Drug Use scale used somewhat ambiguous wording when taking into consideration when the participant would have been using substances (e.g., *how often (if ever) do you drink until you get drunk?*). Participants would have been reflecting on past behavior, which by default would have included behaviors that occurred before the end of the intervention time period. Therefore, the post-test timing did not allow for the full effect of the LST program to have taken place. The better design would have been a one-month follow up, in which participants were contacted one month after the program completion to take the post-test survey. This would have allowed them to reflect on substance use for the first month after completion of CC.

Third, reporting for the fidelity assessment was sporadic, at best. Mentors were asked to report fidelity every week. However, many mentor fidelity worksheets were submitted blank (1%), were submitted without proper identification (4%) or were never submitted (~20%). This led the average fidelity score, oftentimes, to consist of perhaps just 8 or 9 individual fidelity scores reported by mentors. Including number of days absent in the analysis should have accounted for some of these inconsistencies, given the ambiguity of reason for blank or not-submitted mentor fidelity sheets.

Limitations with training. Another limitation for this study was the training offered to the mentors. All LST facilitators received the full online training in order to deliver the content of the lessons to the youths. Mentors, who spent the majority of the evening in direct contact

with their assigned mentee, only received a brief 1.5-hour training on the purpose of the program and the appropriate methods for infusing the topics into the rest of the night's activities.

Unfortunately, the training was also not age-specific, so mentors who were paired with 17-year-olds, for example, received the same training as mentors that were paired with 12-year-olds. One could imagine that discussions of LST topics might look quite different depending on if the youth was a pre-teen or about to graduate high school. A few mentors expressed discomfort when it came to talking about certain things with their mentees, such as marijuana use. Past research has demonstrated that training is a key component of program fidelity and can contribute to a positive impact of the prevention program (Dusenbury, Brannigan, Falco, & Hansen, 2003). More rigorous training of all mentors may have resulted in more positive and knowledgeable one-on-one interactions between mentors and mentees. In addition, more training may have helped the mentors understand the importance of consistent discussion of the night's topics and reduced variation of the amount of time dedicated to discussion of topics from one mentee to the next. Mentors were instructed to "infuse the topics from the lesson of the night" into at least one additional activity that night, set a goal for the week, and then revisit the following week. Mentors were also told they should discuss the topic from the night at more than one occasion if possible, but this was not required. And while the mentors' activities were tracked, the content of their discussions with their mentees was not monitored. More training of mentors, a stronger focus on what was important for mentors to discuss, and more opportunities for mentor support could have led to a more consistent experience across all participants.

Limitations with program design. Interesting logistical challenges presented themselves over the course of this study. One important one was the use of the middle-school LST program for all age groups within CC. To keep the delivery of the LST lessons consistent,

the middle-school LST curriculum was utilized across age groups, and LST facilitators were instructed to adapt the material to be age appropriate. This means that high school aged kids, who may have benefitted from a more in-depth curriculum, may have been missing out on key information. Elementary school kids, on the other hand, may have been exposed to information that was too advanced for their understanding. While the themes of the lessons were similar across all age groups anyway (all LST programs include lessons on decision making, goal setting, social skills, etc.), the way that the lessons are delivered and the activities that the participants complete vary. The current study may have benefitted from using the appropriate LST curricula for each age group.

Designing the infusion curriculum was challenging, as well. The Campus Connections mentorship program had specific activities and goals for mentees to participate in each night. Therefore, LST facilitators had very strict time constraints when it came to delivering the content of the lessons (about 20 minutes per night). Some nights also had to have two lessons combined into one 20-minute time period. The original LST program's lessons were approximately 1-hour in length. If mentors were not following through with behavioral practice and coaching, then mentees may have been missing out on a good portion of the curriculum.

Additionally, certain pieces of the LST-infusion could have been designed and enforced better. In particular, goal-setting is a major component of the LST curriculum, however, the LST-infusion had it set up as a “suggested” component to the evening. Given the dozens of pairs of mentors and mentees, goal-setting was asked about on fidelity forms but not enforced as a necessity for the program. Goal-setting practice would have allowed for mentees to take a piece of the program home with them and focus on it for a week, and then check back in with their

mentors and be held accountable. This may have reinforced what the participants were learning each week and allowed for more positive changes over time.

Limitations with research design. The current study used an experimental design with a LST-infusion treatment group and original CC-curriculum comparison group to evaluate the effectiveness of the given intervention. However, given that the CC youths are able to choose the night they would like to attend the program (based on availability, other extracurricular activities, etc.), true random assignment of participants was not available for the current project. Instead, nights were assigned to either receive the LST infusion or continue as the original CC curriculum. Participants did not know in advance whether they would be receiving LST or not; however, a true randomized control trial would have involved randomly assigning the participants to either treatment or control. In addition, given the constraints of the project, the nights that were chosen to be “comparison group” nights needed to have more youths (in other words, there were more night allotted to be “treatment” groups compared to nights allotted to being “comparison groups”). So youths involved in the LST-infusion version of CC also had, on average, smaller group sizes for CC in general. This may have been a confounding factor in the experiment.

Another research design limitation includes a lack of a systematic qualitative component. Mentors and facilitators were simply asked to “comment” on the night’s session, things that went well, or things that could have been improved. A more systematic collection of anecdotal evidence from mentors and facilitators is an essential missing piece of this study. Anecdotal evidence would allow for steps to be taken to improve the design of the current infusion model.

Limitations with participants. Another limitation of the current study is the overall participant numbers. According to the power analysis conducted pre-intervention, approximately

240 participants were needed (120 in the treatment and 120 in the comparison group) in order to detect a small to medium effect. The study was conducted over the course of three terms, and unfortunately due to drop-out, participant repetition (i.e., participants having been through the CC or LST program before), and participants not completing surveys, the overall participant numbers for both the LST-infusion and the comparison groups were low—85 in the treatment group, and 81 in the comparison group. In addition, CC was already an intervention that targeted substance use, substance use attitudes, and delinquent behaviors. The LST-infusion aimed to impact the key mediators of social skills, personal self-management skills, and drug resistance in order to ultimately reduce substance use and delinquent behaviors even more. Therefore, the number of participants for the current project may simply not have been enough to detect any positive effects of the LST-infused version compared to the original CC version of the intervention.

A possible confounding factor in the present study includes the criteria for admittance into the CC program. CC focuses on at-risk youths, and many of the youths come to CC with preexisting academic, substance use, legal, or behavioral problems. Past delinquent behavior and substance use was controlled for in the current analysis. However, the youths in the program may have benefitted even more from being introduced to pro-social youths their own age or completing the LST training with more friends and acquaintances. It is difficult to determine if this in fact had an effect on the current study. One could imagine that participating in pro-social activities, campus tours, LST lessons, and a positive relationship with a college student would allow for a positive impact of the program. However, if participants did not bond with other pro-social youths their own age, then going home or back to school with the same people that possibly have a harmful influence on their lives could negatively impact the youths' ability to

make pro-social decisions. It might be more challenging for youth to implement the lessons learned in LST if their friends and acquaintances have not also received the LST lessons. Young people who participate in LST in a school setting, with all of their peers, may be more likely to benefit from LST given that they would have a larger support system.

Limitations with analysis. The current study had a few limitations in regards to the analysis of the effects. My initial plan for the analysis included utilizing SEM for all analyses. However, given the smaller-than-expected sample size and models with less than ideal fit, SEM may not have been the most appropriate technique. This may be because the chosen scales were not valid representations of the constructs in the theory. Regression modeling was thus used to confirm all results for the mediation analysis path *a*. In addition, I was unable to complete the analyses of group effects for differences by gender and age because of small sample sizes and lack of power. The current study would have benefitted from a larger sample size in order to achieve levels of power needed for moderation effects. Analyses for the treatment effects for participants with a past history of substance use were completed; however, lack of power is also a concern when interpreting these results.

Situational limitations. Next, the delivery of the LST-infusion was limited given unforeseen circumstances. For some of the LST nights, CC was cancelled or delayed due to weather. Some lessons were skipped and some were combined (for example, delivering two LST lessons in one 20-minute period). This reflects the reality of delivering an intervention in a real community setting; however, it also may impact the overall efficacy of the program. A version of the program in which all participants received the same “amounts” of lessons may have had a more positive impact on the desired outcomes.

A final limitation has to do with the timing of the project and historical developments in Colorado, where the project took place. In particular, one primary goal of this initiative was to reduce substance use and reduce positive attitudes towards substance use. During this period, Colorado laws around marijuana were changing, and specifically, recreational marijuana was made legal for individuals age 21 and older. While this does not affect the ability for youths in the project to be legally allowed to smoke marijuana (all were under the age of 21), it did affect the conversations that the LST facilitators and mentors had with the youths in the program. Ultimately, changing attitudes around the acceptability of marijuana in the state and subsequent changes in the legal status of marijuana could have had an impact on the positive attitudes of the youths toward marijuana use.

Future Research

Future research studies should focus on the design and evaluation of new infusion models to improve program outcomes. The current study, while overall having no impact on the outcomes targeted, did demonstrate that infusion models can be designed with a rigorous evaluation process in mind. Re-design of the infusion method could lead to a successful infusion-model intervention. For example, the current program could have benefitted from better mentor training, longer LST-content lessons delivered by facilitators, more of a focus on goal-setting, and a focus on delivering age-appropriate material. In addition, it may be worthwhile to determine if a similar LST-infusion program could be effective for a youth population that is not specifically designated “at risk” and therefore maybe has less knowledge or preemptive biases about substances before the program begins.

Second, future research should focus on evaluating best practices for infusion model designs. In general, what factors of the original prevention program are essential to be included

in an infusion model? What can be changed? Guidelines for infusion model design and delivery would benefit not only the current project, but many prevention programs implemented in schools and community settings country-wide. Perhaps content is best learned at home by participants, and group settings need to focus on behavioral practice. Or, perhaps peers need to take a greater role in behavioral practice rather than one-on-one with an older adult. Perhaps multi-modal delivery is not as effective for certain types of interventions such as substance use prevention. Future work should evaluate the different ways that infusion models can be designed in order to maximize effectiveness and efficiency.

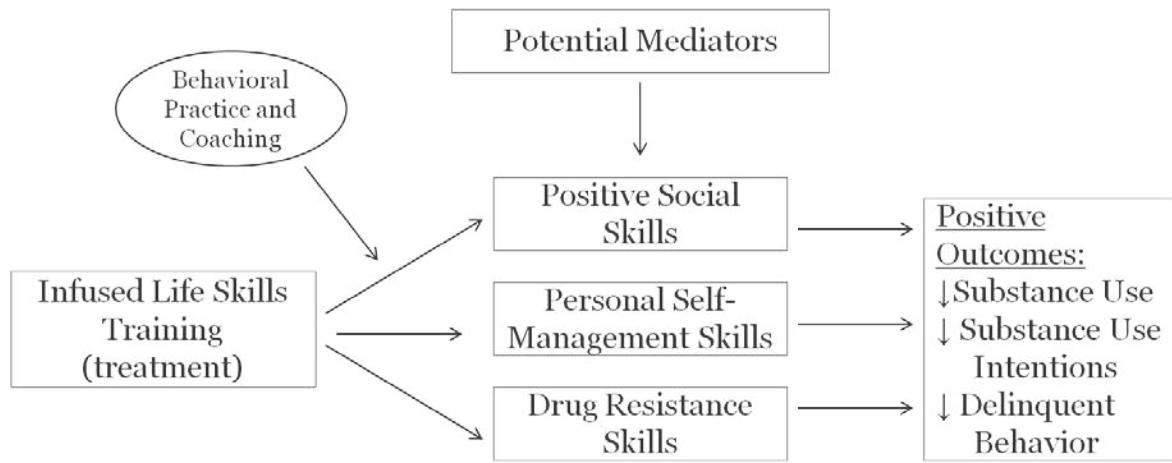
Finally, future research should take into consideration the country's changing attitudes around particular substances – especially marijuana. With the legalization of recreational marijuana use in four states (including Colorado, where the current study took place), it is difficult to fully understand how attitudes around the drug are changing. In particular, young people should not be affected by the changing laws – they are under the legal age of 21. However, with more social acceptability and availability, youth attitudes about a new legal substance may lead to an increase in earlier substance use initiation. More research on this topic is essential as laws continue to change.

Conclusions

The purpose of this study was to design, implement, and evaluate an evidence based infusion model for Life Skills Training in at-risk youths. Contrary to the hypotheses, the LST-infusion did not increase social skills, personal self-management skills, drug resistance, substance use, substance use intentions, or delinquent behavior for youths in the LST-group versus youths in the comparison group. This study reinforces the necessity of evaluation of prevention programs in each and every setting they are implemented. While there are many

limitations to the current project, the rigorous design and multi-disciplinary approach demonstrate the value of partnerships between researchers and practitioners when it comes to prevention programs. In addition, this study leads into many new and exciting research avenues in the field of adolescent substance use prevention using infusion model methodology.

FIGURES



LifeSkills Training will increase social skills, self-management skills, and drug resistance skills, which will in turn decrease substance use, substance use intentions, and other delinquent behavior.

Figure 1. Logic model for LST infusion.

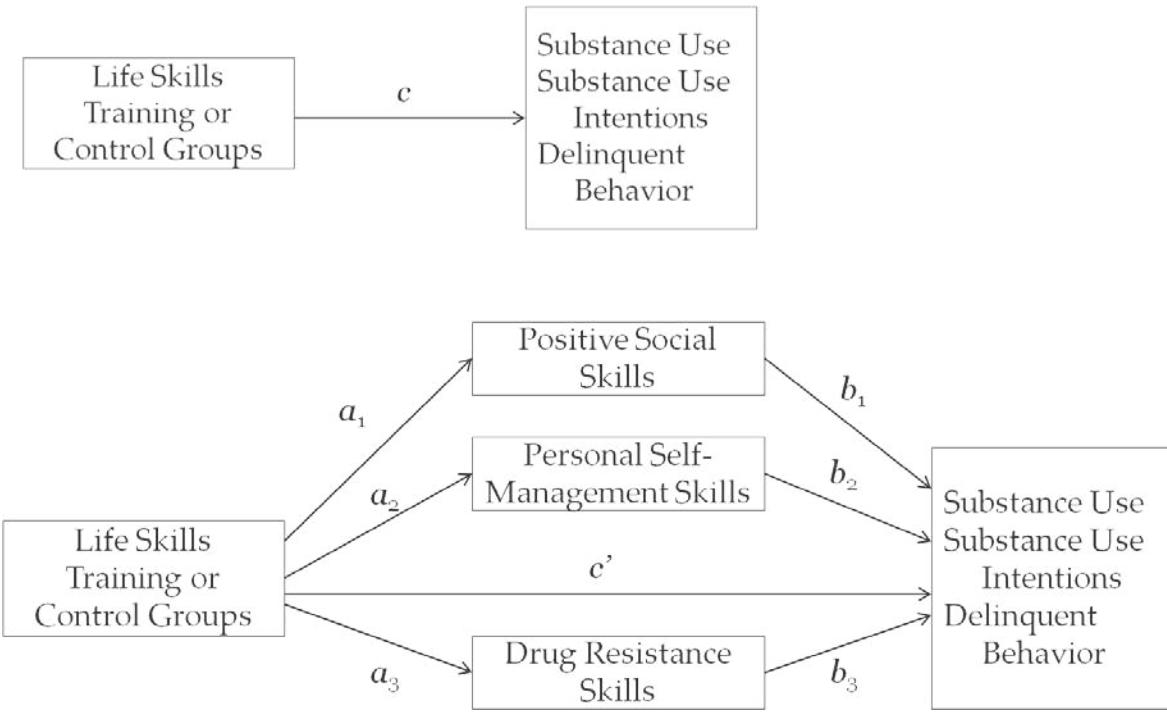


Figure 2. Depiction of multiple mediation model for hypotheses 1 through 4.

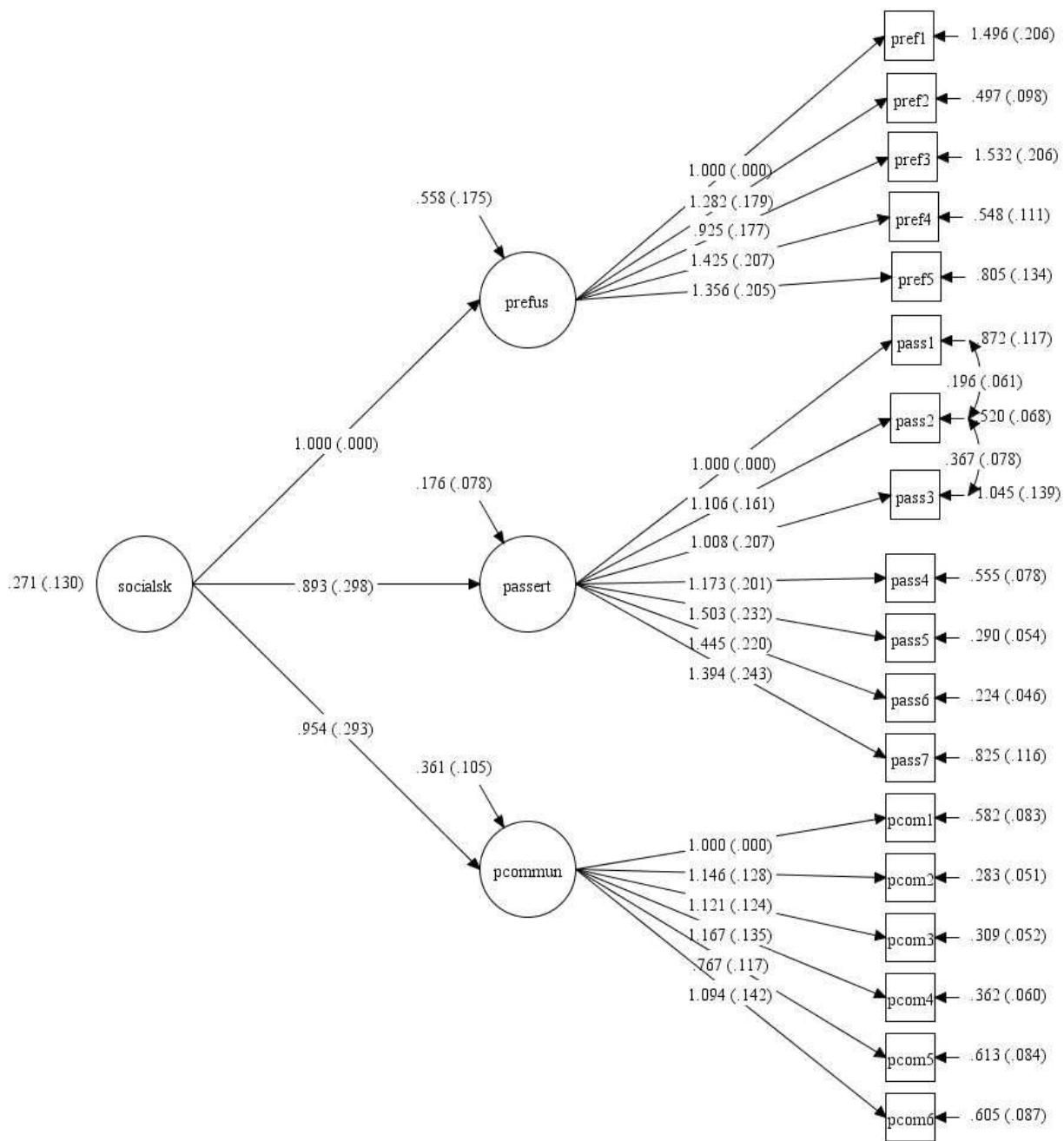


Figure 3. Second-order CFA for Social Skills. Standard errors for all factor loadings and error terms are in parentheses. *Pcom1-6* represent individual questions asked about communication; *pass1-7* represent individual questions on the assertiveness scale, and *pref1-6* represent scale questions on the refusal skills scale.

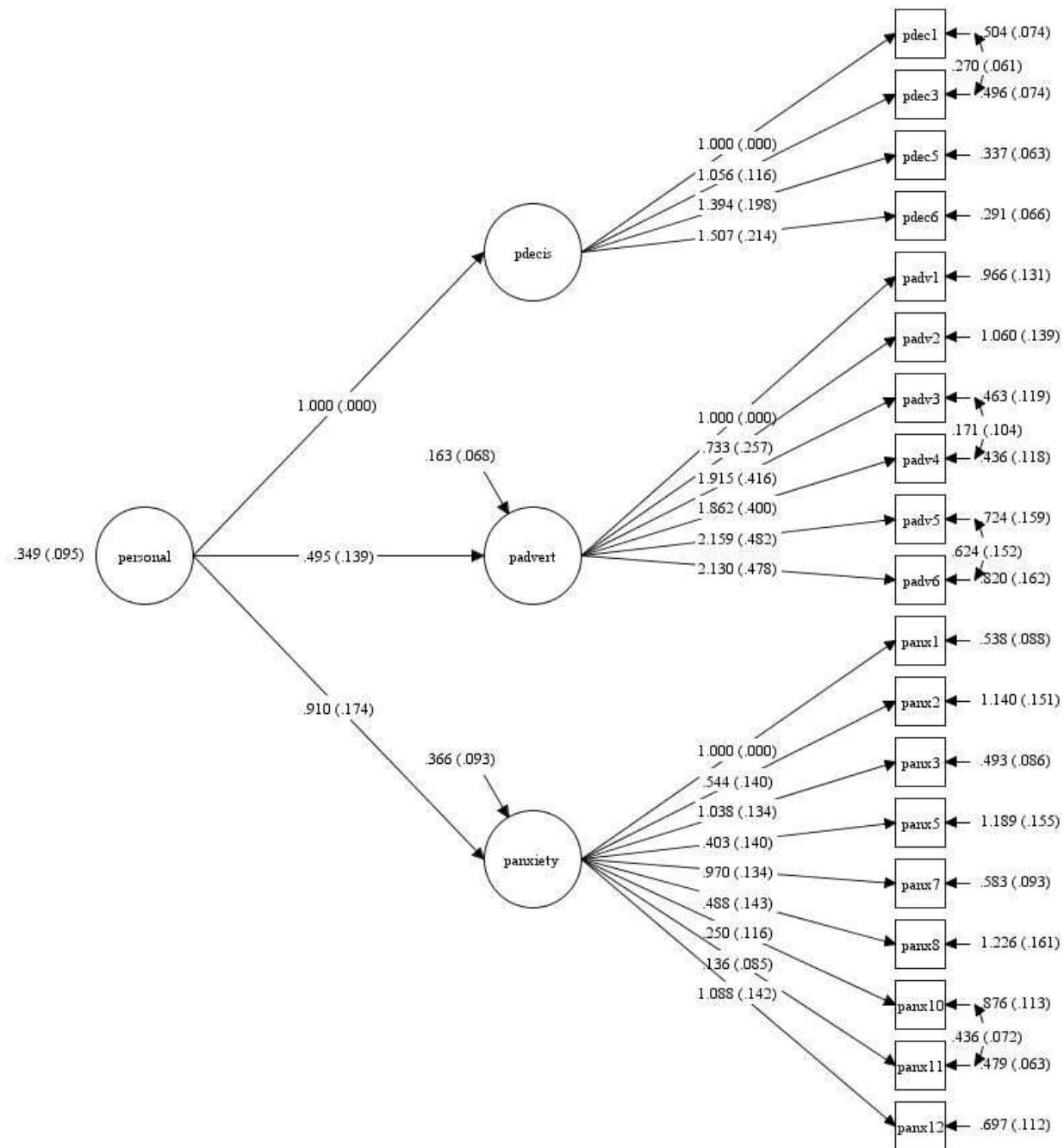


Figure 4. Second-order CFA for Personal Self-Management Skills. Standard errors for all factor loadings and error terms are in parentheses. Panx 1-12 represent individual questions asked about coping with anxiety; padv1-6 represent individual questions on the advertising skills scale, and pdec1-6 represent scale questions on the decision making skills scale.

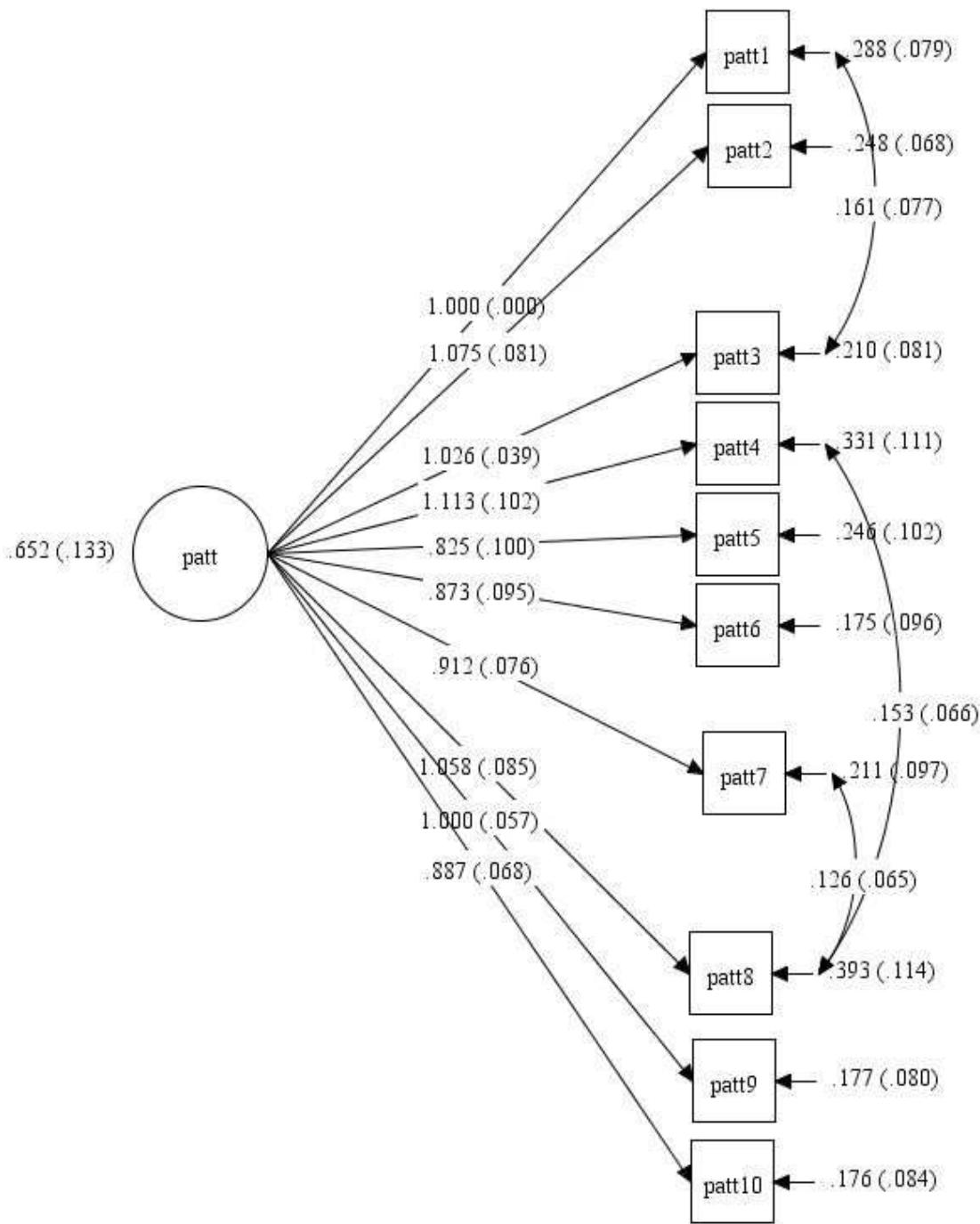


Figure 5. CFA results for Positive Attitudes about alcohol and other substances. Standard errors for all factor loadings and error terms are in parentheses. Patt 1-10 represent individual questions asked about substance use attitudes, while Patt represents the latent variable for attitudes.

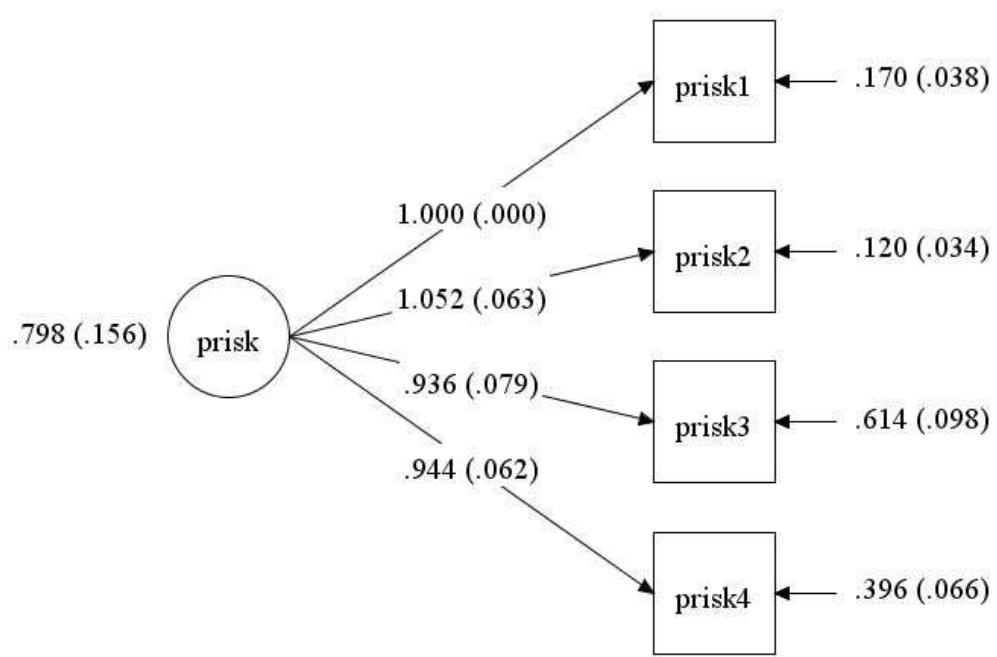


Figure 6. CFA results for Knowledge of Risks scale. Standard errors for all factor loadings and error terms are in parentheses. Prisk 1-4 represent individual questions asked about substance use attitudes, while prisk represents the latent variable for attitudes.

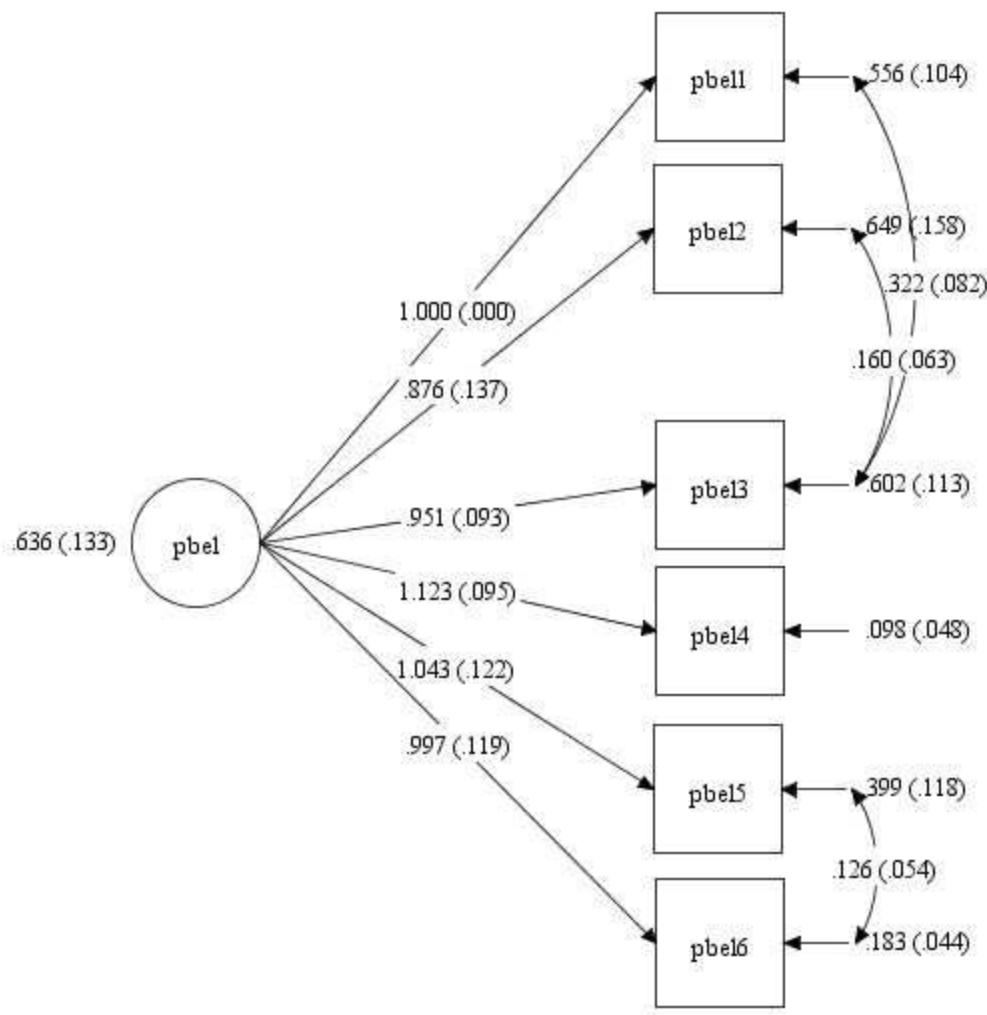


Figure 7. CFA results for normative beliefs about peer substance and alcohol use. Standard errors for all factor loadings and error terms are in parentheses. Pbel 1-6 represent individual questions asked about substance use attitudes, while Pbel represents the latent variable for attitudes.

TABLES

Table 1

Descriptive Statistics for All Mediating and Outcome Variables

Variable	Pre-test Scores						Post-test Scores					
	Comparison Group			Life Skills Infusion Group			Comparison Group			Life Skills Infusion Group		
	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>M</i>	<i>SD</i>	<i>SE</i>
Frequency of Substance Use	1.41	0.92	0.11	1.43	0.99	0.11	1.25	0.59	0.08	1.45	1.29	0.16
Intentions to Use Substances	1.33	0.60	0.07	1.33	0.58	0.07	1.31	0.52	0.07	1.35	0.73	0.09
Delinquent Behavior	2.69	2.97	0.46	2.54	3.12	0.36	1.81	1.59	0.22	1.89	1.96	0.24
Normative Beliefs	1.87	0.78	0.10	1.91	0.82	0.09	2.06	0.99	0.13	1.92	0.76	0.09
Substance Use Attitudes	1.53	0.72	0.09	1.57	0.76	0.09	1.57	0.81	0.11	1.66	0.82	0.10
Knowledge of Substances	9.49	3.26	0.40	9.91	2.79	0.31	9.41	3.71	0.48	9.55	3.80	0.47
Knowledge of Risks	3.28	0.77	0.90	3.20	0.73	0.08	3.19	0.98	0.13	3.06	0.88	0.11
Refusal Skills	3.48	1.10	0.13	3.70	0.98	0.11	3.54	1.19	0.16	3.48	1.18	0.15
Assertiveness Skills	3.92	0.83	0.10	4.06	1.12	0.13	3.93	0.90	0.12	3.86	0.82	0.10
Decision Making Skills	3.46	0.93	0.11	3.63	0.71	0.08	3.53	0.87	0.12	3.54	0.77	0.10
Advertising Skills	3.51	0.96	0.12	3.63	0.71	0.08	3.58	0.95	0.13	3.46	0.88	0.11
Coping with Anxiety Skills	3.36	0.49	0.06	3.49	0.55	0.06	3.36	0.47	0.06	3.38	0.36	0.05
Communication Skills	3.40	0.73	0.09	3.60	0.81	0.09	3.48	0.87	0.11	3.59	0.87	0.11

Note. *M* = Mean score, *SD* = Standard Deviation, *SE* = Standard Error.

Table 2

Correlations among Outcome and Mediating Variables

Variable	1	1p	2	2p	3	3p	4	4p	5	5p	6	6p	7	7p	8	8p	9	9p	10	10p	11	11p	12	12p	13	13p
1- Frequency of substance use	-																									
1p- Post Frequency	.854	-																								
2- Intentions to use substances	.808	.628	-																							
2p- Post Intentions	.623	.804	.700	-																						
3- Normative Beliefs	.308	.315	.359	.308	-																					
3p- Post Beliefs	.112	.376	.151	.343	.468	-																				
4- Substance Use Attitudes	.546	.541	.723	.601	.359	.156	-																			
4p- Post Attitudes	.452	.640	.649	.705	.440	.345	.716	-																		
5- Knowledge of Substances	-.143	-.138	-.210	-.084	-.305	-.178	-.383	-.207	-																	
5p- Post Knowledge	.096	-.042	-.058	-.044	-.186	-.305	-.036	-.200	.405	-																
6- Knowledge of Risks	-.057	-.100	-.082	-.124	.081	.208	-.157	-.145	.174	.063	-															
6p- Post Risks	.003	-.007	-.045	-.076	.244	.285	-.124	-.075	.104	-.030	.475	-														
7- Refusal Skills	-.428	-.347	-.424	-.373	-.196	-.072	-.435	-.326	.232	-.081	.165	.181	-													
7p- Post Refusal	-.287	-.147	-.281	-.243	-.209	.083	-.316	-.309	.112	-.145	.101	.266	.500	-												
8- Assertiveness Skills	-.064	-.098	-.060	-.085	.041	.154	-.118	-.189	.053	.055	.037	.198	.255	.287	-											
8p- Post Assertiveness	-.085	.056	-.042	.034	-.010	.223	-.052	-.029	.023	-.144	.131	.228	.213	.432	.480	-										
9- Decision Making Skills	-.220	-.099	-.196	-.196	-.082	-.011	-.242	-.210	.200	-.065	.242	.011	.306	.212	.389	.524	-									
9p- Post Decision Making	-.150	.008	-.109	-.039	-.010	.002	-.138	-.164	.208	.035	.135	.139	.264	.288	.344	.489	.548	-								
10- Advertising Skills	-.042	-.067	-.122	-.158	.135	.220	.194	-.172	.117	-.186	.358	.290	.174	.280	.166	.217	.370	.341	-							
10p- Post Advertising	-.057	.015	-.042	-.076	.102	.137	-.124	-.076	.097	.022	.194	.274	.218	.328	.138	.379	.437	.523	.481	-						
11- Coping with Anxiety Skills	-.345	-.217	-.320	-.193	-.131	-.055	-.314	-.171	.047	-.215	.063	-.077	.202	.125	.083	.175	.301	.083	.191	-.023	-					
11p- Post Coping	-.286	-.195	-.212	-.237	-.058	-.121	-.100	-.205	.044	-.020	.054	.032	.189	.264	.013	.285	.398	.531	.306	.397	.311	-				
12- Communication Skills	.046	.125	.061	.088	.051	.072	-.021	-.040	.092	.043	.237	.051	.095	.068	.382	.418	.609	.525	.498	.438	.244	.285	-			
12p- Post Communication	-.121	.089	-.030	-.012	.042	.060	-.010	-.080	.044	.004	.065	.116	.128	.299	.328	.435	.556	.669	.312	.459	.185	.444	.675	-		
13- Delinquent Behavior	.560	.483	.478	.473	.284	.242	.243	.318	.039	.172	-.070	.036	.220	-.149	.127	.139	.012	.147	.041	.099	-.109	-.074	.241	.214	-	
13p- Post Delinquent	.531	.342	.536	.521	.257	.176	.411	.411	-.036	-.124	-.036	-.011	.257	.238	-.050	.062	-.006	-.045	-.046	-.079	.213	.207	.209	.058	.541	-

Note. p refers to post-test variables. Bolded coefficients are significant at the $p < .05$ level.

Table 3

Censored-Inflated Regression Predicting Frequency of Substance Use

	Model 1 - OLS Regression			Model 2 - Logistic Regression		
	b	SE	p-value	b	SE	p-value
Intercept	-0.58	0.67	0.39	29.25	10.84	0.007
LST-Infusion	0.24	0.37	0.51	3.30	2.06	0.11
Baseline Frequency	0.99	0.21	0.001	-30.40	9.76	0.002
Gender	-0.48	0.42	0.25	-1.34	1.74	0.44
Age	-0.31	0.19	0.11	-1.05	0.91	0.25
Absent	0.39	0.20	0.05	0.99	1.20	0.41

Note: Bolded coefficients are significant at the $p < .01$ level. SE indicates Standard Error. Gender was coded with Female = 1, and Age was mean-centered before the analysis. The treatment indicator is represented by the LST-Infusion variable (non-significant).

Table 4

Censored-Inflated Regression Predicting Intentions to Use Substances

	Model 1 - OLS Regression			Model 2 - Logistic Regression		
	b	SE	p-value	b	SE	p-value
Intercept	-0.67	0.80	0.40	1.26	6.49	0.85
LST-Infusion	0.32	0.25	0.20	1.68	2.84	0.55
Baseline Intentions	1.19	0.35	0.001	-4.44	3.03	0.14
Gender	-0.08	0.33	0.81	0.49	1.86	0.79
Age	-0.18	0.09	0.04	-1.09	1.22	0.38
Absent	0.04	0.12	0.73	0.95	0.66	0.15

Note: Bolded coefficients are significant at the $p < .01$ level. SE indicates Standard Error. Gender was coded with Female = 1, and Age was mean-centered before the analysis. The treatment indicator is represented by the LST-Infusion variable (non-significant).

Table 5

Censored-Inflated Regression Predicting Self-Report Delinquent Behavior

	Model 1 - OLS Regression			Model 2 - Logistic Regression		
	<i>b</i>	<i>SE</i>	<i>p</i> -value	<i>b</i>	<i>SE</i>	<i>p</i> -value
Intercept	0.73	0.50	0.13	-4.09	1.80	0.02
LST-Infusion	0.08	0.43	0.85	-0.66	3.13	0.83
Baseline Delinquency	0.33	0.20	0.10	-0.08	0.48	0.86
Gender	0.09	0.37	0.81	-3.90	1.63	0.02
Age	0.10	0.09	0.29	0.48	0.99	0.63
Absent	0.11	0.18	0.55	0.63	0.69	0.36

Note: Bolded coefficients are significant at the $p < .01$ level. *SE* indicates Standard Error. Gender was coded with Female = 1, and Age was mean-centered before the analysis. The treatment indicator is represented by the LST-Infusion variable (non-significant).

Table 6

Coefficients for Ten Multiple Linear Regression Models to Evaluate Infusion Fidelity

Outcome Variable	Infusion Fidelity - Required			Infusion Fidelity - Suggested		
	b	SE	B	b	SE	B
Assertiveness	-1.17	1.19	-0.26	-0.23	0.90	-0.06
Communication Skills	-0.12	1.02	-0.02	0.15	0.77	0.04
Decision-Making Skills	-0.82	0.93	-0.19	0.28	0.69	0.08
Refusal Skills	0.56	1.56	0.09	-0.56	1.17	-0.11
Advertising Skills	0.72	0.84	0.13	-0.33	0.60	-0.08
Attitudes about Substances	-0.39	0.69	-0.12	-0.47	0.49	-0.18
Normative Beliefs	-0.42	0.92	-0.11	0.31	0.71	0.10
Knowledge of Risks	-1.90	1.22	-0.46	1.07	0.87	0.32
General Life Skills Knowledge	8.23	6.75	0.36	-0.93	4.67	-0.05
Coping with Anxiety	1.03	0.69	0.58	-0.11	0.55	-0.07

Note: SE indicates Standard Error. Coefficients for required and suggested fidelity scores were not significant at the $p < .05$ level. Covariate coefficients not shown.

Table 7

Treatment effects of LST-infusion for participants with a self-reported history of alcohol or substance use.

	Frequency of Substance Use			Intentions to Use Substances			Self-Reported Delinquency		
	b	SE	p-value	b	SE	p-value	b	SE	p-value
Intercept	0.30	0.24	0.22	0.60	0.29	0.04	0.11	0.88	0.90
LST-Infusion	0.15	0.21	0.46	0.01	0.07	0.95	0.56	0.66	0.39
Baseline Frequency	0.70	0.09	0.00	0.07	0.11	0.54	0.19	0.30	0.53
Baseline Outcome Score	N/A	N/A	N/A	0.58	0.22	0.01	0.50	0.13	0.001
Gender	-0.40	0.20	0.05	-0.06	0.19	0.76	-0.48	0.65	0.46
Age	-0.05	0.08	0.49	-0.10	0.08	0.22	-0.02	0.24	0.94
Absent	0.11	0.07	0.13	0.05	0.07	0.44	0.28	0.23	0.22

Note: SE = Standard Error. Bolded coefficients are significant at the $p < .05$ level. Gender was coded with Female = 1, and Age was mean-centered before the analysis. Participants with no prior alcohol or substance use were not included in the analyses.

Table 8

The effects of LST-infusion on Social Skills for participants with a self-reported history of alcohol or substance use.

	Communication Skills			Assertiveness Skills			Refusal Skills		
	b	SE	p-value	b	SE	p-value	b	SE	p-value
Intercept	1.37	0.41	0.001	2.12	0.69	0.002	1.61	0.48	0.001
LST-Infusion	-0.14	0.17	0.41	0.00	0.19	0.99	0.06	0.30	0.85
Baseline Frequency	-0.19	0.07	0.008	-0.09	0.08	0.26	-0.23	0.15	0.13
Baseline Skill	0.70	0.11	0.001	0.47	0.16	0.004	0.20	0.23	0.38
Gender	-0.11	0.17	0.50	0.34	0.18	0.06	-0.02	0.34	0.94
Age	0.04	0.07	0.59	0.02	0.07	0.78	-0.04	0.11	0.74
Absent	0.04	0.06	0.48	-0.03	0.07	0.65	-0.14	0.11	0.19

Note: SE = Standard Error. Bolded coefficients are significant at the $p < .05$ level. Gender was coded with Female = 1, and Age was mean-centered before the analysis. Participants with no prior alcohol or substance use were not included in the analyses.

Table 9

The effects of LST-infusion on Personal Self-Management Skills for participants with a self-reported history of alcohol or substance use.

	Coping with Anxiety			Decision Making			Advertising Skills		
	b	SE	p-value	b	SE	p-value	b	SE	p-value
Intercept	2.52	0.60	0.001	1.29	0.52	0.01	2.47	0.71	0.001
LST-Infusion	-0.16	0.14	0.25	-0.07	0.19	0.69	-0.59	0.29	0.04
Baseline Frequency	-0.10	0.06	0.10	-0.10	0.08	0.19	-0.05	0.12	0.65
Baseline Skill Level	0.33	0.17	0.05	0.65	0.14	0.001	0.35	0.22	0.11
Gender	-0.12	0.13	0.38	0.07	0.18	0.69	0.25	0.27	0.36
Age	0.11	0.06	0.05	0.10	0.07	0.10	0.16	0.12	0.20
Absent	-0.07	0.05	0.14	-0.03	0.07	0.68	0.00	0.10	0.98

Note: SE = Standard Error. Bolded coefficients are significant at the $p < .05$ level. Gender was coded with Female = 1, and Age was mean-centered before the analysis. Participants with no prior alcohol or substance use were not included in the analyses.

Table 10

The effects of LST-infusion on Drug Resistance Skills for participants with a self-reported history of alcohol or substance use.

	Knowledge of Risks			Normative Beliefs			Attitudes about Substances		
	b	SE	p-value	b	SE	p-value	b	SE	p-value
Intercept	1.20	0.66	0.07	0.92	0.29	0.001	1.21	0.31	0.001
LST-Infusion	0.02	0.24	0.94	0.21	0.15	0.16	-0.12	0.21	0.58
Baseline Frequency	0.04	0.10	0.69	-0.04	0.06	0.54	0.01	0.10	0.90
Baseline Skill Level	0.51	0.19	0.01	0.57	0.12	0.001	0.45	0.15	0.003
Gender	0.40	0.23	0.08	0.04	0.15	0.80	-0.33	0.20	0.09
Age	-0.02	0.10	0.87	-0.15	0.06	0.01	0.07	0.08	0.40
Absent	0.07	0.08	0.39	-0.01	0.06	0.90	0.10	0.07	0.18

Note: SE = Standard Error. Bolded coefficients are significant at the $p < .05$ level. Gender was coded with Female = 1, and Age was mean-centered before the analysis. Participants with no prior alcohol or substance use were not included in the analyses.

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