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THE IMPACT OF A THEORY-BASED WEB INTERVENTION ON THE INTENTION TO USE PRESCRIPTION DRUGS FOR NON-MEDICAL PURPOSES AMONG COLLEGE STUDENTS: A RANDOMIZED CONTROLLED TRIAL

Rasha Arabyat

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THE IMPACT OF A THEORY-BASED WEB INTERVENTION ON THE INTENTION TO USE PRESCRIPTION DRUGS FOR NON-MEDICAL PURPOSES AMONG COLLEGE STUDENTS: A RANDOMIZED CONTROLLED TRIAL

By

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DISSERTATION

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy
Pharmaceutical Sciences

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Albuquerque, New Mexico

May, 2016

DEDICATION

This dissertation is dedicated to my husband Bashar, my kids (Ahmad, Omar & Zaha), my parents (Mahmoud & Abla), and my parents-in-law (Rafi & Nadia)

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THE IMPACT OF A THEORY-BASED WEB INTERVENTION ON THE INTENTION TO USE PRESCRIPTION DRUGS FOR NON-MEDICAL PURPOSES AMONG COLLEGE STUDENTS: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

The nonmedical use of prescription drugs (NMUPD) among college students is escalating at an alarming rate. A limited number of studies have utilized a theoretical framework to understand and change this behavior. The main objectives for this study were (1) to utilize the reasoned action approach (theoretical framework) to design and evaluate an intervention to change students' intentions toward NMUPD, and (2) to test the predictive validity of the reasoned action approach in understanding NMUPD.

Methods: The intervention was designed and tested during a pilot phase. Using a two-group post-test controlled trial, students were randomly assigned to either the intervention group or the control groups. The numbers of respondents in the intervention group were 188, and in the control group were 199. A survey was conducted to test the effectiveness of the intervention and the predictive validity of the reasoned action approach in understanding NMUPD

Results: Overall, college students have strong intentions to avoid NMUPD. They also have negative attitudes toward NMUPD, high perceived norms that their important referents will not approve their NMUPD, and high perception that NMUPD is under their control. The intervention was able to bring changes in attitudes between the intervention and control groups. However, no changes were observed in intentions, perceived norms, perceived behavioral control, nor in their underlying beliefs. The reasoned action approach major constructs (attitudes, norms, and perceived behavioral control) were successful in explaining 37% of the variance in students' intentions to avoid NMUPD. The most significant predictor of students' intentions was perceived norms. The demographic factors that were significantly associated with intentions to avoid NMUPD included previous NMUPD, gender, tobacco use, marijuana use, and alcohol consumption. An analysis restricted to only those who reported NMUPD, showed that students who used stimulants have lower intentions to avoid NMUPD, more favorable attitudes toward NMUPD, but lower perceived norms that their important referents will not approve their NMUPD.

Conclusion: The reasoned action approach was successful in predicting students' intentions to avoid NMUPD, though the theory-based intervention was less successful in influencing and changing these intentions. More research is needed to improve the intervention dissemination and utilization. Future interventions should focus on both reducing the perceived social pressure and the approval of NMUPD, in addition to changing favorable attitudes toward NMUPD into unfavorable attitudes, especially among stimulants users.

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LIST OF ACRONYMS

A	Attitude
ADHD	Attention Deficit Hyperactivity Disorder
ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
CASA	Center on Addiction and Substance Abuse
CNS	Central Nervous System
DAWN	Drug Abuse Warning Network
EA	Experiential Attitude
ED	Emergency Department
GABA	ɣ-Aminobutyric Acid
HCPs	Healthcare Professionals
HHS	U.S. Department of Health and Human Services
IA	Instrumental Attitude
INCB	International Narcotics Controlled Board
IRB	Institutional Review Board
LSD	Lysergic Acid Diethylamide
MSA	Metropolitan Statistical Area
MTF	Monitoring The Future
NCES	National Center for Education and Statistics
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NM	New Mexico
NMUPD	Nonmedical Use of Prescription Drug
NSDUH	National Survey on Drug Use and Health
ODPHP	Office of Disease Prevention and Health Promotion
OTC	Over-The-Counter
PBC	Perceived Behavioral Control
PDMP	Prescription Drug Monitoring Program
PN	Perceived Norms
RADAR	Researched Abuse, Diversion, and Addiction Related Surveillance
RCT	Randomized Controlled Trial
SAMHSA	Substance Abuse and Mental Health Service Administration
SN	Social Norm
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UNM	University of New Mexico

CHAPTER ONE: INTRODUCTION

Overview

The use of prescription drugs for nonmedical purposes has escalated rapidly in the United States.[1,2] In 2013, it was estimated that about 15.3 million Americans had used prescription drugs for nonmedical purposes in the past year.[3] Nonmedical use of prescription drug (NMUPD) is an emerging epidemic in the United States,[1] ranked second only after marijuana use among persons aged 12 years and older.[4] According to the National Survey on Drug Use and Health (NSDUH), NMUPD is defined as the deliberate or non-deliberate utilization of medication without a prescription, or for purposes other than for what it was prescribed such as for recreational purposes or to reduce stress and anxiety.[3–5] The most misused prescription drugs are stimulants (i.e., amphetamines and methylphenidate), opioid analgesics (i.e., codeine and hydrocodone) , sedatives (i.e., example phenobarbital and triazolam) and tranquilizers (i.e., alprazolam and diazepam).[1]

Using prescription medications without medical supervision or for reasons other than what they were prescribed for can lead to addiction and/or serious health consequences including death.[6] The Centers for Disease Control and Prevention reports showed a significant increase in emergency department (ED) visits involving a prescription drug use for nonmedical purposes.[7] These findings, among others[6,8,9], shed light on the substantial consequences of NMUPD in the United States.

Among college students, in particular, NMUPD has grown rapidly to become a major public health concern.[4,10,11] NMUPD by college students has been associated with binge drinking, abuse of illicit drugs, poor academic performance, and risky sexual behaviors.[12–14] Several studies have explored motives and attitudes toward using prescription drugs for nonmedical purposes among college students.[14–16] However, a limited number of studies has investigated the feasibility of designing and evaluating interventions that may decrease NMUPD among college students.

One successful approach to understand, predict, and influence a certain behavior is to use an approach grounded on socio-behavioral theories. Theoretical frameworks help to organize ideas, develop research methods and analyses, and to design interventions.[17] One of the most prominent theoretical frameworks, in the social and behavioral sciences, is the reasoned action approach by Fishbein and Ajzen.[18] The reasoned action approach has been applied for predicting and influencing human behavior for more than 45 years, and over a thousand published papers have utilized this framework.[19]

To our knowledge, no previous work has utilized the reasoned action approach to design and evaluate an intervention to influence college students' intentions toward nonmedical NMUPD. This current work is innovative in providing a theory-based web intervention that could be used as a model to reduce college students' engagement in this particular risky behavior.

Nonmedical Use of Prescription Drug (NMUPD)

In the United States, there is an increasing demand for pharmaceutical drugs to the point that the generation born between late 80s and early 90s is often described as "Generation Rx".[20] In the last two decades, there was an unprecedented increase in the prescribing rates of drugs, including prescription-type pain relievers (such as opioids), stimulants, sedatives, and tranquilizers.[21–24] The 2013 National Survey on Drug Use and Health (NSDUH) combined the aforementioned drug categories into one group known as "psychotherapeutics."[4] Nonmedical use of psychotherapeutics was defined as using these drugs without a prescription or merely for the feeling experienced while taking the drug. Over-the-counter (OTC) medications were excluded from this definition.[4]

The 2013 NSDUH report indicated that 6.5 million individuals aged 12 years and older reported nonmedical use of psychotherapeutics in the previous month; a number only second to marijuana. Moreover, the report indicated that 2 million individuals (12 years and older) reported using psychotherapeutics for the first time last year; which is more than 5,000 initiators per day. Among initiators in all illicit drugs (including heroin, marijuana, prescription drugs, and others); one in five initiated with prescription drugs in the past year.[4]

The increased rate of NMUPD was associated with a rise in ED visits, and drug overdoses incidents leading to serious injuries and even death. For example, in 2011, there were almost a million and a half emergency department visits related to NMUPD in the US.[22] These visits could be attributed to drug abuse, adverse drug events, or other drug-related issues. Approximately more than half a million of these cases were related to sedatives and tranquilizers. In addition, almost a 400,000 ED visits involved opioid analgesics.[22] Specifically, the Drug Abuse Warning Network (DAWN) indicated that sedatives and tranquilizers accounted for 160.9 visits/100,000 people in the US population, and the opioids for 134 visits per 100,000 of the US population. Although central nervous system (CNS) stimulants (such as amphetamines) contributed only with 14.5 visits per 100,000 people, they caused a 292% increase in ED visits between 2004 and 2011, followed by opioids analgesics (153%) and sedatives/tranquilizers (124%).[25]

In 2013, of the 22,769 deaths related to pharmaceutical medications overdose, more than 70% involved opioid analgesics, and almost 30% of deaths were related to benzodiazepines (potent tranquilizers). More often, however, people who died from prescription drug abuse had a combination of two or more drugs; most notably, a combination of benzodiazepine and opioid analgesics.[22] Similar results were found by the National Poison Data System indicated that opioids analgesics were the most commonly implicated medication in the 2,937 death incidents related to poisoning from pharmaceutical medications.[26]

According to a recent analysis of the trends in opioid pain relievers abuse and mortality in the United States, the overall prescription and abuse of opioids increased considerably from 2002 to 2010, but in the 2011-2013 period the rate decreased significantly. However, this decline was not significant for college students ($p = 0.41$).[27]

The high rate of ED visits due to prescription drug abuse (involving deaths and serious injuries), is accompanied with a significant economic burden. The costs associated with prescription drug abuse, including NMUPD, are related to loss of productivity (due to missing work or death), health care costs (such as medications to treat abuse), and other costs such as criminal justice costs. In 2006, the approximate costs of NMUPD reached $ 53.4 billion.[25] Loss of productivity accounted for $42 billion (79%), followed by criminal justice costs at $8.2 billion (15%), drug abuse treatments at $2.2 billion (4%) and treatment of medical complications at $944 million [US] (2%).[25]

NMUPD among College Students at a Glance

According to the 2013 National Survey on Drug Use report, the current use of illicit drugs is the highest among individuals between 18 and 25 years old, with 5.9% reporting nonmedical use of prescription medications over the past 12 months.[4] Recent national data shows that there is a significant number of college students who are using prescription drugs for nonmedical reasons or without medical supervision.[13,26] Most notably, college students are more likely than their non-college counterparts to misuse prescription stimulants, particularly Adderall® (amphetamine), and Ritalin® (methylphenidate).[26] This trend may be explained by the fact college students are using stimulants as study aids.

The trends in NMUPD among college students were investigated in a repeated cross-sectional study for 2003-2013 period. Almost one in five respondents reported NMUPD at least once in the past year. The use of stimulants for nonmedical reasons in the past year by college students increased significantly from 2003 to 2013; however, the use of opioids analgesics decreased significantly, whereas the use of anti-anxiety/sedatives remained relatively stable. This study also reported that the most significant predictors of past-year NMUPD among college students were male gender, white race, being a member of social fraternities/sorority group, and history of previous medical use of prescription drugs.[27]

Several studies examined perceptions, attitudes, and motives for NMUPD among college students. A recent systematic review examined the barriers and facilitators of NMUPD among adolescents (12-17 years) and young adults (18-25 years). In this review, a socio-ecological framework was the basis for categorizing risks and protective factors associated with NMUPD. The results of this exhaustive literature review integrated 50 articles (including longitudinal, cross-sectional, and systematic reviews). At the individual level, the most common predictors for NMUPD were prior use of illicit drugs (such as marijuana), a history of hostile behavior against others, and low perceived threat or harmfulness of prescription drugs. At the school level, poor academic performance was evident among students who seek prescription drugs for nonmedical purposes. Perceived drug use and approval from important others were the most predominant inter-personal factors. At the community level, accessibility to prescription drugs increased the risk of NMUPD.[28]

A cross-sectional study to investigate factors related to abstinence from NMUPD among college students, found that lack of interest was the most common factor followed by fear from harming one's physical and mental health. Lack of accessibility to prescription drugs was also an important factor. College students who reported using prescription drugs for nonmedical purposes mostly used stimulants followed by pain-relievers and anti-anxiety drugs.[29] Peer pressure and approval also impacted NMUPD by college students. An investigation reported that by the fourth year of college, almost two-thirds of students were offered prescription stimulants for nonmedical purposes, A friend with a prescription was the most common source for other students to procure stimulants.[14]

In summary, several studies have investigated the motives and barriers for NMUPD, which is an emerging public health concern. These studies can be utilized to design interventions to reduce NMUPD among college students.

Nonmedical Use of Prescription Drugs in New Mexico

In 2010, New Mexico (NM) ranked second in drug-overdose mortality rate in the United States.[30] Most of these instances were related to prescription drug abuse, specifically opioid analgesics (50%).[31] In New Mexico, the number of deaths related to prescription drugs outnumber those related to heroin and cocaine use combined, and outnumber deaths related to motor vehicle accidents.[30] The rate of drug-induced deaths in NM (23.8 per 100,000 people) is significantly higher than the national average rate (12.8/100,000).[30]

In the Albuquerque Metropolitan Statistical Area (MSA), 125,000 people ages 12 years and older on average reported using an illicit drug in the past year. The rate of nonmedical use of opioid pain relievers (6.4 percent) is higher than the average national rate (4.9 percent).[32]

Bernalillo County has the highest number of drug overdose mortality rate in NM, and the number of deaths increased by 66.3% in one year (from 2010 to 2011). Rio Arriba County had the third highest rate of deaths due to drug poisoning, including deaths related to NMUPD, in the country in the period between 2004 and 2008 at rate of 57.4 per 100,000 people.[33] The rate of drug use, including prescription drugs, by adolescents in NM was among the top ten highest in the US (2009-2010), specifically, in the past year nonmedical use of opioid analgesics, and in the past month use of illicit drugs.[34]

These statistics indicate the considerable burden of drug abuse in general, and prescription drug abuse in particular in New Mexico. Prevention is crucial in fighting this epidemic in New Mexico. Recognizing this problem among adolescents and young adults before the development of addiction can be influential in deterring devastating consequences of prescription drug abuse. Preventive strategies may include educational interventions and community campaigns to raise awareness about NMUPD and should in particular target adolescents and young adults. Moreover, using brief interventions is usually inexpensive and more likely to be effective at early stages of drug misuse.[35]

As mentioned in the previous sections, NMUPD is a particular health concern among college students. However, there is insufficient information about this phenomenon in the state of NM. Given the burden of prescription drug misuse and abuse in NM, it is important to recognize and prevent the problem in its early stages. Specifically, targeting adolescents and young adults is crucial in recognizing prescription drug abuse early before further complications develop and when brief interventions are more likely to be successful.

Understanding and preventing prescription drug misuse require adequate knowledge of cognitive, behavioral, and socio-ecological factors related to this behavior. These determinant factors are best explained and integrated within behavioral theories. These theories can be used to identify the roots of the problem and the associated modifiable factors. Moreover, behavioral change theories can help in planning, designing, and evaluating an appropriate intervention that takes into consideration the unique properties of the targeted population. Theory-based interventions have been successful in producing changes in behaviors and maintaining these changes on the long run.[36]

To the best of our knowledge, no study has used a theoretical framework to design and evaluate an intervention to influence college students' decision regarding NMUPD. Consequently, there are few interventions, if any, to target college students' attitudes and intentions to use prescription drugs non-medically.

Theoretical Framework

Behavioral science theories have been used to understand and predict why people choose to engage or not to engage in a certain behavior.[17] For the purpose of this study, we have utilized the reasoned action approach that was initially proposed by Fishbein and Ajzen in 1975.[19] The strength of the reasoned action approach is its ability to provide a common framework to account for any social behavior.[18]

After a specific behavior is clearly identified and properly operationalized, the reasoned action approach assumes that this behavior can be explained by a specific set of determinants. The decision to engage or not to engage in a specific behavior such as NMUPD follows reasonably from a set of beliefs and information acquired about the behavior under investigation.[18]

According to the reasoned action approach, there are three types of beliefs that guide a decision toward performing a specific behavior. First, people possess beliefs about the pros and cons related to the outcome of performing the behavior. These beliefs, which are related to one's perceptions regarding the consequences of engaging in that behavior, are known as behavioral beliefs and are assumed to influence an individual's attitudes toward personally implementing that behavior. Attitude can be further subcategorized into instrumental attitude (IA) and experiential attitude (EA). Instrumental attitude is knowledge- or cognitive-based, and influenced by beliefs about the outcomes from performing a behavior. Experiential attitude r is the affective aspects of attitudes.[19]

Second, beliefs about important others (friends, parents, spouse, etc.) approval or disapproval of our performance of certain behaviors are known as injunctive normative beliefs, and beliefs about the extent to which important others are themselves implementing that behavior are known as descriptive normative beliefs. These two beliefs determine the perceived social norms, which is defined as the impact of social and peer pressure on the individual's decision to perform or not to perform a certain behavior.[19]

Finally, individual's beliefs about the influence of environmental and personal factors on their ability to carry out certain behavior are known as control beliefs, and are the determinant of the perceived behavioral control.[19]

According to the reasoned action approach, intentions are the most important determinants of the likelihood of performing a certain behavior. Intentions are guided by attitudes, perceived norms, and control beliefs. Generally speaking, the more favorable one's attitudes toward the behavior in question, the higher peer pressure (perceived norm) from important others, and the greater control over internal and external perceived barriers, the stronger the individual's intentions to carry out a particular behavior.[19]

The theory of reasoned action has been used successfully in predicting and explaining social behaviors. Armitrage & Conner (2001) conducted a meta-analysis of more than 130 studies utilizing the reasoned action approach in predicting health-related behaviors. The theory of reasoned action and theory of planned behavior were found to contribute to 39% of variance in behavioral intentions, and 27% of variance in performing behavior.[37] The reasoned action approach is not only used to predict and change behaviors, but can also be utilized to design and evaluate interventions. After identifying the relevant behavioral, normative, and control beliefs, the reasoned action approach was used in designing and evaluating a web-based intervention to affect college students' intentions to use prescription drugs for nonmedical purposes.

Objectives of the Study

The aim of this study was to design and evaluate the impact of a web-based intervention on the intention to use prescription drugs for nonmedical purposes among college students. There were two main objectives for this study:

1. To utilize the reasoned action approach as a theoretical framework to design and evaluate an intervention to change students' intentions toward NMUPD

2. To test the predictive validity of the reasoned action approach in understanding NMUPD among college students

Hypotheses of the Study

The following hypotheses were tested in the current study. Hypotheses 1 to 7 are related to objective number one, and the rest of hypotheses are related to objective number two.

$H_0$1: No significant difference exists in college students' intention to avoid NMUPD between the intervention and control groups.

$H_0$2: No significant difference exists in college students' attitude toward NMUPD between the intervention and control groups.

$H_0$3: No significant difference exists in college students' perceived social norms of NMUPD between the intervention and control groups.

$H_0$4: No significant difference exists in college students' perceived behavioral control of NMUPD between the intervention and control groups.

$H_0$5: No significant difference exists in college students' behavioral beliefs of NMUPD between the intervention and control groups.

$H_0$6: No significant difference exists in college students' normative beliefs of NMUPD between the intervention and control groups.

$H_0$7: No significant difference exists in college students' control beliefs of NMUPD between the intervention and control groups.

$H_0$8: A negative attitude toward NMUPD is not a significant predictor of college students' intentions to avoid NMUPD, after controlling for perceived norms and perceived behavioral control.

$H_0$9: Perceived norm is not a significant predictor of college students' intention to avoid NMUPD, after controlling for attitudes and perceived behavioral control.

$H_0$10: Perceived behavioral control is not a significant predictor of college students' intention to avoid NMUPD, after controlling for attitudes and perceived norms.

$H_0$11: Attitudes, perceived norms, and perceived behavioral control do not explain significant variance of college students' intention to avoid NMUPD.

$H_0$12: The previous use of prescription drugs for nonmedical purposes does not increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms and perceived behavioral control.

$H_0$13: The intervention does not increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms, perceived behavioral control, and previous use of prescription drugs.

$H_0$14: No significant relationship exists between college students' intention to avoid NMUPD and gender.

$H_0$15: No significant relationship exists between college students' intention to avoid NMUPD and race/ethnicity.

$H_0$16: No significant relationship exists between college students' intention to avoid NMUPD and type of degree pursued.

$H_0$17: No significant relationship exists between college students' intention to avoid NMUPD and sorority/fraternity groups.

$H_0$18: No significant relationship exists between college students' intention to avoid NMUPD and housing (i.e. on-campus vs. off-campus).

$H_0$19: No significant relationship exists between college students' intention to avoid NMUPD and tobacco use.

$H_0$20: No significant relationship exists between college students' intention to avoid NMUPD and marijuana use.

$H_0$21: No significant relationship exists between college students' intentions toward NMUPD and alcohol consumption.

$H_0$22: No significant relationship exists between college students' intention to avoid NMUPD and age at first use of NMUPD.

$H_0$23: No significant relationship exists between college students' intention to avoid NMUPD and the class of prescription drug used (i.e. stimulants, painkillers, or depressants).

Study Significance

Increased nonmedical use of prescription drugs in the United States is considered an epidemic according to the Centers for Disease Control and Prevention. In 2013, one in five people who started using illicit drugs for the first time initiated with prescription drugs for nonmedical purposes. Current use of prescription drugs for nonmedical purposes is highest among individuals aged 18-25 years including those typically in college years. College is an exciting and challenging period that involves growth, experimentation, and trying new things. This new atmosphere exposes students to risky behaviors, including illicit drug use and abuse. College is also characterized by declining parental supervision and increasing peer pressure. Adolescents and young adults may be particularly vulnerable to the devastating consequences of prescription drug abuse, including addiction, ED visits due to drug overdoses and even death.

Brief educational interventions are more likely to be successful at the early stages of drug misuse before the development of serious complications such as addiction. Also, interventions that are based on behavioral theories are more likely to be successful in producing changes and maintaining them overtime. However, no known study has utilized a theoretical approach to design and evaluate an intervention to influence college students' attitudes, perceived norms, perceived behavioral control and intentions toward NMUPD.

The results of the current study can provide valuable information for college campuses about the best techniques and ways to approach college students and influence their attitudes, and intentions toward using prescription drugs for nonmedical purposes. The long-term goal of the study is to reduce NMUPD by college students to promote their overall well-being and to prevent the devastating consequences of NMUPD such as drug overdose, hospitalization, and death.

The findings of our study will contribute to our understanding of the types of beliefs that affect college students' intentions toward NMUPD. Our intervention was designed in a cost-effective and efficient way. Moreover, our study will provide the basis for the development of future interventions that can be applied in different situations, populations, and behaviors.

Potential Limitations of the Study

The current study has several potential limitations. First, there is a possibility of recall bias that might happen when the respondent cannot remember using prescription drugs for nonmedical reasons in the past.

Second, given that using prescription drugs for nonmedical purposes is socially undesirable behavior, students may not be willing to disclose their past or future willingness to use these drugs.[38]

Third, it is also possible that only students who are personally interested in the study or have strong intentions to use prescription drugs are the ones who will respond to the survey. In such cases, a non-response bias may be introduced to our study.[39]

Fourth, only intentions were measured but not confirmed by measuring actual behavior in the future. Ideally, intentions and behavioral performance should be done at two distinct points in time. However, several studies have found that intention predicts behavior quite well.[40,41]

Fifth, the results from the current study may not be generalizable to other settings, as only UNM students were involved in the study.

Sixth, the length of the survey might discourage some students from participating. The survey is lengthy because it was designed according to the recommendations by Fishbein and Ajzen, in which multiple items were used to assess both direct and belief-based measures of major predictors of intentions (attitudes, norms, and perceived behavioral control). Omitting any of these items may threaten the accuracy of measuring these constructs.

Seventh, given the voluntary nature of the study, there is no guarantee that students will view the entire intervention. Viewing the educational intervention can take place anywhere and anytime. Thus, there is a possibility for the presence of distractions that may reduce students' ability to view and comprehend the entire intervention. The accuracy of their responses to the survey may also be affected, especially that some items may look similar to students who view the survey quickly.

CHAPTER TWO: LITERATURE REVIEW

In this chapter, the definition of nonmedical use of prescription medication is discussed along with the most commonly misused prescription medications (pain relievers, stimulants, and central nervous system depressants).Then, an expanded review of this problem among college students is presented. Frequency, epidemiology, and motives for nonmedical use of prescription drugs (NMUPD) by college students are discussed. In addition, misperceptions and beliefs about NMUPD are also analyzed. Studies that evaluated the effectiveness of interventions that address the use of prescription drugs for nonmedical reasons are reviewed. Next, a detailed discussion of the reasoned action approach is presented. Lastly, the application of the reasoned action approach to design interventions is discussed thoroughly.

Definition of Nonmedical Use of Prescription Medication

There is no consistent agreement on a universal definition of NMUPD due to the various agencies that collect, analyze and report data regarding nonmedical use of prescription drugs. The definition of NMUPD is further complicated by different terminologies utilized such as “misuse,” “abuse,” or “nonmedical use.” Sometimes these terms are used interchangeably.[42]

The National Survey on Drug Use and Health (NSDUH) defines NMUPD as “using medications without prescription of the individual’s own, or simply for the experience or feeling the drugs caused.”[4] Whereas, the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) defines NMUPD as “using medication without prescription, in greater amounts, more often, longer than prescribed or for a reason other than a doctor said you should use them.”[43] The latter definition is similar to the one adopted by the National Center on Addiction and Substance Abuse at Colombia University(CASA).[1] The Researched Abuse, Diversion, and Addiction Related Surveillance (RADAR), also included in their definition of prescription drug abuse “the use in combination with other drugs to get high, or use as a substitute for other drugs of abuse.”[1]

Often the terms “abuse,” “misuse,” and “nonmedical use” were used interchangeably in the literature. However, there were some differences between these terms. For instance, McCabe et al, (2013) used the term drug “misuse” to refer to performing behaviors not intended by the prescriber such as using higher doses or using prescription drugs intentionally for their euphoric effects. McCabe and colleagues defined NMUPD as using these medications without prescription from a doctor, nurse or dentist.[5]

In contrast, there were also other ways to distinguish between drug misuse and abuse found in the literature. Drug abuse was defined, sometimes, as the intentional use of a drug to get high or for the associated pleasant experience. Drug misuse, on the contrary occurs when an individual is taking the medication without following the directions, such as when self-treating themselves, but with no intentions to get high.[44]

To summarize, different approaches were found to describe and define nonmedical use of prescription drugs. For the purpose of the current study, the term nonmedical use of prescription drugs (NMUPD) is defined as the deliberate or non-deliberate utilization of medication without prescription or for purposes other than prescribed such as to get high or to reduce stress and anxiety.

Epidemiology of the NMUPD

The most recent, reliable, and comprehensive sources for data related to prescription drug abuse include: The Drug Abuse Warning Network (DAWN), the National Survey on Drug Use and Health(NSDUH), the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), and Monitoring The Future (MTF) survey.

DAWN is a nationally representative survey, which collects information from selected hospitals across the United States about drug related Emergency

Department (ED) visits. DAWN is sponsored by the Substance Abuse and Mental Health Service Administration (SAMHSA) and reviews ED medical records to get information about the ED visits that involved drug use. Information about almost all drug categories are collected including illicit drugs, alcohol, prescription drug abuse, (over-the-counter) over-the-counter medications (OTC), inhalants and dietary supplements.[45]

In the 2009 DAWN report, there were approximately 4.6 million drug related ED visits nationally. Almost 45% (2.1 million visits) were related to drug abuse in general, out of which 27.1% (nearly 1.2 million visits) were related to nonmedical use of pharmaceutical medications. In fact, between 2004 and 2009 the ED visits attributed to nonmedical use of medications increased by 98.4% (from 627,291 to 1,244,679). Opioid analgesics were the most frequently implicated drugs in ED visits related to nonmedical use of medications (nearly half of visits), followed by sedatives and anti-anxiety medications (one third of visits).[45]

ED visits to due to hydrocodone, as a single constituent or in combination with other drugs, contributed to 104, 490 visits (an increase by 124.5% between 2004 and 2009) and oxycodone was involved in 175,949 visits (an increase by 242.2% between 2004 and 2009).[45] A recent short report by DAWN demonstrated that from 2005-2011, almost one million ED visits were attributed to benzodiazepines, whether alone or in combination with other drugs.[46] The nonmedical use of stimulants by adults aged 18-34 increased significantly from 2005 (5605 visits) to 2011(22,949 visits).[47]

NSDUH is another annual national survey sponsored by SAMHSA and considered the major source of information on the use of illicit drugs (including prescription drugs), alcohol, and tobacco in the civilian, noninstitutionalized individuals aged 12 years and older. Nearly more than 67,000 people are interviewed for the NSDUH annually.[4]

According to the 2013 NSDUH report, 6.5 million people aged 12 years and older were current nonmedical users of psychotherapeutics (pain relievers, stimulants, sedatives, and tranquilizers). Specifically, 4.5 million were current nonmedical users of pain relievers, 1.7 million of tranquilizers, 1.4 million of stimulants, and 251,000 of sedatives.[4]

Additionally, it was estimated that 2.8 million individuals aged 12 years and older used an illicit drug for the first time within the last year. About 20% of those individuals started with NMUPD, particularly 12.2% started with pain relievers, 5.2% with tranquilizers, 2.7% with stimulants, and 0.2% with sedatives. The NSDUH found that more than 50% of individuals, who used prescription drugs nonmedically, obtain these medications from friends or relatives for free.[4]

Among college students aged 18-22 years, almost 1 in 5 were current users of illicit drugs (nonmedical. The rate was even higher among males in the same age category, in which one in four were current users of illicit drugs.[4]

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is a longitudinal survey sponsored by the US Department of Health and Human Services (DHHS), National Institutes of Health (NIH), and the

National Institute on Alcohol Abuse and Alcoholism (NIAAA). This survey collects data (among others) about alcohol consumption, tobacco use, and drug abuse. A nationwide representative sample (n=34, 653) of US adults aged 18 years and above were interviewed at Wave 1 of the survey (2001-2002) and were followed at Wave 2 (2004-2005).[43]

Based on results from NESARC data, approximately 4.8% of US adults aged 18 years and older reported a lifetime use of prescription analgesics for nonmedical purposes. The mean age at the initiation of nonmedical use was 25.2 years. The most significant predictors for nonmedical use of prescription analgesics were younger age (18-24) and nonmedical use at Wave 1 [(Adjusted Odds Ratio AOR = 3.42, 95% CI (1.45-8.07)].[48]

A study based on data from NESARC showed that younger age (AOR = 1.03, $p<0.001$), and never been married (AOR = 2.25, [CI 95% 1.81 -2.8], $p<0.001$) were significant predictors of nonmedical use of opioid analgesics. However, protective factors included female gender (AOR = 0.82, [CI 95% 0.68 -1.00], $p<0.05$), and being non-Hispanic/Black (AOR = 0.56, [CI 95% 0.32-0.96], $p<0.05$). The presence of comorbid mental and physical conditions, were found to increase the risk of nonmedical use of opioid analgesics.[49]

According to NESARC data, the prevalence of lifetime nonmedical use of anxiety medications (including both sedatives and tranquilizers) among those surveyed was estimated to be 7.4%, while the past-year nonmedical use was approximately 1.9%. In fact, those who had a legitimate prescription for anxiety medications were more likely to be lifetime and past year nonmedical users (OR = 2.98 and OR =3.36 respectively) compared to those with no legitimate prescription.[50] The most important predictors for nonmedical use of anxiety medications among those with a legitimate prescription were: male gender [OR =1.68, 95%CI (1.34-2.12)], white [OR = 1.82, 95%CI (1.6-2.63)], those who are aged 19-29 years [OR =2.7, 95%CI (2.13-3.5)] compared to those 30 years and older. Also, family history of drug problems, behavioral problems, alcohol problems, or depression were significant predictors of the nonmedical use anxiety medications.[50]

Monitoring The Future (MTF) is a longitudinal study of illicit drug use by American college students, adolescents, and adults through age 55. The survey has been conducted every year by the University of Michigan since 1975. The most recent report released by the MTF team (2013) revealed that among college students 5.4% reported using narcotics other than heroin (without medical supervision) in the past year, particularly vicodin (4.4.%) and oxycontin (2.3%). In 2013, the rate of past-year nonmedical use of sedatives (barbiturates) among college students was 2.7% and tranquilizers was 4.4, most notably the past-year use of amphetamines among college students, was 10.6% which is higher that among non-college counterparts (8.9%). Specifically, among college students, the annual rate of Adderall (amphetamine) use without medical supervision was 10.7% compared to only 6.8% among non-college peers, and 3.6% for Ritalin (methylphenidate) use among college students compared to 2.3% among non-college counterparts.[26]

In summary, according to the results from nationally representative data, opioids analgesics are the most frequently used drugs for nonmedical reasons, followed by anti-anxiety medications (including tranquilizers and sedatives) and stimulants. The same trend is also observed in ED visits involving a prescription drug used for nonmedical purposes. Being male, young adult, White, with a family history of NMUPD, were the common found predictors of NMUPD.

Categories of the Most Frequently Used Prescription Drugs Nonmedically

According to the NSDUH, the four categories of prescription drugs, which are used most frequently for nonmedical reasons, are combined into one category known as “psychotherapeutics”. These include pain relievers (opioid analgesics), sedatives, tranquilizers, and stimulants. Over-the-counter drugs were not included in this definition.[4]

Opioid Analgesics

Opioid analgesics are potent pain relievers that bind to the µ-opioid receptors in the brain. Opioids are sometimes used as cough suppressants and for the management of diarrhea. Opioids analgesics that are available by prescription in the US include codeine, hydrocodone, oxycodone, morphine, methadone, hydromorphone, propoxyphene, fentanyl, and tramadol.[35] Opioids analgesics are available in the US either as a single ingredient (e.g. oxycodone), or in combination with other drugs (hydrocodone and acetaminophen).

The number of opioid analgesic prescriptions in the United States increased significantly. It is estimated that between 1991 and 2010, the total number of opioid prescriptions increased from 76 million to 210 million. Interestingly, even though the US represents only 4.6% of the world's population, the US consumes 80% of the world's reservoir of opioids and 99% of the worldwide hydrocodone supply.[51]

Unfortunately, the tremendous number of opioid prescriptions is associated with greater nonmedical use, ED visits, and deaths. According to the most recent DAWN report, the total number of ED visits that involved narcotic/opioid pain relievers was 420, 040. The percent change in ED visits from 2004-2011 was 153%. Oxycodone (alone or in combination) contributed to more than 170,000 visits in 2011. In fact, oxycodone is the pharmaceutical with the largest increase in ED visits in the period of 2004-2009 (242.2%).[52]

Between 2002 and 2011, 25 million people started using opioid analgesics nonmedically.[53] In fact, almost 1.2 million ED visits were attributed to the nonmedical use of pharmaceuticals in 2009. Opioids were the most frequently implicated agents in this category which contributed for more than half of ED visits.[52] In addition, opioid analgesics were the pharmaceuticals with the largest percentage of deaths related to overdose. Of the 22,767 deaths attributed to pharmaceutical overdoses, 16,235 (71.3%) were related to opioid analgesics in 2013.[22]

Central Nervous System (CNS) Depressants (Sedatives, Hypnotics, and Tranquilizers)

Sedatives, hypnotics, and tranquilizers are known as CNS depressants because they slow down brain function leading to relaxing effects. These agents are mostly used for the management of sleep problems, panic attacks, and anxiety. Benzodiazepines are the CNS depressants that are most prescribed for their sedative and anxiolytic effects. Benzodiazepines are also used as anticonvulsants, muscle relaxants, and anesthetics. The sedative and anti-anxiety effects are the most common reasons for abusing benzodiazepines. These agents are widely prescribed because of their relatively selective action on the CNS. Benzodiazepines' mechanism of action involves potentiating the effect of an intrinsic neurotransmitter known as ɣ-aminobutyric acid (GABA)which is the main inhibitory neurotransmitter in the human's CNS. GABA reduces neuronal excitability causing relaxing and calming effects.[54]

Benzodiazepines are classified as Schedule IV controlled drugs by the international narcotics controlled board (INCB). Currently, there are fifteen approved benzodiazepines by the FDA. The most currently prescribed benzodiazepines are alprazolam (Xanax), diazepam (Valium), lorazepam (Ativan), chlordiazepoxide (Librium), clonazepam (Klonopim), temazepam (Restroil), triazolam (Halcion), and midazolam (Versed).

There are three classes of benzodiazepines depending on their duration of action: short, intermediate, and long acting.[55] For the management of insomnia, usually the short and the intermediate benzodiazepines are the most effective.

The long acting agents are usually used for the management of anxiety. Benzodiazepines are considered safe due to their selective mechanism of action. However, some adverse events may occur at low doses, such as dysphoria and sensation of heaviness. At higher doses, other serious adverse events may occur, such as dysarthria, altered mental status, and memory impairment.[56] Complex tasks that require hand-eye coordination, such as driving, are also affected by high doses of benzodiazepines, leading to traffic accidents. Another serious unwanted side effect is paradoxical excitement, which is contrary to the intended purpose of benzodiazepines. Paradoxical excitement causes higher levels of anxiety and hyperactivity which might lead to aggressive behaviors and sometimes criminal acts.[56]

Benzodiazepines are sometimes nonmedically used for their recreational effects, either alone or in combination with other drugs such as opioids analgesics. Benzodiazepines can enhance the ecstatic effects of opioids and the depressant consequences of alcohol. When used for long period, benzodiazepines can cause addiction and tolerance.[55] With time, some individuals are no longer responsive to the therapeutic doses of benzodiazepines and require greater amounts of the drug. Moreover, when addicted to benzodiazepines, abrupt cessation will lead to withdrawal symptoms. These symptoms include high levels of anxiety, nightmares, difficulty sleeping, and memory impairments among others.[55]

A recent short report by DAWN revealed that more than 1 million ED visits involved benzodiazepines (alone or in combination with other drugs such as opioids or alcohol) between 2005 and 2011. Specifically, alprazolam was one of the pharmaceuticals with the greatest percent increase in drug related ED visits (148.3%) between 2004 and 2011.[46]

Barbiturates, another category of CNS depressant, are used for their anxiolytic, sedative-hypnotic, and anticonvulsant effects. Their mechanism of action is also through enhancing the inhibitory action of the GABA neurotransmitter. However, unlike benzodiazepines, barbiturates bind directly to GABA receptors at higher doses. In this case, barbiturates exert their action independently from the intrinsic neurotransmitter. This direct mechanism of action is the reason for the low therapeutic index of these medications and the higher toxicity profile compared to benzodiazepines.[54] Adverse events related to barbiturates include slurred speech, confusion, drowsiness, and severe cases can lead to coma and death. Barbiturates are often abused recreationally for their relaxing and euphoric actions. Barbiturates are highly addictive and, if stopped abruptly, cause withdrawal symptoms (tremors, difficulty sleeping and anxiety).[57]

Because of the low safety of barbiturates, physicians prescribe benzodiazepines instead of barbiturates for the sedative-hypnotic and anxiolytic uses.[57] currently, barbiturates are only used in general anesthesia, epilepsy, and acute migraine management. Although the medical use of barbiturates decreased significantly,[58] evidence exists that the abuse rate is on the rise, especially among young adults.[59]

Stimulants

Stimulants are another type of prescription drug that act on the CNS, which may cause addiction if misused/abused. Stimulants, such as methylphenidate (e.g., Ritalin®, Concerta®), amphetamine/dextroamphetamine (Adderall®), dexmethylphenidate (Focalin®) and dextroamphetamine (Dexedrine®),[47] are prescribed for medical conditions such as narcolepsy (falling asleep suddenly), weight loss, and Attention Deficit Hyperactivity Disorder (ADHD). Their mechanism of action involves increasing the concentration of catecholamine (dopamine and norepinephrine) and serotonin, in higher concentration. They can also increase the concentration of the aforementioned neurotransmitters by inhibiting their reuptake in the brain. Thus, stimulants increase alertness, and attention, but reduce hyperactivity.[13]

Stimulants have a high potential for abuse, and, thus, are classified as Schedule II by INCB. They are also used nonmedically (without prescription) for weight loss as they are known to suppress the appetite. Students tend to misuse stimulants to stay awake for long periods with the intention to improve their academic performance. At higher than usual doses, stimulants cause hallucinations and euphoria and might be misused for these particular reasons.

Adverse events while taking stimulants include difficulty sleeping, anxiety, irritability, loss of appetite, increase in heart rates and blood pressure. Withdrawal symptoms include exhaustion, depression, and paranoia.[60] Results from the most recent NSDUH (2013), showed that approximately 1.4 million persons aged 12 years and older were current users of stimulants which as an estimate that is significantly higher than in 2011 (970,000 users). Of those 1.4 million persons, 603,000 were new nonmedical users of stimulants. The average age of new nonmedical use of stimulants was 21.6 years. In the past 12 months, 1 in 5 (20.6%) individuals who started using illicit drugs started with nonmedical use of prescription pharmaceuticals, including 2.7% started with a stimulant. Most of the current users of stimulants obtain their prescription drugs from a relative or a friend for free.[4]

The 2013- DAWN special report concerning the number of ED visits attributed to ADHD medications showed a significant increase in ED visits related to these medications. In fact, between 2005 and 2010, the number of those visits increased from 13,379 to 31,244. The largest increase was evident among adults aged 18 years and older. Specifically for those aged from 18 to 25 years, the number of ED has more than tripled.[47]

Analysis of ED visits related to ADHD stimulants demonstrated that almost 50% of these visits were related to the nonmedical use. In addition, the number rose significantly from 5,212 to 15,585 visits between 2005 and 2010. Another important observation from this report is that other pharmaceuticals were involved in virtually half of ED visits involving ADHD stimulants. The most concomitant prescription medications were anxiolytics, insomnia medications, and narcotics.[47]

Using stimulants for nonmedical purposes is a particular concern among college students. A recent ten-year trend analysis of lifetime and past year NMUPD among college students revealed that both rates significantly increased for stimulants, but not for opioids and sedatives/anxiolytics. In particular, the rate of NMUPD was 4.5% in 2003 and increased significantly to 9.3% in 2013. This pattern reflects an increase in the prescription rate of ADHD stimulants, the nonmedical use of stimulants to enhance academic performance.[27]

A Review of Studies that Investigated the Frequency, Pattern and Motives for NMUPD among College Students

Recently, there has been a growing interest in investigating the phenomenon of prescription drug abuse among college students. This is evident in the significant number of original studies and reviews that appeared in the literature lately to examine the nonmedical use of prescription drugs, especially stimulants. We were able to identify more than 70 original studies and reviews in PubMed related to frequency and motives of prescription drug use among college students. Our inclusion criteria were original studies and reviews that, (1) address reasons, beliefs, attitudes, and factors associated with NMUPD, (2) were conducted in the United States, (3) surveyed college students, (4) and were published in a peer-reviewed journal. Some reasons for exclusion were studies that, (1) address NMUPD among high school students and adolescents not attending college, (2) and were conducted in a country other than the United States.

Characteristics of Studies that Assessed NMUPD

We found that most studies included in our literature review were cross-sectional in nature. A few studies, however, were longitudinal.[61,62] This is due to the fact that NMUPD is a relatively new and emerging phenomenon on college campuses. We also found that most of the studies addressed the nonmedical use of prescription stimulants. This is because using prescription stimulants for nonmedical purposes is particularly evident on college campuses. Most of the studies were quantitative in nature, except for two studies that used a qualitative approach,[63,64] and a mixed methodological design.[65] Unfortunately, few studies utilized a theoretical approach to investigate beliefs and attitudes about NMUPD.[64,66–69] Social learning theory was tested among four studies [64,66,67,69] and the theory of planned behavior was tested in three studies.[68,70,71]

The most investigated aspects of NMUPD were frequency, prevalence, sources, motives, and demographic factors associated with NMUPD. Additional information about the illicit use of other substances, such as alcohol and marijuana, were also common among these studies. Most studies explored only one type of prescription drug. However, some studies explored the four types of the most commonly abused prescription drugs concomitantly. A limited number of studies asked about the route of administration,[15,72,73] or conducted studies among professional students (such as medical, pharmacy and dentistry students).[74–76]

A considerable number of recent studies utilized online or web-based methods to distribute surveys[27,72,73,75–79] as opposed to the traditional paper and pencil formats. Online survey distributions take advantage of the abundance of personal computers, smart phones, and tablets among college students. Using online surveys maximize students' convenience and privacy in an attempt to increase response rates.

The response rates obtained from web-based surveys found in the literature among college students regarding the nonmedical use of prescription drugs are summarized in Table 1. The average response rate from these studies was 57%. The response rate in most of these studies was unusually high. For example, in the study conducted by Arria et al. (2008), the response rate was 72%. One possible explanation for such a high response rate was that each student who participated in this study was provided with monetary incentives.[61]

Table 1 Summary of response rates for studies that used online surveys regarding nonmedical use of prescription drugs among college students

Author and Year		Topic	Response rate (%)*
McCabe et al. (2005)[80]	2005	"Illicit use of prescription pain medication among college students"	47.30%
Teter et al. (2006)[15]	2006	"Illicit Use of Specific Prescription Stimulants Among College Students: Prevalence, Motives, and Routes of Administration"	66%
McCabe & Teter (2007)[81]	2007	"Drug use related problems among nonmedical users of prescription stimulants: A web-based survey of college students from a Midwestern university"	68%
McCabe et al. (2008)[82]	2008	"Misperceptions of Nonmedical Prescription Drug Use: A Web Survey of College Students"	68%
Arria et al. (2008)[61]	2008	"Perceived harmfulness predicts nonmedical use of prescription drugs among college students: Interactions with sensation seeking	72%
McCabe et al. (2008)[83]	2008	Screening for Drug Abuse Among Medical and Nonmedical Users of Prescription Drugs in a Probability Sample of College Students"	68%
Teter et al. (2010)[73]	2010	"Nonmedical use of prescription stimulants and depressed mood among college students: Frequency and routes of administration"	68%
Rabiner et al.(2010)[84]	2010	"Predictors of Nonmedical ADHD Medication Use by College Students"	46%
Egan et al(2013)	2013	"Simultaneous use of nonmedical ADHD prescription stimulants and alcohol among undergraduate students"	34.80%
Brandta et al. (2014)[29]	2014	"survey of nonmedical use of tranquilizers, stimulants, and pain relievers among college students: Patterns of use among users and factors related to abstinence in non-users"	30%
Dart et al.(2014)[72]	2014	"Nonmedical Use of Tapentadol Immediate Release by College Students"	60%
*Average response rate = 57%			

Frequency, Prevalence and Epidemiology of NMUPD among College Students

The percentage of students using prescription drugs for nonmedical purposes varies considerably between different studies. This is due to methodological and geographical variations in these studies. Methodological variations include survey distribution and administration, response rate, and sample selection. Moreover, the way by which the questions about NMUPD was formulated affected the frequency (lifetime, past year, or past month use) of past use.

A large-scale study conducted by McCabe et al. (2006)[85] utilized random sampling techniques and provided valuable incentives for undergraduate students to participate in an online survey. In this survey, the four most commonly abused prescription drugs, sleeping medication, anxiolytics, stimulant medication, and pain medication, were evaluated. The final sample size of this study exceeded 9,000 undergraduate students. It has been found that the frequency of lifetime illicit use for any of the four medications to be 21% and the annual prevalence to be 14%.[85] The lifetime illicit use of prescription drugs was also confirmed by a cross-sectional study conducted over a 10-year- period and involved more than 20, 000 college students.[27] In this study, the average lifetime use of at least one of the four groups was also 20%.[27]

Other studies, however, with smaller sample sizes found higher lifetime use. For example, Peralta & Steele (2010) conducted a study among 465 college students found a lifetime illicit use of any of the four groups to be as high as 39.4%.[69] This percentage was close to 36.8% and 35.6% found in a study conducted by Brandt et al. (2014)(n= 303 college students),[27] and Benotsch (2011) (n=435 undergraduate students) respectively. [86] Other researchers found a much lower lifetime rate of illicit use prescription drugs, such as 5.5% among Hispanic students in a study conducted by Cabriales et al. (2013),[87] and an analysis of the Public Health College Alcohol Study which included 11,000 students by Ford and Arrastia (2008) found a lifetime illicit use of any of prescription medications to be as nearly as 11%.[66]

Among the studies that explored pain medications, prescription stimulants, anxiolytics, and sleep medications, it was found consistently that the illicit use of pain medications and stimulants exceeded anxiolytics and sleep medications.[69,75,85,87] However, there was disagreement whether pain medications or stimulants has the highest rate of nonmedical use. For example, McCabe et al. (2006)[85] found that the annual rate of illicit use was highest for pain medications (9%) followed by stimulants (5%), anxiolytics (3%) while sleep medication has the lowest frequency of (2%). A similar pattern was found by Cabriales et al.(2013) study among Hispanic college students [87] Peralta & Steele (2010) among college students at a Midwestern university,[69] and Lord et al. (2009) among PharmD students.[75] In contrast, other studies found that the illicit use of stimulants exceeded that of pain medications.[29,62,77,88,89] The reasons for these discrepancies could be due to geographical variations and the different time in which these studies were conducted.

In general, the illicit use of prescription stimulants is a relatively recent phenomenon that coincides with the escalation of ADHD diagnosis and management. For this reason, recent studies usually find higher rates of illicit use of stimulants compared to opioid analgesics. To illustrate this point, the study conducted by McCabe et al. (2006) was actually based on data from a survey conducted in 2003 and found that opioid analgesics were illicitly used more than stimulants.[85] In contrast, more recent studies such as those conducted by Meisel & Goodie(2015)[88] and Snipes et. al (2015)[77] found that illicit use of stimulants surpassed opioid analgesics. A trend analysis of NMUPD among college students over a 10-year periods by McCabe et al.(2014) demonstrated that the nonmedical use of prescription stimulants, both past-year and lifetime use, increased significantly between 2003 and 2013 ($p < 0.001$), unlike opioid analgesics which showed significant decrease over the same period ($p < 0.001$).[27]

Unusual high rates of NMUPD were frequently seen with stimulants. For example, in a study conducted by Desanties et al.(2009) among 307 fraternity college students, more than half (55%) of the sample reported nonmedical use of stimulants.[90] Nonmedical use of stimulants is frequently seen among Greek affiliated students. This phenomenon is discussed further in the section about "Motives and Correlates of NMUPD" among college students. Another high rate (43%) was seen in a study by Advokat et al.(2008) study, among a convenience sample of undergraduate students in a southern public university.[91] This high rate may be due to the convenient sample used for the study which may not be representative.

There were variations in assessing previous illicit use of prescription medications between studies. Most surveys queried about lifetime and past-year use. However, there were some studies asked about the nonmedical use in the last 6 months, or in the last month.[92,93] For example, Rabiner et al.(2009) study (n=3400 undergraduate student) found that the percentage of nonmedical use of ADHD medications, in the last six months, to be 5.4%, and a study by Garnier et al.(2009) found that 13.7% of the surveyed students used opioid analgesics nonmedically in the last six months.

To obtain more precise estimation of the most recent use of stimulants, Weyandet (2009)[94] queried about last month nonmedical prescription stimulant use among a sample consisted of 390 college students. In this study, 7.5% of the 390 college students reported nonmedical use of stimulants in the past month.[94]

Many surveys provided students with a list of drugs and asked them to indicate which one they had used for nonmedical purposes. Among opioid analgesics, OxyContin® (Oxycodone), hydrocodone, and Vicodin® (acetaminophen/codeine) were the most commonly mentioned by college students.[29, 67, 85] Adderall® (amphetamine/ dextroamphetamine) and Ritalin® (methylphenidate) were the most commonly used prescription stimulants nonmedically.[15,29,69,95] Among anti-anxiety medications, college students most frequently used Xanax® (alprazolam) without a prescription.[29]

Concurrent Use of Other Illicit Drugs, Alcohol, and Tobacco along with NMUPD

Several studies examined the concomitant use of prescription drugs and other abusable drugs.[75,88,96] It has been found that students who used prescription drugs for nonmedical purposes were also more likely to report binge drinking, tobacco and marijuana smoking, and the use of other illicit drugs such as cocaine and LSD (Lysergic Acid Diethylamide).

Among college students who used any prescription drug for nonmedical reasons, 80% also consumed alcohol, 44% smoked marijuana, and 28% report reported tobacco use. Among college students who reported NMUPD, less than 10% also reported past-year use of LSD, cocaine, methamphetamine, heroine, and ecstasy.[88] In fact, alcohol use disorders (AUD) constituted 75% of NMUPD.[96] Another study found that, the use of marijuana can be as high as 90% among those who reported nonmedical use of prescription stimulants.[81] In one study, the correlation coefficient between the nonmedical use of stimulants and cocaine and ecstasy use was found to be as high as 0.832.[92] Among those who regularly misused opioids, 67% also used tranquilizers, 51% reported using cocaine, 31% used ecstasy, 14% used methamphetamines, and 6% used heroine.[97]

Compared to students who never used benzodiazepines nonmedically in the past year, nonmedical users of benzodiazepines were over 30 times more likely to report past-year nonmedical use of opioid analgesics (AOR = 32.1, 95%CI = 25.4 – 40). In addition, those who reported illicit use of benzodiazepines were ten times more likely to indicate using cocaine, prescription stimulants, and ecstasy during the past year and past month. They were also four times more likely to report binge drinking in the last two weeks, and cigarette smoking in the past month.[98]

Sources of Prescription Drugs

Multiple studies queried college students about their source of prescription drugs for nonmedical purposes. Most of these studies found that peers and friends were the most common sources. The second significant source was family members.[14,65,99,100] One study found that nearly 62% of students were offered prescription stimulants for nonmedical use by year four of college.[14] This study also found that the most common source for nonmedical use was a friend with a prescription stimulant for ADHD.[14] Rozenbroek & Rothstein (2011) also indicated that in 50% of the cases, friends were the source for nonmedical use of prescription stimulant was from friends.[89] A higher percentage was found in a study conducted by Lord et al.(2011) in which friends accounted for 85% of the source for prescription medications stimulants, followed by parents (18%), other family members (12%), and online sources (5%).[97] Less common sources identified by a study carried out by DeSantis et al. (2008) were work sites and strangers.[65]

A qualitative study conducted by Cutler (2014) using semi-structured interviews, indicated that prescription stimulant medications are very accessible for nonmedical use.[64] The same observation was made by DeSantis et al. (2008) using a multi-methodological approach. This study asked: “how difficult it is to obtain illegal stimulants?” Thirty-nine percent indicated “very accessible” and 43% said “somewhat easy.” Less than 1% thought it was very difficult to obtain these drugs. In summary, a total of 85% indicated that getting prescription stimulants on campus was "very easy" or "somewhat easy." As one of the students said "they seem to be everywhere."[65]

Some students indicated that it was easy to get prescriptions for stimulants by healthcare professionals.[64] Additionally, other students thought that healthcare professionals prescribe stimulants in excess.[64] Students with legitimate prescription and extra pills were sometimes approached by other students to sell or share their drugs. In fact, as demonstrated by McCabe et al. (2014), among college students who were prescribed medications in the previous year, nearly 27% were asked to share their medications by other student.[25]

Predictors of and Motivations for NMUPD among College Students

In general, prescription stimulants are used mainly to enhance academic performance, to reduce distractions, and to improve concentration.[14,15,64,67,75,76,79,89,92,95,101,102] The main motive for the nonmedical use of opioid analgesics is to have fun, reduce stress, relax, and to deal with chronic pain.[63,75,89,97] Other motives for nonmedical use of prescription stimulants are to lose weight, boost energy during athletic events, and socialization.[63,64,66,76]

Students frequently mentioned enhancing academic performance as the main motive to use prescription stimulants, especially during preparation for big exams and to meet deadlines for projects.[65] College students used these medications as an effective study aid to enhance alertness, increase work performance, stay wake, reduce fatigue, improve reading comprehension, and to boost memory and cognition.[16,65,67,95] Many studies indicated that college enrollment is per se a predictor for nonmedical use of stimulants.[13,54,87] In fact, a study by DeSanties et al.(2008) found that 63% of college students first used non-prescription stimulants in college settings.[65] As one of the students described taking Adderall "so much more productive. I mean I'm generally productive. It's just like a different level on Adderall."[65]

Using prescription for recreational purposes was among the common reasons cited by college students.[63,64,66,97,100,102,103] The most commonly used drugs to get high or to enhance the partying experience were opioid analgesics, CNS stimulants, and anxiolytics.[63] Students used these medications for socializing with peers and friends, especially during parties.[63, 66] Mixing prescription drugs with alcohol was described by some students as a "new" or different way of "high," not experienced by drinking alcohol alone.[63] As one student described "if you take a valium and have a beer, then you're pretty much good for the rest of the night, instead of buying seven or eight beers, it just a great money saver."[63] Some indicated that they sought for a pill to feel high, if alcohol was not available.[65]

Most studies showed that males were more likely to use prescription drugs for nonmedical reasons than females.[10,75,80,93,98,104,105] However, a study by Teter et al. (2005), found no gender differences in NMUPD.[101] Not only was the frequency of utilization different between the two genders, the motives were also different. Males usually used opioid analgesics for recreational purposes (to get high and to have fun), and females used them to deal with depression, to manage chronic pain, and to lose weight.[97] Hall et al. (2005) found that the main predictor for the illicit use of prescription stimulants by males was knowing where to get these medications easily. However, for females, the main predictor of the illicit use of prescription stimulants was being offered the medication by another student.[106] Moreover, while undergraduate female students were more likely to be prescribed pain medications, male student were more likely to report nonmedical use.[80]

White college students were found consistently to have higher NMUPD compared to Black students.[66,75,81,93,98,104] According to Ford & Arrastia (2008), it is possible that non-Whites, have more accessibility to street and other illicit drugs while white students had more access to prescription medications.[66] Fewer studies, however, found that being Hispanic was also a predictor of NMUPD.[67, 75]

Early onset of using prescription drugs for nonmedical purposes is a predictor for drug abuse and addiction.[76,107] In addition, using prescription drugs nonmedically before college is a predictor for recreational uses of prescription drugs.[97]

Concurrent illicit drug use, binge drinking, and risky behaviors were common correlates with NMUPD. Use of marijuana, other illegal drugs, poly substance abuse, excessive alcohol intake and binge drinking were frequently seen with prescription drug misuse in general.[13,74,76,80,81,92,93,98,108] Risky sexual risk behaviors such as having multiple sexual partners and unprotected sex were also found to be significantly associated with NMUPD among college students.[86,98]

Although enhancing academic performance was the most frequently mentioned motive, studies found that low GPA was a significant predictor of the nonmedical use of prescription stimulants.[12,109] In addition, college students who used stimulants without prescription were found to skip classes, spend more time in social activities and less time studying. Usually, freshmen were more likely to report using prescription drugs, than advanced students.[76,108] This may be due to the significant challenges and stressful times that students faced during the first year of college.

Attending colleges that are more competitive was also found to be associated with NMUPD.[110] Having a friend who used stimulants increased the likelihood of NMU by other students.[67,69,94,99] In addition, obtaining prescription medications from a friend rather than a family member was associated with reporting higher rates of alcohol and other drug use.

Participation in fraternity/sorority groups has been found to be a risk factor for NMUPD in several studies.[27,72,75,77,80,81,92,94,108,110] In particular, a study conducted by McCabe et al. (2014) revealed a strong association between Greek membership and the past-year nonmedical use. For example, compared to non-members, being a member of social fraternity or sorority groups lead to an Adjusted Odds Ratio (AOR) of 1.94 (95%CI: 1.54-2.45) of nonmedical use of sleep medications, 2.29(95%CI: 1.87-2.80) of nonmedical use of sedative/anxiety medications, 2.82 (95%CI: 2.44-3.21) of nonmedical use of stimulant medications, 1.30(95%CI: 1.12-1.51) of nonmedical use of opioid medications, and 1.89(95%CI: 1.69-2.10) of nonmedical use of any medications in the past year.[27]

Snipes et al. (2015) found that religiosity had a protective effect against NMUPD by college students. However, the Greek-membership negated this protective effect.[77] DeSanties et al. (2009) conducted a study specifically among fraternity and sorority students and found that the nonmedical use of stimulants was unusually high among this particular group.[90] In this study, approximately, 55% of the 303 college students who were affiliated with Greek groups reported NMU of stimulants.[90] The vast majority of the surveyed students reported academic motives for such use, and did not perceive ADHD medications as unsafe.[90]

One exception was found by Volger et al. (2014) in which being a member of a fraternity or sorority groups protected against the nonmedical use of prescription stimulants. Involvement in pharmacy fraternities decreased the possibility of NMUPD by 70%.[76] The authors justified such atypical findings as pharmacy students' used these fraternities to promote healthy study habits, community service, and advancing pharmacy as a profession in general.[76]

Psychological factors and underlying beliefs toward NMUPD included holding positive attitudes toward NMUPD in general; sensation seeking; impulsivity, low risk perception, higher anxiety; and feeling sad, hopelessness, depression, suicidal thoughts, and perfectionism.[13, 59,69,77,88,103,104] Mental illnesses were also associated with the NMUPD.[113]

Less frequently studied factors included health insurance, family income, type of housing (i.e. on-campus vs. off-campus), and the route of administration of prescription drugs. There were inconsistent results regarding the influence of health insurance, as one study found that lack of health insurance was a risk factor for NMUPD,[113] while another study indicated opposite result.[112] Having a family income of $50,000- $99,999 was associated with higher NMUPD,[81] and living in a house or an apartment (compared to living in a university residence hall).[80] Teter et al. (2006) found that most illicit users of prescription stimulants (95.3%) reported taking them orally.[15] Nearly 50% of frequent non-oral users of prescription stimulants reported depressed mode.[73] Arria et al. (2008) indicated that nonmedical users of both stimulants and analgesics had a greater likelihood of inhalation compared with stimulant users only (13.9% vs. 4.3%).[62] The primary route of taking tapentadol (opioid analgesic) was also oral, followed by inhalation and then injection.[72]

Interventions to Address Prescription Drug Abuse

Unfortunately, the number of controlled studies that evaluated the effectiveness of interventions to reduce the nonmedical use of prescription drugs among young adults is limited. A majority of studies that examined the effectiveness of interventions were directed against alcohol, marijuana, and tobacco.[35,114–116] To find studies the evaluated interventions for prescription drug abuse, the following inclusion criteria were used: (1) randomized controlled studies,(2) to evaluate the effectiveness of interventions to reduce nonmedical use of prescription drugs, (3) among young adults and adults. Studies were excluded if they were (1) conducted among students in elementary and high school,[116,117](2) directed against other illicit drugs such as marijuana and cocaine[115,116] (3) studies among regular prescription drug users [118] and (4) studies that required parent involvement.[119,120]

.Most of the studies found in the literature did not much the inclusion criteria. Therefore, only the techniques used in these interventions were the focus of the search. The most common components of the interventions used to address drug misuse and abuse in general were enhancing assertiveness and refusal skills,[115,117] providing dramatic narratives,[121] persuasive communications and behavioral cognitive therapy,[122] motivational interviewing,[118] promoting social skills and coping mechanisms,[118] raising knowledge and awareness about risks and benefits,[121] challenging misperceptions, and harm reduction.[123]

A randomized controlled trial conducted by Tait et al. (2014) among 160 amphetamine-type stimulant users (including nonmedical use of prescription stimulant) utilized a fully-automated web-based intervention. The strategies utilized in this study included cognitive behavioral therapy and motivational augmentation. Other techniques such as evaluating the pros and cons of the nonmedical use of stimulants, specifying a clear goal, and enhancement of refusal skills were also used. The results revealed few significant improvements in the intervention group compared to the control one. Surprisingly, participants in the control group reported a more decline in the use of amphetamine compared to the intervention group. Some of the limitations of the study included, loss to follow-up and failure to complete the entire intervention by the participants. Significant number of participants in the intervention group did not even complete the first module.[124]

Another randomized controlled trial, were conducted among 346 working women. Although not using college students, this study tested the feasibility of a web-based program known as SmartRx to prevent the nonmedical use of prescription drugs, including analgesics, sedative-hypnotics, stimulants, anti-depressants, and tranquilizers. The intervention comprised of self-guided modules that provided information about a drug's action, side effects, safe handling, and responsible use. The idea of using an online intervention, according to the authors of the study, was to provide a non-threatening environment, especially when dealing with such stigmatized behavior.[121]

The rational of this intervention was that by raising awareness and promoting healthy alternatives such as relaxation and yoga, participants were less likely to engage in drug misuse. The results of this trial indicated that women in the intervention group had more knowledge and self-efficacy in managing problems with medications compared to the control group. The main limitation of the study was low generalizability as it was conducted among working women in the medical field (nurses, physician assistants, and others).[121]

Only one randomized controlled trial was proposed to be conducted among college and university students regarding prescription drug abuse.[123] The protocol of this study was grounded in harm-reduction strategy to impact injunctive and descriptive norms toward licit and illicit drug use among students. Illicit drugs to be targeted included the nonmedical use of prescription drugs such as opiates and amphetamines.

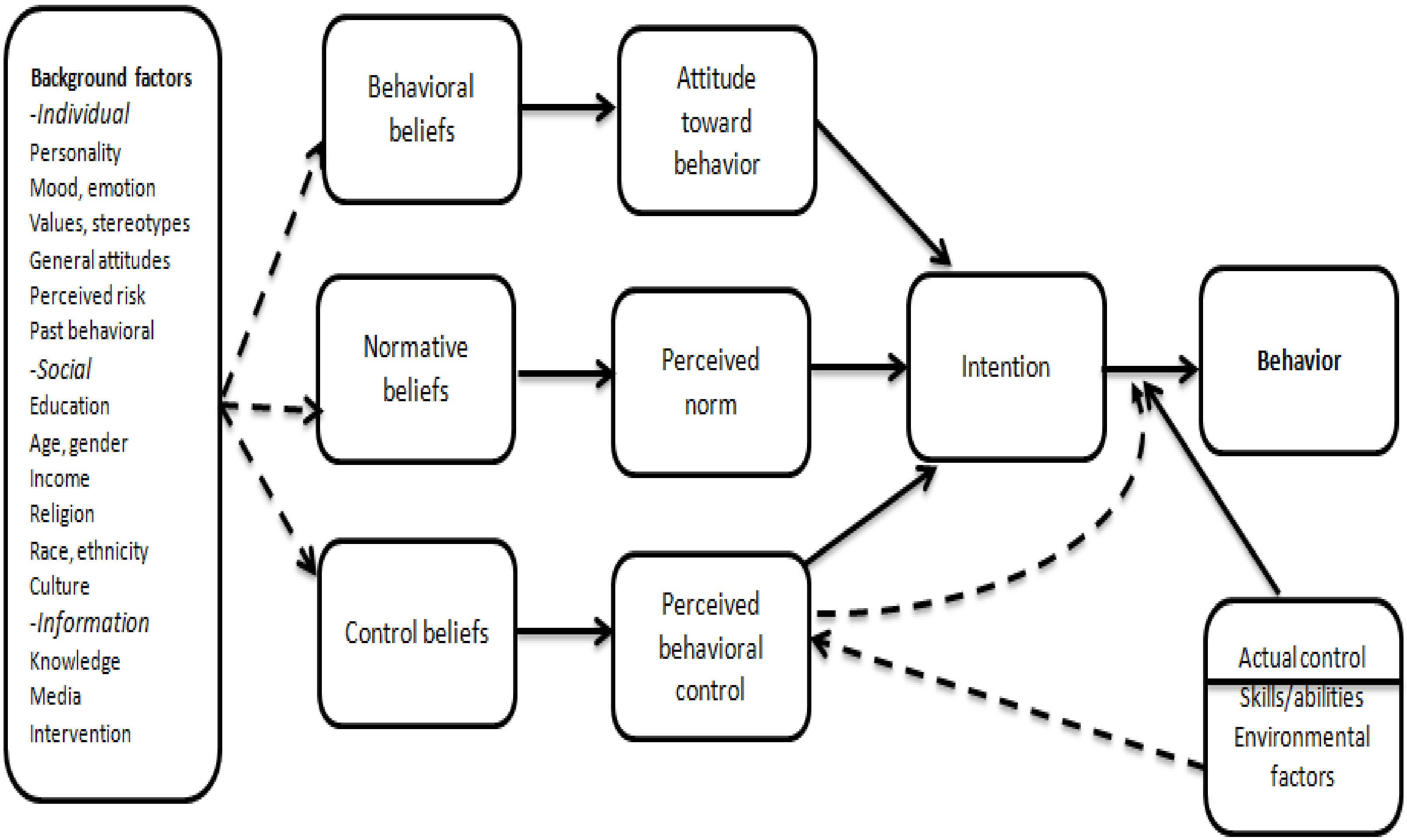
The idea behind using the social norm approach was that college students were susceptible to peer pressure. Messages based on results from a survey (to be distributed) would be composed to challenge misperceptions about norms regarding illicit drug use among college students. Example of these messages included " survey found that 80% of college students never used prescription drugs for nonmedical reasons in their entire life" and "it has been found that most students think it is not safe to use prescription drugs without medical supervision."[123]

Overview of the Reasoned Action Approach

Fishbein and Ajzen described the latest version of the theory in their book "predicting and changing behavior: the reasoned action approach" (2010). To predict or change a behavior, Fishbein and Ajzen emphasized the importance of defining the behavior clearly. Four elements should be included to describe the behavior, including time, context, target and action. In addition, compatibility in these four elements should be consistent in measuring theory's constructs.[19]

The next step is to look at the behavior determinants. The reasoned action approach assumes that our decision to perform a behavior stems from a set of beliefs that originate from multiple sources, and from our interaction with individuals around us. There are also intrinsic factors such as personality traits that influence the way we seek, interpret, and recall information to which we are exposed. Figure 1 demonstrates the schematic presentation of the reasoned action approach.[19]

Figure 1 Schematic presentation of the reasoned action approach



(Source: Fishbein M, Ajzen I. *Predicting and Changing Behavior: The Reasoned Action Approach*. Taylor & Francis; 2011)

Fishbein and Ajzen postulated that no matter how we acquired these beliefs, they guided our decision to engage or not to engage in that behavior. The latest version of the reasoned action approach identifies three main beliefs known as behavioral, normative, and control beliefs.

First, behavioral beliefs formulate individual's attitude toward executing the behavior. In other words, personal evaluations of the benefits and drawbacks of the behavior shape an individual's attitude and consequently the likelihood of performing the behavior.

Second, normative beliefs are formed based on the degree to which important people in our life would support our decision to execute the behavior (injunctive normative beliefs). Another type of normative beliefs is formulate based on the degree to which these important others personally perform a particular behavior (descriptive normative beliefs). Together, these normative beliefs form the perceived norm, which is the sense of peer and social pressure to perform or not to perform the behavior.

Third, control beliefs are formed because of the impact of personal and environmental factors which facilitate or hinder our ability to carry out a behavior. These control beliefs result in a perception of low or high self-efficacy or perceived behavioral control as defined in the reasoned action approach.[19]

Attitudes, perceived norms, and perceived behavioral control combined lead to the formulation of behavioral intention or willingness to perform a behavior. Intention is the immediate determinant of a behavior. The stronger the intention, the more likely that a behavior to be performed. However, this statement is true only if an individual has the necessary skills and qualities to perform a behavior in the absence of environmental constraints. These factors are captured within the perceived behavioral control construct of the reasoned action approach. Therefore, both intentions and perceived behavioral control serve as direct predictors of behavior.[19]

Figure 1presents a schematic visualization of the reasoned action approach in its most recent version. As indicated in the theory, immediate and the most important determinant of behavior is intention. However, to act on their intention, people should have the necessary skills and ability to perform the behavior in the absence of environmental barriers. On the other hand, the underlying attitudes and perceived norms should be investigated to understand intention better. However, this representation is a simple way of visualization of the theory as it lacks loops and relations between constructs.

It should be noted that these three predictors have different importance in determining one's intention to carry out a behavior. The relative contribution of these three determinants depends on the nature of the behavior, the population, and the context/environment. It is also important to recognize that the term "reasoned" does not mean that people are rational and reasonable when reaching a decision to engage in certain behaviors. The reasoned nature of the theory implies that the formation of attitudes, norms, and perceived behavior control follows reasonably from a set of beliefs. The theory, however, does not assume the rationality of these beliefs, as they might be biased and inaccurate. The origin of these beliefs is not addressed by the reasoned action approach.[19]

Behavioral, normative, and control beliefs are influenced by many variables such as demographic factors, general attitudes, personality traits, and past behavior. The dashed arrows between the background variables and the three beliefs indicate that this relation or connection is not always evident. In the presence of various background factors, it is difficult to decide which to include in the final model to predict intention or behavior. However, inclusion of relevant background factors plays an important role in understanding particular behavior.

Predictors of Intention

Direct predictors of intention as presented in the reasoned action approach are attitudes, perceived norms, and perceived behavioral control. Additional predictors may include past behavior.

Attitudes

Attitude is one of the most heavily studied construct in socio-behavioral sciences to predict and explain behavior. Several definitions for attitude exist in the literature. Fishbein and Ajzen defined attitude as “a latent disposition or tendency to respond with some degree of favorableness or unfavorableness to a psychological object”.[19] This definition implies that attitudes are “evaluative in nature," which encompass a full range of appraisals from two extremes including a neutral point. This scale is also known as "bipolar evaluative" scale.

Attitude is often measured by using a group of two extremes evaluative scales, usually with seven positions or alternatives. This scale is known as the semantic differential that was originally developed by Chalres Osgood et al., (1957). A score obtained from this scale would represents an individual's attitude toward an object or behavior[125] Examples of the semantic differential scale include a set of evaluative adjectives that range from "positive" to "negative," "bad" to "good" and "like" to "dislike." The most extreme minimum side of the scale is usually assigned a -3 score and the other extreme side is assigned a score of +3. The overall individual's attitude could either be the sum or mean score across all presented scales. Higher score means favorable attitudes toward the specific behavior.

Cronbach's alpha coefficient is usually measured to test the internal consistency between items that were used to evaluate the attitude. Cronbach's alpha ranges between zero and one. For the internal consistency to be satisfactory, Cronbach's alpha should be at least 0.75.[126,127]

Some researchers have distinguished two types of attitudes experiential (affective) and instrumental (cognitive). The experiential attitude is related to the way someone feel while performing a behavior, and can be measured using bipolar adjectives such as relaxing-stressful and enjoyable-unenjoyable.[128] On the other hand, instrumental attitudes are more cognitive based (related to the consequences of performing the behavior) and can be measured using dimensions such as harmful-beneficial and useless-useful.[17]

Factor analysis performed in several studies revealed that it is possible to dissect attitudes into two interrelated aspects, instrumental and experiential. It is a good practice that the semantic differential measure of attitude to include both instrumental and experiential items as a starting point. Although it may be not necessary that the final scale will have both subtypes of attitudes, most attitudinal scales are composed of both types.[19]

Although it is easy to construct the semantic differential scale, many measures of attitudes are based on the evaluation of underlying beliefs. In other words, the measurement of an individual's attitude can be inferred from the verbal expressions or opinions toward a behavior or object. For example, a person who states, "using prescription drugs without medical supervision is damaging to one's mental health" would seem to have a less-favorable attitude toward the nonmedical use of prescription drugs. On the other hand, a person who thinks that "prescription stimulants boost my energy and enhance academic performance" seems to have a more-favorable attitude.

Likert (1932) offered a simple method known as the method of summated ratings to assess attitudes. After identifying a large pool of items, the investigator decides which items evoke either favorable or unfavorable attitude toward the object or behavior. Any item that is neutral or vague is eliminated. The remaining items are then presented to the respondent to measure their level of agreement with each belief.[129,130]

According to the theory of reasoned action, beliefs are precursors for attitudes. The expectancy value model describes the way by which beliefs impact attitudes.[131] It maintains that attitudes toward an object or behavior are formed as new beliefs are emerged. The strength of the beliefs, along with the evaluations of attribute, are summed up to indicate an overall attitude toward the object.

$A = \Sigma\, b_i\, e_i$
A: stands for attitude toward an object
b_i: The strength of the attribute's *i* belief
e_i : The evaluation of attribute *i*

According to this model, favorable attitudes result from holding positively valued attributes toward an object or behavior and unfavorable attitudes result from holding negatively valued attributes. The more strongly an individual possess a given belief, the more its evaluation contributes to the attitude toward an object.

A high correlation between direct measures of attitudes (using the semantic differential scales) and belief-based measures (using the expectancy model) is supported by several meta-analyses. For example Armitage & Conner (2001), found a mean correlation of 0.53 between these two measures of attitudes (direct and indirect) across various behaviors.[37] The belief-based measures of attitudes are sometimes known as indirect measures. However, in their recent publications, Fishbein and Ajzen warned that it is confusing to view the $\Sigma b_i\, e_i$ index as an indirect measure of attitude. Instead, they recommended considering this index as a composite measure of beliefs that is presume to determine the attitude. A standardized survey/questionnaire should be constructed to assess belief strength and evaluation with respect to each item.[19]

Perceived Norms (PN)

The social environment in which we live s shapes our intentions and behaviors. The reasoned action approach measures this influence as the perceived social. Stronger perceived social pressure usually leads to stronger intention to perform certain behaviors. Fishbein and Ajzen defined subject norms earlier as the perception that an individual holds regarding important others' approval/disapproval of him/her performing a behavior. The term "subjective" was used because it was an individual evaluation of perceived approval/disapproval toward certain behaviors that may or may not be true regarding what important others expected them to do.[128]

However, the updated theory, found that perceptions about behavioral approval by important referents may not be the only from of social pressure. In addition, individuals are also influenced by the perception that important referents may themselves be carrying out this behavior. These two sources of normative pressure are known as "injunctive" and "descriptive norms," respectively.[128]

Perceived injunctive norms are measured directly by using questions about the opinions and thoughts of a generalized social agent (not a specific group). Injunctive norms should be measured with respect to a specific behavior and should be compatible with the measures of intention and behavior in terms of action, context, target, and time factors. For example, to measure the injunctive norms of a college student with respect to the use of prescription drugs for nonmedical reasons, a question can be formulated in the following manner:

Most people who are important to me think that it is OK for me to use prescription drugs for nonmedical reasons in the next 3 months:

Agree: _-3_:_-2_:_-1_:_0_:_1_:_2_:_3_: Disagree

Measures for injunctive normative beliefs should be formatted with respect to a specific referent group rather than a generalized social agent. The original version of the reasoned action approach called for measures of the motivation to comply with a particular group or individual. Knowing that a referent approves certain behavior is only meaningful if a person is motivated to comply with that referent. According to the reasoned action approach, the injunctive norm is identified by the summation of injunctive normative beliefs each multiplied by motivation to comply with referent.

$N_I = \Sigma\, n_i\, m_i$
N_I = Injunctive norm
n_i = injunctive normative belief of referent *i*
m_i = motivation to comply with referent *i*

Fishbein and Ajzen recommended using a unipolar scale to measure motivation to comply (unlike the injunctive norm). This is because an individual's non-compliance with a referent opinion does not mean they wanted to do the contrary. Additionally, they recommended measuring motivation to comply with referent's direction in general rather than at the level of a particular behavior. This precaution was suggested to avoid redundancy in measuring injunctive norms, as measuring motivation to comply would not add unique information accounted at the specific behavior level. It is also important to provide a "non-applicable" option in the questionnaire when measuring injunctive norms and motivation to comply, since not every individual will have all the referents mentioned in their social network (example, they may not be married or do not have sisters and brothers).[19]

The descriptive norm is the second source of social norms that was added recently to the theory. People are not only influenced by what important persons in their life think they should (or should not) do, but they are also impacted by the perceptions of what these referents are actually doing.[132]

The number of studies that assess descriptive norms and descriptive normative beliefs is limited. Compatibility is the first issue that complicates measuring descriptive norms. When measuring descriptive norms, it is difficult sometimes to specify behavior within a rigid time frame. The other issue is the recognition of a generalized agent for each behavior. For example, it is not possible to ask about family members in general when it comes to assessing descriptive normative beliefs regarding breastfeeding or screening for prostate cancer. In the presence of these issues, it is up to the researcher to formulate the appropriate questions depending on the behavior in question.

Perceived Behavioral Control (PBC)

Having a positive attitude and perceiving social pressure may not be enough to carry out certain behaviors. It is also important to have the necessary skills/abilities and motivation (in absence of environmental constrains) to perform the behavior. These aspects are captured within the perceived behavioral control construct of the theory, which can be defined as "the extent to which people believe that they are capable of performing a given behavior, that they have control over its performance." The perceived behavioral control is not unique to the reasoned action approach. It originally stems from the concept of self-efficacy, which was first introduced by Bandura (1977) within the social cognitive theory.[133]

Similar to the measurement of attitude and perceived norm, the principle of compatibility, with regard to action, target, context, and time, should also be evident when measuring PBC. Usually the PBC is measured in two ways; the first uses direct questions about the capacity to carry out a behavior, and the second measures beliefs about specific things that may facilitate or impede the performance of a behavior. These beliefs are known as "control beliefs" and are considered as the origin of the perceived behavioral control. The measures of control beliefs should correlate with the direct measures of PBC.[128]

Direct items to evaluate perception of control regarding, for example, using marijuana in the next three months include statements such as "for me using marijuana in the next three months would be: difficult-easy." In general, there are two ways to measure PBC with respect to a particular behavior, by identifying certain possible barriers that pertain to a specific behavior, and by asking respondents about their level of control over the performance of that behavior. Fishbein and Ajzen used the terms “self-efficacy” and “perceived behavioral control” interchangeably and found no theoretical basis to view these concepts as two separate constructs. Both terms refer to one’s perceived ability to perform a certain behavior. PBC can be measured using the following equation:

$PBC = \Sigma c_i p_i$
PBC: perceived behavioral control
c_i : belief for control factor i
p_i : the power of factor i to facilitate or hinder performance of behavior.

In the standardized questionnaire, the respondent is asked to answer two questions for each behavioral control, one to evaluate control belief strength, and the other to assess the factor’s power. An index of control beliefs is obtained by summing the product of the strength of each control belief by its perceived power across all control beliefs. Control belief strength is the subjective probability that a given control item will be present. One way to measure control belief strength, for example, related to physical activity, is to ask respondents about the likelihood of having time to exercise in the following two weeks. To measure the perceived power of this control belief, the respondent may be asked, for example, whether having extra time makes exercise……(easier- more difficult). The direct measure of perceived behavioral control should correlate with the index measure of control beliefs.[128]

Control beliefs can be further separated into two types or items. The first one refers to the capability to carry out the behavior, in other words, it is the individual's perception of their ability to perform the behavior in question. It is the perception of how easy or difficult it is to execute certain behavior. This control belief is often labeled as "capacity". The second type control belief is related mainly to the degree of control an individual has over the performance of a behavior. This control belief is known as "autonomy" and can be assessed using items such as "it is up to me to perform behavior x."[19]

It is recommended when measuring the perceived behavioral control (or self-efficacy) to include items related to both types of control beliefs (i.e. autonomy and capacity). These two beliefs are found to be correlated, and, when combined into a single construct, usually have high internal consistency.

The Role of Background Factors

Demographic variables, social-structural factors, and personal attributes are frequently measured and analyzed in studies that examine human behavior. However, the role of these factors varies according to the nature of behavior, and the studied population.

The theory of reasoned action acknowledges the importance of these factors as the origin of behavioral, normative, and control beliefs. However, the influence of background factors on intention or behavior is usually mediated via attitudes, perceived norms and perceived behavioral control. Therefore, a number of studies has shown the variance in intention produced by background factors is eliminated (or significantly reduced) once attitudes, norms, and behavioral control are taken into account.[128]

Past Behavior

Previous performance of the behavior is well known to serve as a good predictor for future behavior. It has been found that past behaviors impacts future intentions and behavior directly and may not be fully mediated through attitudes, perceived norms, and perceived behavioral control.

In fact, several studies and meta-analyses suggested that including past behavior as an additional predictor produces a significant increase in the amount of explained variance in behaviors and/or intentions beyond those explained by the theory's major predictors.[128]

Prediction of Intentions and Behaviors from Perceived Attitudes, Norms, and Behavioral Control

After measuring attitudes, perceived norms, and perceived behavioral control, the next step is to predict intentions from these three constructs. It is important to recognize that the relative importance/weight of these three constructs in predicating intentions depend on the population and the behavior in question. For some populations social norms may carry more weight than attitudes in predicting intentions, while for others, it is the perceived behavioral control that contributes the most. In the same manner, one behavior may be influenced mainly by attitudinal considerations more than control or normative constructs. It is equally essential to consider that, in some occasions, not all of the three determinants of intention are statistically significant in predicting intentions.

It is important to test whether the three basic determinants of intention correlate with intention individually before testing the whole model. Once these constructs are found to be significant predictors of intention, they can be included in the full model. A considerable amount of evidence, based on individual studies, as well as, meta-analysis, showed that intentions can be predicted accurately from attitudes, perceived norms, and perceived behavioral control.

For example, Armitrage & Conner (2001) conducted a meta-analysis of more than 130 studies utilizing the theory of reasoned action and the theory of planned behavior in predicting health-related behavior. They found that the reasoned action approach contributed to a 39% variance in behavioral intentions and a 27% variance in performing behaviors. In addition, the correlation coefficient between attitudes and intentions ranged from 0.45 to 0.60 on average. The correlation between perceived social pressure and intention ranged from 0.34 and 0.42 on average. Additionally, the mean correlation between perceived behavioral control and intention was between 0.35 and 0.46.[37]

Using the Reasoned action Approach to Design an Intervention

To summarize the previous sections, the reasoned action approach starts with identifying the salient behavioral, normative, and control beliefs that lead to the formation of attitudes, perceived social pressure, and perceived behavioral control. These three determinants serve as predictors of intention, which in the presence of sufficient volitional control, leads to the performance of a behavior.

However, the reasoned action approach provides little guidance over the design of an intervention to influence and change a particular behavior. There are several strategies/techniques to change behavioral intention, which are presented in this section. First, persuasive communication is one of the most frequently used techniques to deliver desired information to a target population.[122,134] In this technique, a message is formulated in a persuasive manner to support the argument and maximize the acceptance of the message to produce the desired change in beliefs and, ultimately, intentions and behaviors. Unfortunately, there is no general rule or guideline for the content of the message, or how it should be framed to maximize its delivery and approval by the target population. Some attributes that may enhance a message's persuasiveness include providing scientific evidence, logical flow of ideas, reducing distractions, avoiding using jargons, and utilizing a trusted professional/communicator to deliver the message.[122,134]

Second, framing is considered a useful way to formulate a health/social message. Gallagher and Updegraff (2012) conducted a meta-analysis of the impact of health message framing on attitude, intention, and behavior. Health messages can be framed in two ways, a gain-frame, or a loss-frame. When formulating a message in a gain-frame way, the benefits and advantages of engaging in a particular behavior are usually highlighted. On the other hand, formulating a message in a loss-frame way involves emphasizing the consequences of failing to carry out a certain behavior.[135]

In their Prospect Theory, Rothman and Salovey (1997) proposed that when people are faced with a choice between two options, their preference for one option over the other would be impacted by the manner in which the message is framed. Rothman and Salovey (1997) recommended using a gain-frame message for disease preventive behavior and a loss-frame message for disease detection (such as screening) behavior.[136]

Gallagher and Updegraff (2012) did not find a significant difference between gain-framed and loss-framed techniques on the persuasiveness of health messages used to impact attitudes and/or intentions.[135]

However, when persuasive effect was assessed among studies that utilized measures of actual behavior, there was a significant difference in persuasiveness between gain-framed and loss-framed health messages. The most pronounced difference between the two types of framing was in studies that assessed preventive behaviors specifically in smoking, prevention of skin cancer, and in physical activity.[135]

The study concluded that using studies that only measure attitudes and intentions to investigate the impact of message framing on health behavior might be insufficient. Health messages may provide other information, such as social norms and perceived behavioral control that have influential impact on behavior.[135]

It is also important to recognize that interventions usually employ more than one technique to communicate information. In addition to persuasive communication, other strategies include group discussions, modeling and mental simulation. These last two strategies are usually utilized by psychologists to help patients overcome their problems, but can also be used to design an intervention to influence intention and behavior.[128]

A different approach should be implemented when individuals have the intention to perform certain behavior but fail to act on it. In such circumstances, useful strategies include, for example, using booklets or pamphlets. These strategies are performed at the individual level.[128] On the other hand, different strategies can be implemented at the community level that can influence larger number of people.[137]

People may also have the intention to perform certain behavior but fail to act on their intentions because they simply forget to do so. In such case, different interventions may be implemented. For example, individuals may have the intention to take their medications on time but forget to do that. In this case, situational cues such as taking the medication upon arising or having reminders sent to them using information technology - may increase the adherence rate.[138]

Another possible strategy to help individuals act on their intention includes asking them to make a pledge/commitment that they are going to perform the behavior at a certain time. A study conducted by Amrhein (2003) indicates that the strength of commitment was the most important predictor of drug use outcomes among substance abusers.[139]

Despite the tremendous number of published studies that utilized the reasoned action approach to predict and understand human behaviors, few studies utilized this framework to attempt to change and manipulate behaviors. In alignment with the current research, the rest of this review is restricted to experimental studies that utilized the reasoned action approach to attempt to change and manipulate students' behavior. We focused mainly on studies that reported a change in intention. Only randomized controlled trials and quasi-experimental studies were included. Studies that were not conducted among students[140–144] or descriptive in nature were excluded.[145] We made every possible effort to include all relevant studies. However, some might have been missed unintentionally. Table 2 summarizes studies that focused on interventions that utilized TRA/TPB as a framework to influence students' behavior.

Table 2 Interventions that utilized TRA/TPB as a framework to influence students' behavior

Study Author/year	Title	Behavior	Design
Chatzisarantis & Hagger (2005)[146]	"Effects of a Brief Intervention Based on the Theory of Planned Behavior on Leisure-Time Physical Activity Participation"	Physical activity	RCT*
Coyle et al (2006)[147]	"All4You! A randomized trial of an HIV, other STDs, and pregnancy prevention intervention for alternative school students"	Sexual risky behavior	RCT
Sniehotta (2009)[148]	"An Experimental Test of the Theory of planned Behavior"	Physical activity	RCT
Huang et al (2011)[149]	"Integrating Life Skills Into a Theory-Based Drug-Use Prevention Program: Effectiveness Among Junior High Students Taiwan"	Drug use prevention	RCT
Jemmott et al (2011)[150]	"Cognitive-Behavioral Health-Promotion Intervention Increases Fruit and Vegetable Consumption and Physical Activity among South African Adolescents: A Cluster-Randomized Controlled Trial"	Health promoting behavior	Cluster RCT
Milton & Mullan (2012)[151]	"An Application of the Theory of Planned Behavior—A Randomized Controlled Food Safety Pilot Intervention for Young Adults"	Food safety	RCT
Beaulieu & Godin (2012)[152]	"Staying in school for lunch instead of eating in fast-food restaurants: results of a quasi-experimental study among high-school students"	Eating healthy food	quasi-experimental study
Kothe et al (2012)[153]	"Promoting fruit and vegetable consumption. Testing an intervention based on the theory of planned behavior"	Fruit and vegetable consumption	RCT

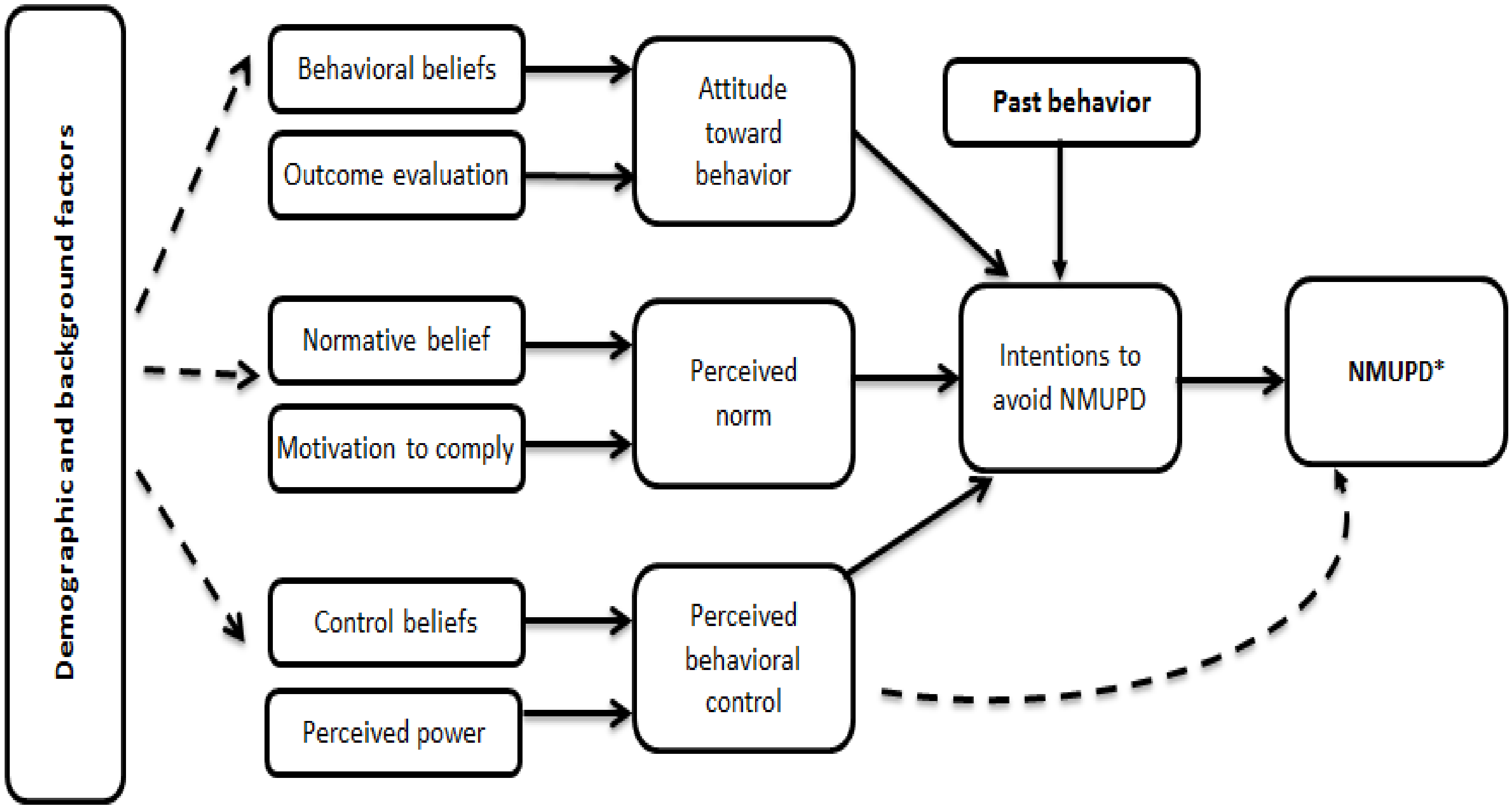
Study Author/year	Title	Behavior	Design
Montanaro & Bryan (2014)[154]	"Comparing Theory-Based Condom Interventions: Health Belief Model Versus Theory of Planned Behavior"	Condom use	RCT
Feenstra et al (2014)[155]	"Evaluating traffic informers: Testing the behavioral and social-cognitive effects of an adolescent bicycle safety education program"	Bicycle safety	Quasi-experimental study

*RCT: Randomized controlled Trial, TRA/TPB: Thoery of Reasoned Action/Theory of Planned Behavior

Theoretical Framework for the Study

The theory of reasoned action and the theory of planned behavior have been utilized successfully to predict and understand students' behavior regarding substance abuse and misuse. For the purpose of this study, an extended version of the reasoned action approach was utilized. In which, the intention to avoid NMUPD was postulated to be predicted based on the theory's three basic constructs (attitudes, perceived norms, and perceived behavioral control). In addition, we investigated the role of past behavior in predicting intentions to avoid NMUPD beyond that explained by the basic theory constructs. The role of demographics (such as age, gender and race) and factors related to college students (such as sorority/fraternity affiliation, type of degree pursued, and living arrangement) were also investigated. Figure 2 represents the schematic presentation of the conceptual model of the current study

Figure 2 Schematic presentation for the conceptual model of the study



Summary of Literature Review

There is growing evidence that NMUPD is escalating at an alarming rate, especially among young adults and college students. NMUPD can lead to serious consequences, including addiction, ED visits, disability, and death. Different agencies had different definitions for NMUPD with some overlap. Some of the common elements were: the use of medication without prescription, in a way other than directed by the healthcare professionals, or for recreational purposes.

The most frequently used medications for nonmedical purposes are pain relievers (i.e. opioid analgesics), sedatives (i.e. barbiturates), tranquilizers (i.e. benzodiazepines), and stimulants (i.e. amphetamines). Opioids analgesics were responsible for the largest percentage of deaths due to overdose.[45] Benzodiazepines are safe only if used as directed by Healthcare professionals (HCPs) and for short period. Benzodiazepines had been used recreationally, either alone or in combination with other drugs or alcohol, which caused an increase in ED visits in recent years.[46] The medical uses of barbiturates declined significantly, but the abuse rate might be on the rise, especially among young adults.[59] The number of ED visits related to stimulants increased significantly in the recent years. The largest increase was among young adults from 18-25 years. This may be due to an increase in the prescription rate of ADHD medications and the motivation to improve academic performance.[27]

Results from national surveys among the US population found a high rate of illicit drug use among young adults.[4,47] In addition, these national surveys indicated that the most frequently used medications for nonmedical reasons were opioids analgesics followed by anti-anxiety medications and stimulants. It was difficult to find a precise prevalence of NMUPD among college students due to the different definitions applied by the different agencies concerned with collecting data about drug abuse/misuse, and the under-representativeness of college students in most of these national surveys.

The nonmedical use of prescription drugs among college students has recently received a special attention by researchers. Most of the studies conducted among college students regarding NMUPD were small-scale, cross-sectional, lacking a theoretical framework and exploring only one type of prescription drug. The prevalence of NMUPD among college students varied considerably among studies. A large-scale study found that the average lifetime prevalence of nonmedical use of any prescription drug among college students to be 20%.[27] The nonmedical use of painkillers or stimulants was found to be consistently higher than anti-anxiety or sleep medications.[69,75,85,87] There was, however, disagreement over whether pain medications or stimulants had the highest rate of nonmedical use.[65, 99,100,156]

NMUPD was found to be accompanied with binge drinking, tobacco and marijuana use, and the use of other illicit drugs.[75,88,96] The most common sources of prescriptions for nonmedical reasons were friends and family members.[65,100,156,157]

Motivations for NMUPD were mainly to enhance academic performance with the use of stimulants,[15,64,156] to reduce stress and for self-medication (using opioids and depressants).[63,75,89] The most common predictors for NMUPD among college students were being male,[65,72,80] White,[66,75,156] starting NMUPD at an early age,[74,105] using illicit drugs, binge drinking,[74,76,158] and being a member of fraternity/sorority groups.[27,72,75]

A limited number of controlled studies evaluated the effectiveness of interventions to reduce NMUPD among young adults. Some of the interventions were promoting refusal skills,[115] using persuasive communication,[122] enhancing social skills,[118] and challenging misperceptions.[121]

The reasoned action approach is a useful theoretical framework to understand, predict, and change behaviors. The most important determinant of the likelihood of engaging in a behavior, according to this theory, is intention. Perceived behavioral control, attitudes, and perceived social norms are the main predictors of intention. These predictors are shaped by control, behavioral, and normative beliefs, respectively.[159]

In summary, there are several gaps in the literature on NMUPD. Although a large number of studies investigated predictors, correlates, and motivations for NMUPD among college students, most of them lacked a theoretical framework. Therefore, little is known about college students' beliefs regarding NMUPD within a theoretically rationalized framework. Moreover, none of the studies reviewed developed an intervention using a theoretical basis to change students' intentions regarding using prescription drugs for nonmedical reasons. Therefore, theoretically-grounded research is needed to predict, understand, and ultimately change college students' attitudes, norms, and intentions to use prescription drugs nonmedically.

CHAPTER THREE: RESEARCH METHODOLOGY

This chapter summarizes the research methods that were used in this study. It describes the procedures that were utilized in designing and writing the components of the intervention. The chapter outlines the characteristics of the targeted population, sampling frame, methods for randomization, inclusion/exclusion criteria, and sample size calculation. The chapter also provides a detailed description of the survey instrument that was used for the evaluation of the effectiveness of the intervention. The procedure for pilot testing and checking the reliability of the instrument was outlined. Additionally, methods used for data cleaning and analysis were described. Finally, a summary is provided for of the study's hypotheses along with the corresponding statistical tests.

Research Methodology and Study Design

The effectiveness of the web-based intervention used in this study to address NMUPD by college students was tested using a two-arm parallel group randomized controlled trial. The sample used in this study was drawn from college students at the UNM (including undergraduate, graduate, professional, part-time, and full time students).

Students were randomly assigned to view either the web-based intervention: http://www.rxoutofcontext.org/ (the experimental group) or a general health website: http://www.cdc.gov/family/college/ (the control group). This study included only a post-test of the intervention**.** The study did not include pre-testing. Despite its simplicity, this design is strong and superior over the single-group design. The advantages of post-test only randomized controlled trials (RCTs) that they are being easy to implement and inexpensive, but can still be used to assess cause-effect relationships. Pre-test is not a requirement for post-test only RCTs. Pre-test ensures that the two groups are comparable before the intervention is implemented. Nevertheless, because random assignment was performed, the two groups were assumed to be probabilistically equivalent and, therefore there was no need for pre-test.[160]

As part of the study design, an online intervention and survey were chosen to the exclusion of other methods (including telephone, mail, and face-to-face delivery) for several reasons. Compared to the face-to-face delivery, web-based interventions are easier to execute and distribute. In college settings, implementing an online program overcomes the barriers of space and time allocation and the need for staff training and compensation. Web surveys and interventions are especially convenient to college students because of their flexibility with regard to completion time, students are not obliged to change their schedules to complete online surveys/interventions. The widespread use of new technologies, such as smartphones, tablet-style computers, and lightweight personal laptop computers further enhances the convenience of online activities. Lastly, web-based interventions offer the possibility of using multimedia such as videos and interactive programs, thus making them attractive to college students.[161] In addition, using web-based surveys overcomes the need for data entry processing which may be required for other modes of delivery such as mail.

Unfortunately, there are some disadvantages associated with web-based interventions. First, due to its anonymous, simple, and convenient nature, some students may not provide sufficient responses. Second, the response rate is usually lower than those of paper-based surveys.[161] A recent meta-analysis conducted by Shih and Fan (2008) of 39 studies compared the response rate of mail and web-based surveys. In this meta-analysis, they found that web-based surveys have a lower response rate compared to paper-based surveys.[162] The response rate for web-based surveys ranges from 7% to 88% with a mean of 34%.[162] On the other hand, the response rate for paper-based surveys ranges from 10% to 89% with a mean of 45%. Thus, the average response rate of paper-based surveys is higher by 10% compared to web-based surveys.[162] The most important determinants of the variation in response rates were the type of population and the number of follow-up reminders. However, the same meta-analysis found that college students tend to prefer web-based surveys.[162] Third, students are surrounded by more distractions while completing an online intervention/ survey, such as noises, television, or eating.

Despite the aforementioned limitations, there is modest evidence of the effectiveness of web-based interventions.[161] For example, a recent review of computer-based alcohol prevention programs among college students found that these programs are more effective than assessment-only control groups.

However, their effectiveness is similar to programs delivered using educational classes.[163]

IRB Procedure

Since this research involves human subjects, an application for the University of New Mexico's Institutional Review Board (IRB) was filed on October 2, 2015. Since no more than minimal risk (i.e. low possibility of the breach of subject's confidentiality) was expected, this study was reviewed under the exempt category. Every effort was made to preserve the confidentiality of survey responses and the anonymity of the respondents' identities. The study was approved on November 30, 2015, under the study ID number 15-526 (APPENDIX A).

Components of the Intervention

The intervention for this study was designed according to the theoretical constructs of the reasoned action approach. It is a brief, online intervention presented in multiple sections to address each construct of the theory. Choosing an online based intervention has several advantages, including reaching a large number of students at a low cost, flexibility in accessing the program, overcoming barriers of time and place constraints, and the possibility of repeating the intervention multiple times. Additionally, using prescription drugs for nonmedical purposes maybe a sensitive issue for some students that is better addressed in a private environment.

The presence of engaging components such as using multimedia, a quiz, and videos, in the current intervention is also superior to traditional educational materials, like pamphlets. The students were also encouraged to pledge not to use prescription drugs for nonmedical purposes.

The persuasive communication approach was used to address the salient behavioral, normative, and control beliefs pertaining to the nonmedical use of prescription drugs. Additional components of the intervention included correcting misinformation and utilizing multimedia, such as educational and dramatic videos about the nonmedical use of prescription drugs. Table 3 summarizes the key components of the intervention. The full website can be visited at http://www.rxoutofcontext.org/

Table 3 Key components of the intervention

Component	Outline of the intervention
Knowledge	Nonmedical use of prescription drugs on college campuses is on the rise. Prescription drugs are only safe and effective when used as directed by your doctor. When taken without prescription or for purposes other than prescribed, these drugs are dangerous and addictive. Prescription drugs can also impair your ability to drive. Taking too many prescription drugs or combining them with alcohol or other drugs can be deadly. More information are provided about the most commonly used prescription drugs for nonmedical reasons by college students.
Behavioral beliefs	This part of the program is to challenge the following beliefs: 1. The first belief or misperception is that prescription drugs are safer than "illicit street drugs" because they are FDA approved, prescribed by doctors and dispensed by pharmacists. The following paragraph is included in the intervention to challenge this belief: *"Prescription drugs can be as dangerous as street drugs if they were taken without prescription, in excess, for purposes other than prescribed. In fact, New Mexico ranked second in drug-overdose mortality rate in the US. Most of which are related to prescription drug abuse specifically Opioid analgesics.* *Strikingly, number of deaths related to prescription drugs outnumbers those related to heroin and cocaine combined and deaths related to motor vehicle accidents.* *Some college students mix prescription medications with alcohol which can lead to serious consequences including death".* 2. The second belief or misperception is that sharing your prescription with other students is "OK". The following paragraph is included in the intervention to challenge this belief: *"It is not "OK" to share or sell your prescription to others since this action is considered illegal and may harm others. It is important to store your medications in a secure place and properly dispose them when you do not need them anymore".* 3. The third belief or misperception is that prescription drugs

Component	Outline of the intervention
	are less addictive than other illicit street drugs. The following paragraph is included in the intervention to challenge this belief: *"These medications are not less addictive than other illicit drugs such as heroin and cocaine. In fact, prescription drugs share similar mechanism of action and chemical structures with illicit drugs and can lead to addiction, serious mental and physical side effects"*. 4. The fourth belief or misperception is that using prescription medications by some students is considered an effective study aid, to enhance alertness, and increase work performance. The following paragraph is included in the intervention to challenge this belief: *"Actually, college students who use stimulants without a prescription have been found to skip classes, spend more time in social activities and less time studying Many studies have shown that the nonmedical use of prescription stimulants is correlated with lower grades".* 5. The fifth belief or misperception is that the most common source of prescription drugs is a "drug dealer". The following paragraph is included in the intervention to challenge this belief: *"College students usually get their prescription drugs form friends and family members. Therefore, it is important to not share your prescribed medications with others and to save medications in a secure place and dispose them carefully"*
Normative beliefs	This part of the intervention is to emphasis that nonmedical use of prescription drugs by college students is NOT as common as they might think. The following paragraphs are direct quotes from the intervention: "*It is important to recognize that nonmedical use of prescription drugs is not the norm and not everyone is doing it. Most college students understand that it is never OK to use prescription drugs without prescription or for nonmedical purposes".* *"College students overestimate the prevalence of nonmedical use of prescription drugs by their peers. Majority of students thought*

Component	Outline of the intervention
	that their peers are using prescription stimulants for nonmedical reasons, In reality only a small percentage of students do that". "*A similar trend was observed for nonmedical use of opioid analgesics, majority of students, thought that their peers are using prescription stimulants for nonmedical reasons, In reality only a small percentage of students do that".*
Control beliefs	This part of the intervention is to increase student's self-efficacy. 1. The first section of this part is to increase college student's ability to improve their academic performance without the need to use prescription drugs. The following paragraph is included in the intervention regarding this aspect: *"There is no evidence that prescription stimulants can increase performance among healthy individuals with ADHD.* *Usually nonmedical use of prescription stimulants is prevalent among students with lower grades. Those students use stimulants to catch up with their assignments and homework to compensate for partying and not attending classes.* *In contrast, college students who have good academic performance tend to adopt responsible study habits.* *To improve your grades there is no better strategies than regularly attending classes, avoiding procrastination, and completing homework/assignments on time.* *If you struggle with keeping up with school requirements, seek help from professional resources around the campus. Using prescription stimulants is highly unlikely to help you achieve your goals. In fact, these shortcuts are more likely to be harmful and lead to addiction."* 2. The second section is to increase college student's control over their ability to cope with stress. The following paragraph is quoted directly from the intervention regarding this aspect: *"Stress is common during college years.* *Instead of taking depressants or painkillers, you can manage stress by exercising regularly or learning relaxation techniques, such as meditation and Yoga"* *If faced with an excessively stressful situation, contact Student Health and Counseling Center on the main*

Component	Outline of the intervention
	campus. (http://shac.unm.edu/) 3. The third section is to increase college students control over their ability to refuse prescription drugs' offers from other students. The following paragraph is quoted directly from the intervention regarding this aspect: "*When being offered a drug, practice the following refusal methods. Say "No Thanks" clearly and audibly for a friend or a family member who offer you a prescription drug.* *Give a reason or excuse to escape the situation with confidence and without hesitation.* *Offer an alternative activity such as let's work on the assignment early instead of leaving it to the last minute."*
Intention	To help students act on their intentions students will be asked to make an explicit commitment not to use prescription drugs for nonmedical purposes or without a legitimate prescription, and to sell or give their prescription to other students.

*Only the key components are presented in the table, additional information can be found in the website http://www.rxoutofcontext.org/.

Writing and Designing the Intervention

To design the current intervention, we followed guidelines provided by the Office of Disease Prevention and Health Promotion (ODPHP), which is a part of the U.S. Department of Health and Human Services (HHS).[164] These guidelines were reported in a document known as "Health Literacy Online: A Guide for Simplifying the User Experience" and can be access via their website http://health.gov/healthliteracyonline/. These guidelines aimed to provide evidence-based strategies to write and design health promotion web-sites that are engaging and easy-to-use, particularly, for people with limited health literacy.

Literacy, in general, can be defined as "a person's ability to read, write, speak, and solve problems at levels needed to function in society."[165] On the other hand, health literacy is “a person’s capacity to find, understand, and use basic health information and services needed to make appropriate health decisions.”[166] Although literacy and health literacy are highly correlated, there are some instances where even highly literate people may have difficulty reading and understanding basic health information.[164]

Studies conducted in academic settings found that college students generally have good health literacy skills.[167,168] For example, a study conducted to assess health literacy among Hispanic college students at the University of New Mexico (n=331), found that 90% achieved a score that is equivalent to “an always adequate literacy.”[167] The study concluded that this health literacy score is higher than the average general Hispanic adult population. However, this study, among others, also found that many students still have difficulties responding to items of the health literacy assessment tool.[167,168]

Even though college students have high health literacy levels, it is still important to design a website that is clearly written and easy to use. These features make navigation and comprehension of the presented information easier for all students, not only those with limited health literacy skills. In the studied educational website, only short texts (not more than 3 lines) and bulleted information were presented to make it easier for users to find and retain the information that they read.[169]

In designing web pages for the educational website, we made the text fit the center of screen as many of users with limited literacy levels are less likely to scroll to find information. In addition, we used left navigation over right navigation, since many users ignore content in the right margin or mistakenly confuse them with advertisements.[164] We avoided crowded texts, small font size, long and complex sentences. We used “previous” and “next” buttons to facilitate navigation through the web pages.[164]

In order to help users find the information they wanted quickly and easily, the messages delivered through our website were brief, engaging, and to the point. The study used interactive tools, audio and visual components, and a quiz to make the website more engaging. Some of the strategies that were used to improve users’ experience while navigating through the website, included placing the most important information first; making health information specific, direct, and actionable; using positive tone and realistic goals; and focusing on the benefits of health behaviors rather than barriers and risks.[164]

Some of the strategies that improved the display of the website included, using bullets and short text, multiple headings, a font size of at least 12, images, white spaces, and centering the content on the screen.[164]

The US Department of Health and Human Services and the American Medical Association recommend that educational materials be written at or below 6th grade level to be effectively understood by the general American public. However, the educational website in this study is designed specifically to be read by college students. Accordingly, a material that is more difficult to read is expected to be understood by the study’s target population.[170]

Sampling Frame and the Method of Randomization

The study's target population included college students attending University of New Mexico during period between November 30, 2014 and January 19, 2015, and appearing on the email list provided by the UNM registrar's office. The data access form found on the Office of Registrar's website (http://registrar.unm.edu/data-access-form.php) was filled out and sent to the enrollment office. Two random samples of students' emails were requested; one list was randomly assigned to receive a link to the intervention (http://www.rxoutofcontext.org/), and the other list (control group) received a link to a general health website (http://www.cdc.gov/family/college/). The two lists were compared, before the dissemination of the invitation emails, to ensure that each student was listed in only one group (i.e., either the intervention or the control group) but not both. No email addresses appeared in the two lists. Both groups (i.e. the intervention and control groups) received the same evaluation survey.

An invitation email containing a brief description of the study along with a link for the website and the survey was sent first. This email included information about the study's objectives, purposes, and importance. A total of four reminder emails were sent at varying time intervals. The reminder e-mails also had links for the website and the survey. Respondents received a "thank you" e-mail notification upon completing the survey. A copy of the recruitment email for the intervention and control groups can be found in APPENDIX B, APPENDIX C, respectively. As an incentive to participate in the study, the invitation and reminders e-mails informed sampled students that they were eligible to be included in a drawing for one of the 20 gift cards for 20 dollar each.

Characteristics of UNM Students

The University of New Mexico's main campus is located in the city of Albuquerque. As of Spring 2015, there was 25,816 students enrolled; of which 71% were undergraduate and 16% were graduate students. The remaining 13% were professional degrees, included medical, Doctor of Pharmacy, Doctor of Physical Therapy, Doctor of Nursing, and law degrees. The average load for undergraduate students was 13.4 credit hours; the average load for graduate students was 7.6 credit hours.

Analysis by gender showed that there are more female students than male students (55% vs 45% respectively). The average age for part time students was 32.4 and the average age for full time students was 23.58. The average female age was very close to the average male age (26.4 years vs 26.1 years respectively). With regard to race/ethnicity distribution, the majority of students identified themselves as Hispanic (39.96%), followed closely by White (39%). Other races/ethnicities identified by UNM students were American Indian (5.15%), Asian (3.32%), and African American (2.36%).[159]

Inclusion/Exclusion Criteria

Students who were currently enrolled at the University of New Mexico during the study period from November 30th 2014 to January 19th 2015, 18 years and older, and have access to internet were considered eligible for the study. Students were not required to have used prescription drugs for nonmedical purposes to be considered for the study. Students who were not enrolled at UNM were excluded from the study. Participants in this study were chosen for several reasons, including: (1) their familiarity with using computers and accessibility to internet services either at home or provided by UNM, (2) having an established and reliable email accounts, and (3) being college students.

Sample size Calculation

A “priori power analysis” was conducted to determine the required sample size to achieve the goals of the study. The G*Power version 3.1.9.2 software was used.[171]

In this analysis, the following parameters were needed to calculate the sample size (N): the power level (1-β), the pre-specified significance level (α), and the population effect size.[171] The power for this study was set at 80% and the alpha level at 0.05, and the two-tailed t-test was chosen. The effect size was calculated based on the weighted average effect sizes extracted from randomized controlled trials and quasi-experiments that utilized the TRA/TPB to design and evaluate interventions to influence students' intentions to perform certain behaviors.

Ten experimental studies that investigated students' intentions to engage in a healthy behavior or to avoid risky behavior were used to compute a weighted mean effect size. The following formula was used to achieve this purpose: [Weighted mean effect size = Σ(effect size (d)*(sample size)/(total sample size) =[(0.44*83)+(0.07*988)+(0.29*579)+(0.38*413)+(0.81*1057)+(0.5*45)+(0.47*241) +(0.6*194)+(0.4*258)+(0.17*1593)/(83+988+579+413+1057+45+241+194+258+ 1593) = 0.35]. The same formula was applied to calculate the weighted average effect sizes for social norms, attitudes, and perceived behavioral control. These studies and the weighted average effect sizes are presented in Table 4.

Table 4 Effect sizes calculated from experimental studies that utilized TRA/TPB to influence students' intentions toward healthy behaviors

Study Author/year	Behavior	Design	Sample size	Attitude change	SN change	PBC change	Intention Change
Chatzisarantis & Hagger (2005) [146]	Physical activity	RCT	83	*d = 0.62*	*d = 0.14*	*d = 0.36*	*d =0.44*
Coyle et al. (2006)[147]	Sexual risky behavior	RCT	988	*d = 0.006*	*d = 0.017*	*d = 0.033*	*d =0.07*
Sniehotta (2009)[148]	Physical activity	RCT	579	*d = 0.20*	*d = 0.18*	*d = 0.20*	*d = 0.29*
Huang et al. (2011)[149]	Drug use prevention	RCT	413	*d = 0.35*	*d = 0.41*	*d = 0.57*	*d =0.38*
Jemmott et al. (2011)[150]	Health promoting behavior	Cluster RCT	1057	*d = 0.89*	*N/A*	*N/A*	*d =0.81*
Milton & Mullan (2012)[151]	Food safety	RCT	45	*d = 0.48*	*d = 0.17*	*d = 0.87*	*d = .50*
Beaulieu & Godin (2012)[152]	Eating healthy food	quasi-experimental study	241	*d = 0.43*	*d = 0.6*	*d = 0.62*	*d =0.47*
Kothe et al (2012)[153]	Fruit and vegetable consumption	RCT	194	*d = 0.27*	*d = 0.44*	*d = 0.13*	*d =0.60*
Montanaro & Bryan (2014)[154]	Condom use	RCT	258	*d = 0.2*	*d = 0.25*	*d = 0.18*	*d =0.4*
Feenstra et al. (2014) [155]	Bicycle safety	Quasi-experimental study	1593	*d = 0.57*	*d = 0.14*	Not reported	*d =0.17*
Weighted average effect sizes				0.44	*0.22*	0.24	*0.35*

(TRA/TPB: Theory of Reasoned Action/Theory of Planned Behavior) RCT: Randomized Controlled Trial, SN: Social Norm, PBC: Perceived behavioral control, d: Cohen's d)

With respect to randomized controlled trials, the resulting 0.35 value indicates that the intervention affected students' intentions compared to the control group with an effect size of 0.35. In other words, the intervention group had a mean intention to perform a behavior of 0.35 standard deviation larger than that for control group.[172] An effect size of 0.35 reflects a small to moderate practical significance.[173] Based on the weighted average effect size of 0.35, the G*Power software was used to calculate sample size for this study. A priori computation with alpha level of 0.05, power of 0.8 and an effect size of 0.35 with an allocation ratio (N2/N1) of 1 yielded a total sample size of 260 (130 in each group).

Achieving a low response rate is a major challenge in web-based surveys. Response rates in web-based surveys are impacted by the targeted populations, and, the number of frequent reminders.[162] The required sample size for this study was adjusted according to the average response rate obtained from the studies that utilized web-based surveys regarding NMUPD by college students (Table 4). The adjusted sample size was estimated by dividing the calculated minimum sample size from G*Power software by the average response rate. Accordingly, the adjusted sample size needed was 260/0.57 = 456 approximately. Thus, at least 456 surveys should be sent to students' emails to achieve sufficient responses. However, since it is possible to send the survey to a larger sample, the final sample size selected for this study was to 4,000; 2,000 in each group. The larger adjusted sample size was necessary to account for the potential of an unusually low response rate, missing and incomplete responses.

Evaluation of the Effectiveness of the Intervention

To evaluate the effectiveness of the intervention, a survey was designed to measure beliefs regarding the nonmedical use of prescription drugs using the theory of reasoned action approach. Additionally, the number of sessions, the average session duration, and page views of the website were tracked using Google Analytics®.[174] The behavior of interest was “Using prescription drugs for nonmedical purposes or without a prescription anytime in the following three months”. The participants were first given the following information about the study:

> Using prescription drugs for nonmedical purposes is increasing among college students. The present survey is to investigate some of the reasons that students choose to use (or not use) prescription drugs for nonmedical purposes. Please read each of the following questions carefully, and respond to the best of your ability. There are no correct or incorrect answers; we are merely interested in your personal point of view. The survey will take approximately 10 to 15 minutes to be filled out.
> Note: Nonmedical use of prescription drugs is defined as using medications without a prescription, or for purposes other than prescribed by doctors such as to get high, to relief stress or to increase concentration. These include painkillers (e.g. Codeine &Oxycodone), stimulants (e.g. Adderall & Ritalin), and depressants (e.g. Valium & Xanax). Thank you for your time and participation in this study.

The full survey can be found in APPENDIX D.

Measurement of Study Variables

The survey used in this study included items to measure demographic variables, and previous nonmedical use of prescription drugs. Additionally, the survey included items to measure variables related to the reasoned action approach such as attitudes, perceived norms, perceived behavioral control and intention to use prescription drugs for nonmedical reasons.

The three major predictors of intentions were assessed using two measures; direct and belief-based .These two measures were supposed to be highly correlated as indicated by several studies and meta-analyses. As recommended by Fishbein and Ajzen, only direct measures, rather than belief-based measures, should be used in the prediction of intentions. Belief-based measures (previously known as indirect measures) are helpful in understanding the determinants of attitudes, perceived norms, and perceived behavioral control. The following sections present a detailed description of the survey questions. The items found in the current survey were based on literature review of studies that assessed NMUPD by college students and specifically those that utilized a theoretical framework.

Attitudes

Direct Measurement of Attitudes

The direct measurement of college students' attitudes toward NMUPD was assessed by a group of two extreme evaluative adjective scales with seven point alternatives, otherwise known as semantic differential scales. Two types of attitudes were assessed in the survey: the first was experiential (affective aspect) and the other instrumental (cognitive aspect). Experiential attitudes were measured using the following sets of bipolar evaluative adjectives ranging from irritating (-3) to relaxing (+3), unenjoyable (-3) to enjoyable (+3), and unpleasant

(-3) to pleasant (+3). Instrumental attitudes were measured using the following sets of bipolar evaluative adjectives ranging from bad (-3) to good (+3), irresponsible (-3) to responsible (+3), and harmful (-3) to not-harmful (+3). The total score of these six items represents the overall college students' attitudes toward NMUPD. The maximum possible score is 18 and the lowest possible score is -18. A lower score indicates a more negative attitude toward NMUPD. The following question was used as the direct measure of attitude:

***I consider the use of prescription drugs for nonmedical purposes to be:**								
Irritating	-3	-2	-1	0	1	2	3	Relaxing
Unpleasant	-3	-2	-1	0	1	2	3	Pleasant
Unenjoyable	-3	-2	-1	0	1	2	3	Enjoyable
Bad	-3	-2	-1	0	1	2	3	Good
Harmful	-3	-2	-1	0	1	2	3	Not harmful
Irresponsible	-3	-2	-1	0	1	2	3	Responsible

Belief-Based Measures of Attitudes

These measures were previously known as "indirect measures of attitudes" and were assessed by summation of the product of the belief's strength by outcome evaluation using the following formula:

$A = \Sigma\, b_i\, e_i$

A: stands for attitude toward an object

b_i: The strength of the attribute's *i* belief

e_i: The evaluation of attribute *i*

The following multi-part question was used to assess behavioral belief strengths (b_i):

Using prescription drugs for nonmedical purposes will:	Strongly Disagree			Neither disagree nor agree			Strongly agree
Help me stay focused and improve my grades	1	2	3	4	5	6	7
Cause me physical health problems	1	2	3	4	5	6	7
Cause me mental health problems	1	2	3	4	5	6	7
Cause me to be addicted	1	2	3	4	5	6	7
Get me arrested	1	2	3	4	5	6	7
Help me lose weight	1	2	3	4	5	6	7
Help me get high and party	1	2	3	4	5	6	7
Make me feel more socially accepted by my group	1	2	3	4	5	6	7

The following multi-part question was used to measure outcome evaluation for the corresponding attribute (e_i):

Generally speaking, how good or bad do you feel about the following outcomes?	Extremely bad			Neutral			Extremely good
Stay focused and improve my grades	1	2	3	4	5	6	7
Have physical health problems	1	2	3	4	5	6	7
Have mental health issues	1	2	3	4	5	6	7
Develop addiction	1	2	3	4	5	6	7
Get arrested	1	2	3	4	5	6	7
Lose weight	1	2	3	4	5	6	7
Get high and enhance my partying experience	1	2	3	4	5	6	7
Feel more socially accepted by my group	1	2	3	4	5	6	7

Perceived Norms

Similar to attitudes, perceived norms were measured through direct and belief-based measures.

Direct Measurement of Perceived Norms

Perceived norms were measured directly using the following four items. The responses for each item were assessed on a seven-point scale. The first two items represent injunctive norms (reflect what important others think about NMUPD) and the second two items represent descriptive norms (reflect what important others are or not using prescription drugs for nonmedical reasons)

1. Most people who are important to me think I should **NOT** use medications for nonmedical purposes:

Disagree	-3	-2	-1	0	1	2	3	Agree

2. Most people whose opinions I value would **NOT** approve my using of medications for nonmedical purposes:

Disagree	-3	-2	-1	0	1	2	3	Agree

3. Most people whom I respect and admire DO NOT use medications for nonmedical purposes:

Disagree	-3	-2	-1	0	1	2	3	Agree

4. Most people, like me, DO NOT use medications for nonmedical purposes:

Disagree	-3	-2	-1	0	1	2	3	Agree

Normative Beliefs Measures and Motivation to Comply

Normative beliefs were measured in association with specific referent individuals rather than general people or agents. Injunctive norms (N_i) measured through normative beliefs was produced by the summation of injunctive normative beliefs (n_i) each multiplied by motivation to comply (m_i) with referent using the following formula:

$N_I = \Sigma\, n_i\, m_i$
N_I = Injunctive norm
n_i = injunctive normative belief of referent *i*
m_i = motivation to comply with referent *i*

As recommended by Fishbein and Ajzen, normative beliefs were measured using a bipolar scale.[159] The following referent groups were identified from a study that utilized the theory of planned behavior to predict and understand tobacco and alcohol use among students.[175] The following multi-part question was used to assess injunctive normative beliefs (n_i):

How likely would each of the following individuals <u>disapprove your use</u> of prescription drugs for nonmedical purposes?	**Extremely unlikely**			**Neutral**			**Extremely likely**
Your partner (spouse, girlfriend, or boyfriend)	-3	-2	-1	0	1	2	3
Your close friends	-3	-2	-1	0	1	2	3
Your doctor, nurse or pharmacist	-3	-2	-1	0	1	2	3
Your family members	-3	-2	-1	0	1	2	3

To avoid redundancy, motivation to comply with the recommendations from each referent was assessed at the general level rather than with respect to the specific behavior, (the referent's approval or disapproval of using prescription drugs for nonmedical purposes). The following items were used to measure motivation to comply (m_i) using a unipolar scale:

When it comes to matters of health, how likely are you to do what the following individuals recommend?	**Extremely unlikely**			**Neutral**			**Extremely likely**
Your partner (spouse, girlfriend, or boyfriend)	1	2	3	4	5	6	7
Your close friends	1	2	3	4	5	6	7
Your doctor, nurse or pharmacist	1	2	3	4	5	6	7
Your family members	1	2	3	4	5	6	7

Perceived Behavioral Control (PBC)

Direct Measurement of Perceived Behavioral Control

PBC was measured by asking direct questions regarding college students' perception of control over the NMUPD using a bipolar scale of 7-point alternatives ranging from -3 to +3. The following two questions were used for direct measurement of the PBC.

*It is completely up to me whether or not I use medications for nonmedical purposes over the next 3 months:

Disagree	-3	-2	-1	0	1	2	3	Agree

*For me, using medications for nonmedical reasons over the next 3 months is under my control:

Disagree	-3	-2	-1	0	1	2	3	Agree

Measuring PBC through Control Beliefs

Just as behavioral beliefs determine attitudes, and normative beliefs determine social pressure, control beliefs (about facilitators and barriers) determine perceived behavioral control. Control beliefs determine the perception that college students have about their ability to use prescription drugs for nonmedical purposes using the following equation:

$PBC = \Sigma c_i p_i$
PBC: perceived behavioral control
c_i: belief that control factor *i* will be present
p_i: the power of factor *i* to facilitate or hinder performance of behavior

To assess control beliefs, two questions were asked regarding each item: the first one to assess belief strength and the other to measure its power to facilitate or impede the performance of behavior. Control-belief strengths (c_i) regarding the nonmedical use of prescription drugs were assessed using the following multi-part question.

How much control do you feel you have over the following factors?	**No control**			**Neither nor control nor complete control**			**Complete control**
Having a legitimate prescription for the medication	1	2	3	4	5	6	7
Having a friend with a prescription for the medication	1	2	3	4	5	6	7
Having easy access to prescription medications	1	2	3	4	5	6	7
Being offered a prescription medication by a friend or a family member	1	2	3	4	5	6	7
Having a health insurance	1	2	3	4	5	6	7
Getting behind in school work	1	2	3	4	5	6	7
Facing a stressful personal situation	1	2	3	4	5	6	7
Being a member of social fraternity/ sorority group	1	2	3	4	5	6	7

The factor's power (p_i) to facilitate or impede performance of behavior was assessed using the following multi-part question:

How do you think the following factors make using medications for nonmedical purposes easy or difficult?	Extremely difficult			Neither easy nor difficult			Extremely easy
Having a legitimate prescription for the medication	1	2	3	4	5	6	7
Having a friend with a prescription for the medication	1	2	3	4	5	6	7
Having easy access to the medication	1	2	3	4	5	6	7
Being offered a medication by a friend or a family member	1	2	3	4	5	6	7
Having a health insurance	1	2	3	4	5	6	7
Getting behind in school work	1	2	3	4	5	6	7
Facing a stressful personal situation	1	2	3	4	5	6	7
Being a member of social fraternity/ sorority group	1	2	3	4	5	6	7

Past Behavior

Using prescription drugs for nonmedical purposes in the past was hypothesized to predict future use. Past behavior can explain additional variance in intention well beyond that explained by the theory's main predictors (attitudes, injunctive norms, and perceived behavioral control). For these reasons, questions about the use and frequency of the nonmedical use of prescription drug were asked in this study using the following format.

-Have you **ever** used a prescription drug for nonmedical purposes?
-------------(1) Yes
-------------(2) No

-Have you used prescription drugs for nonmedical purposes **in the past 12 months**?
-------------(1) Yes
-------------(2) No

- How many times in the past year have you used a prescription drug for nonmedical reasons? ………..

Demographics and Background Factors

Due to the importance of demographic characteristics and background factors in identifying at-risk individuals and subgroups, several questions related to these factors were included in the survey. The following questions were only answered by those who reported lifetime NMUPD and were related to the specific prescription drug used, reasons for use, and age at the first use.

-Which of the following prescription drugs have you used for nonmedical purposes? Choose all that apply**.**
------------(1) Painkillers (e.g. Codeine, Darvon, Demerol, Hydrocodone, Lortab, Oxycodone)
------------(2) Prescription Stimulants (e.g. Adderall, Concerta, Methylphenidate, Ritalin)
------------(3) Depressants (e.g. Ativan, Halcion, Librium, Nembutal, Valium, Xanax)

-What were your reasons for using a prescription drug for nonmedical purposes? Choose all that apply
-------------(1) For self-medication (e.g. for pain or anxiety)
-------------(2) To study for an exam
-------------(3) To lose weight
-------------(4) To party with friends
-------------(5) Other reasons (please specify………..)

- How old were you the first time you used a prescription drug for nonmedical purposes? ………..

The following background factors were collected from all respondents.

1. Gender: (male, female)
2. Age:(year)

3. Type of UNM degree: (Undergraduate, graduate, professional degree (law, medical, physical therapy, nursing practice, and pharmacy)
4. Number of years as a student at UNM
5. A member of social fraternity/sorority group: (yes/no)
6. Being a student within any of the UNM health sciences center colleges (yes, no)
7. Ethnic/Racial background (Non-Hispanic/White, Non-Hispanic/African American , Hispanic, Native American/American Indian, Asian, and others)
8. Living arrangement (on-campus, off-campus)
9. Tobacco use (Non-tobacco use, former tobacco user, current tobacco user)
10. Alcohol consumption (Non-drinker, former drinker, occasional drinker, frequent drinker)
11. Marijuana use (Non-marijuana user, former marijuana user, occasional marijuana user, frequent marijuana user)

Outcome of Interest

College students' intention not to use prescription drugs for nonmedical purposes was assessed using the following three questions. A 7-point scale anchored by two extremes ranging from -3 to 3, was used. The maximum possible score is 9 and the minimum is -9. Higher score indicates a higher intention to avoid using prescription drugs over the next 3 months. The following multi-part question was used to assess intention.

Please circle the number that closely matches your level of agreement/disagreement with the following statements.	**Strongly Disagree**			**Neither disagree nor agree**			**Strongly agree**
I intend to **AVOID** using prescription drugs for nonmedical purposes over the next 3 months.	-3	-2	-1	0	1	2	3
I am **NOT** willing to use prescription drugs for nonmedical purposes over the next 3 months.	-3	-2	-1	0	1	2	3
I plan to **NOT** use prescription drugs for nonmedical purposes over the next 3 months.	-3	-2	-1	0	1	2	3

Designing the Web-survey:

The survey for the study was designed using Opinio® tool, also known as Esurvey.[176] Opinio® made available to faculty and students by the University of New Mexico through its IT department. Opinio® allows the user to create, publish, and analyze survey data. This survey tool has several advantages, including being completely online–based, accessible through several platforms (Macs, PCs, tablet computers and smart phones), and allows the creation of several types of questions (multiple choice, numeric, dropdown, matrix, and rating).The survey can be made available to respondents by pasting the link into an invitation email, for example. Finally, Opinio® allows reviewing reports of survey responses either in summary or in a detailed manner.[176]

Pilot Testing

Few studies provide recommendations for sample size calculation for pilot studies. For example, a sample size of 12 per group was recommended for pilot testing of clinical trials. This sample size was justified based on feasibility and precision about the mean and variance.[177] A systematic literature review about sample sizes for pilot randomized controlled trials in the United Kingdom found a sample size range per arm from 8 to 114 participants.[178] However, most of the available studies about sample size calculation for pilot studies were based on clinical randomized controlled trials. For pilot testing of our study, 11 students were recruited in the control group and 12 in the intervention group.

The clarity and comprehension of both the brief intervention and the survey were pre-tested using a representative sample of 23 students consisting of undergraduate, graduate, and professional degree students. One group of students was asked to view the educational website (http://www.rxoutofcontext.org/) and fill out the survey. The other group was asked to fill out the survey only. Comments and feedback provided by respondents were used to refine the intervention and the survey. Two types of validity verification were conducted namely face and content validity. Face validity was assessed by asking respondents to verify if they think that the measures appear valid to them. Respondents were also asked to indicate if they think that the materials in the website were clear, easy to read, and transparent to them. In contrast, content validity was evaluated by asking an expert in the field of socio-behavioral theories to judge if the items in the survey appear to measure the underlying construct. The purpose of conducting validity verification was to ensure that each item measures accurately the underlying construct, and to examine the clarity, organization, and readability of the questions. Reliability was assessed by Cronbach's alpha, a measure of internal consistency, using responses from the pilot testing. Cronbach's alpha was measured for all theory of reasoned action constructs to test the stability of the instrument. For our study, a Cronbach's value of more than 0.7 was considered acceptable.[126,127] Cronbach's alpha required a minimum number of three items per scale. For scales with less than three items, Spearman's correlation coefficient was computed.

Testing the Readability of the Intervention

The readability of the website's texts was evaluated using Flesch-Kincaid grade level and Flesch reading-ease tests. These readability tests are used to measure the difficulty in comprehending a passage written in English. These tests utilize formulae based on counting the number of syllables, words, and sentences.[179] The Flesch-Kincaid grade level and Flesch-reading-ease tests rely on the same basic measures (length of words and sentences) but have different weighting mechanisms. These two tests are inversely correlated; a passage with a high score on the Flesch reading-ease test would have a low score on the Flesch-Kincaid grade test.[179]

Flesch reading-ease scores range from 0 to 100. The higher the score, the easier the text is to read. For instance, a text with a score in the range of 90 -100 is considered to be very easy to read; 80-90 easy to read; 70 -80 fairly easy to read; 60-70 standard to read; 50-60 fairly difficult to read; 30-50 difficult to read; and 0-30 very difficult to read text.[180]

Additionally, the Flesch-Kincaid grade level is used to determine the level of education a person needed to understand the written text. The result of this test is a score that corresponds with a US grade level. Score ranges from 0 to 12 indicate less than a college level; 13-16 reflects a college level; and scores more than 16 corresponds with a graduate level

For the purpose of this study, the internal readability check provided by Microsoft Word Processing Software was used to analyze the readability of the intervention.

Data Cleaning

Data was examined to investigate the presence of outliers, missing values, and for violation of tests assumptions. First, outliers were examined for values that clearly and significantly differed from the rest of values. A decision was made either to keep outliers (if valid) or replaces them with the median values. Second, the normality assumption was tested for multiple regression. Third, missing values, as well as, their distributions were identified. To handle missing data, pair-wise deletion was used to keep as much information as possible.

Data Analysis

Stata® statistical software version 13[181] was used to clean and analyze the collected data. Several statistical tests were used depending on data distribution, data type and the research question. The significance level was set as $p<0.05$. Descriptive statistics, t-test, ANOVA (Analysis of Variance), Pearson correlations and multiple regression were the statistical tests used in this study. Data obtained from the survey used in this study, was analyzed mainly using t-tests, to compare attitude, subjective norms, perceived behavioral control, and intention between the control and intervention groups. In addition, the underlying behavioral, normative, and control beliefs were compared between the two groups using t-tests.

Descriptive Statistics

The mean, standard deviation, and median were calculated for demographic factors that are continuous such as age. Frequencies were calculated for categorical data such as gender and living arrangement. The mean score for each item and each construct were also calculated. The mean score for each construct is the total score divided by the number of items used to measure that construct.

T-tests

Independent t-tests were used to compare attitudes, perceived norms, and perceived behavioral control between the intervention and control groups. In addition, t-tests were used to compare behavioral beliefs, normative beliefs, and control beliefs between the intervention and control groups. T-tests were also used to compare intention to avoid NMUPD with respect to gender, sorority/fraternity affiliation, and living arrangement.

Analysis of Variance (ANOVA)

ANOVA was used to assess the difference in mean intentions' score with respect to the variables with more than two categories (race/ethnicity, type of UNM degree, tobacco use, marijuana use, alcohol consumption, and motive to use prescription drugs for nonmedical reasons).

Multiple Regression

Multiple linear regression was used to regress college students' intention on the theory's construct: attitudes, subjective norms and perceived behavioral control. Multiple regression was used to determine the significant predictors of intention to avoid NMUPD. Moreover, the relative importance of each of these predictors was also determined by estimating their respective beta-coefficients. Table 5 summarizes the objectives, hypotheses, and their corresponding statistical tests.

Summary of the Study's Hypotheses and the Utilized Statistical Tests

Table 5 shows a summary of the study's hypotheses along with statistical models that were used to test each hypothesis.

Table 5 Summary of the study's hypotheses, and the corresponding statistical tests

Hypotheses	Model	Statistical test
H01: No significant difference exists in college students' intention to avoid NMUPD between the intervention and control groups	Intention = $B_0 + B_1$ (intervention)	t-test
H02: No significant difference exists in college students' attitude toward NMUPD between the intervention and control groups	A = $B_0 + B_1$ (intervention) A: attitude	t-test
H03: No significant difference exists in college students' perceived social norms of NMUPD between the intervention and control groups	PN =$B_0 + B_1$ (intervention) PN: Perceived Norms	t-test
H04: No significant difference exists in college students' perceived behavioral control of NMUPD between the intervention and control groups	PBC = $B_0 + B_1$ (intervention) PBC: Perceived Behavioral Control	t-test
H05: No significant difference exists in college students' behavioral beliefs of NMUPD between the intervention and control groups	BB = $B_0 + B_1$ (intervention) BB: Behavioral Beliefs	t-test
H06: No significant difference exists in college students' normative beliefs of NMUPD between the intervention and control groups	NB = $B_0 + B_1$ (intervention) NB: Normative Beliefs	t-test
H07: No significant difference exists in college students'	CB = $B_0 + B_1$ (intervention)	t-test

Hypotheses	Model	Statistical test
control beliefs of NMUPD between the intervention and control groups	CB: Control Beliefs	
H08: Negative attitude is not a significant predictor of college students' intentions to avoid NMUPD, after controlling for perceived norms and perceived behavioral control	Intention = B_0 +B_1 (A) + B_2(PN) + B_3(PBC) A: attitude, SN: Perceived norm, PBC: Perceived Behavioral control	Multiple Regression, F-test, R^2
H09: Perceived norm is not a significant predictor of college students' intention to avoid NMUPD, after controlling for attitudes and perceived behavioral control	Intention = B_0 + B_1 (A) + B_2(PN) + B_3(PBC) A: attitude, SN: Perceived norm, PBC: Perceived Behavioral control	Multiple Regression, F-test, R^2
H010: Perceived behavioral control is not a significant predictor of college students' intention to avoid NMUPD, after controlling for attitudes and perceived norms	Intention = B_0 + B_1 (A) + B_2(PN) + B_3(PBC) A: attitude, SN: Perceived norm, PBC: Perceived Behavioral control	Multiple Regression, F-test, R^2
H011: Attitudes, perceived norms, and perceived behavioral control do not explain significant variance of college students' intention to avoid NMUPD	Intention = B_0 + B_1 (A) + B_2(PN) + B_3(PBC) A: attitude, SN: Perceived norm, PBC: Perceived Behavioral control	Multiple Regression, F-test, R^2
H012: The previous use of prescription drugs for nonmedical purposes does not increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms, and perceived behavioral control	Intention= B_0 + B_1(A) + B_2(PN) + B_3(PBC) + B_4(PB) A: attitude, PN: Perceived norm, PBC: Perceived Behavioral control, PB: Past Behavior	Multiple regression, F-test, R^2

Hypotheses	Model	Statistical test
H013: The intervention does not increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms, perceived behavioral control, and previous use of prescription drugs	Intention= $B_0 + B_1(A) + B_2(PN) + B_3(PBC) + B_4($ intervention$)$ A: attitude, PN: Perceived norm, PBC: Perceived Behavioral control	Multiple regression, F-test, R^2
H014: No significant relationship exists between college students' intention to avoid NMUPD and gender	Intention = $B_0 + B_1($gender$)$	t-test
H015: No significant relationship exists between college students' intention to avoid NMUPD and race/ethnicity	Intention = $B_0 + B_1($race/ethnicity$)$	ANOVA
H016: No significant relationship exists between college students' intention to avoid NMUPD and type of degree pursued (i.e. graduate, undergraduate, or professional degrees)	Intention = $B_0 + B_1($type of UNM degree$)$	ANOVA
H017: No significant relationship exists between college students' intention to avoid NMUPD and sorority/fraternity groups	Intention = $B_0 + B_1($sorority/fraternity$)$	t-test
H018: No significant relationship exists between college students' intention to avoid NMUPD and housing (i.e. on-campus vs. off-campus)	Intention = $B_0 + B_1($housing$)$	t-test
H019: No significant relationship exists between college students' intention to avoid NMUPD and tobacco use	Intention = $B_0 + B_1($tobacco use $)$	ANOVA
H020: No significant relationship exists between college students' intention to avoid NMUPD and marijuana use	Intention = $B_0 + B_1($marijuana use $)$	ANOVA

Hypotheses	Model	Statistical test
H021: No significant relationship exists between college students' intentions toward NMUPD and alcohol consumption	Intention = B_0 + B_1(alcohol consumption)	ANOVA
H022: No significant relationship exists between college students' intention to avoid NMUPD and age at first use of NMUPD	Intention = B_0 + B_1(onset of NMUPD)	Correlation
H023: No significant relationship exists between college students' intention to avoid NMUPD and the class of prescription drug used (i.e. stimulants, painkillers, or depressants)	Intention = B_0 + B_1(specific prescription drug)	ANOVA

CHAPTER FOUR: RESULTS

This chapter summarizes the findings and results from the survey. The first section describes results from pilot testing. Then, the findings from the survey's dissemination process, including number of respondents and the overall response rates are presented. The data cleaning process and inspection are also described. A descriptive analysis of respondents' demographic characteristics is provided for the overall sample (intervention and control groups combined). Additionally, the characteristics of the students in the intervention and control groups are compared at baseline. Finally, results from hypotheses testing are presented.

Results from Pilot Testing

Reliability was assessed using Cronbach's alpha, a measure of internal consistency. Cronbach's alpha was measured for all theory of reasoned action constructs to test the stability of the instrument. For our study, a Cronbach's value, of more than 0.7 was considered acceptable.[126,127] Table 6 illustrates Cronbach's alpha/Spearman correlation coefficient for the different scales based on responses for the pilot testing. All the scales had internal consistency values of more than 0.7(Table 6).

Table 6 Cronbach's alpha and Spearman correlation coefficients calculated based on results from pilot testing.

Scale	Number of items	Cronbach's alpha	Spearman Coefficient
Attitude (Direct measure)[a]	6	0.94	
Attitude (Belief-based measure)[b]	8	0.81	
Subjective norms (Direct measure)[c]	4	0.70	
Subjective norms (Belief-based measures)[d]	4	0.88	
Behavioral Control (Direct measure)	2	N/A	0.83
Perceived Behavioral Control (Belief-based measures) [e]	8	0.85	
Intention	3	0.99	

a) Based on semantic differential scale
b) Based on behavioral belief by evaluation products
c) Including both the descriptive and injunctive norms
d) Based on normative belief by motivation to comply products
e) Based on control belief strength by power products.

The characteristics of students who participated in the pilot testing phase of the study are summarized in Table 7. The sample used for pilot testing included a good mix of female and male students; undergraduate, graduate, and professional degree students; and HSC and non-HSC students.

Table 7 Characteristics of the students who participated in the pilot study

Characteristic	Control (N=11)	Intervention (N=12)	P-value
Female (%)	6 (40%)	9 (60%)	0.45
Age -yr	27 (4.9)	29.25 (10.4)	0.54
NMUPD-Yes	2 (18.2%)	3 (25%)	0.69
Type of UNM degree			0.189
Undergraduate	2 (20%)	5 (41.7%)	
Graduate	4 (40%)	6 (50%)	
Professional degree	4 (40%)	1 (8.3%)	
HSC---yes	6 (60%)	6(50%)	0.64
Race			0.53
Non-Hispanic/White	1(10%)	3 (25%)	
Non-Hispanic/African American	1(10%)	0 (0%)	
Hispanic	2 (20%)	5 (41.7%)	
Native American/American Indian	1 (10%)	1 (8.3%)	
Asian	3 (30%)	1 (8.3%)	
Other	2 (20%)	2 (16.7%)	
Live on-campus (Yes)	5 (50%)	0 (0%)	.005
Tobacco use			
Non-tobacco user	2(20%)	10 (83.3%)	.004
Former tobacco user	2 (20%)	2 (16.7%)	
Current tobacco user	6 (60%)	0 (0.0%)	
Alcohol consumption			0.99
Non-drinker	4 (40%)	5 (41.7%)	
Former-drinker	1(10%)	1 (8.3%)	
Occasional drinker	5 (50%)	6 (50%)	
Frequent drinker	0 (0%)	0 (0%)	
Marijuana user			0.001
Non-marijuana user	2 (20%)	11 (92%)	
Former marijuana user	0	0	
Occasional marijuana user	8 (80%)	1 (8.3%)	
Frequent marijuana user	0	0	
HSC: Health Sciences Center; yr: Year; NMUPD: Nonmedical Use of Prescription Drugs.			

In the pilot testing, we did not perform random assignment. Therefore, some of the variables were statistically significantly different between the two groups. The main aim of the pilot testing was to test the feasibility of the study and to ensure that the survey and website were easy to read and navigate through and to point out any unclear item.

The following changes were made in the website based on the respondents' feedback:

- Adding additional buttons such as "next" and "back" to enhance navigation through the website
- Including a page with links to resources to help users who may want more information or those who may wish to seek help quitting. Examples of these website are http://www.generationrx.org and http://cosap.unm.edu.
- Some of the wording (grammatical only, not content) was changed based on students' feedback

The following changes were made in the survey based on the respondents' feedback:

- Adding "social" to fraternity/sorority groups' question, since social and administrative fraternity/sorority groups are different
- Tobacco smoking was replaced by tobacco use, since it can also be chewed or snuffed
- Replacing "Black" with "African American" in the race categories
- Defining nonmedical use of prescription drugs not only at the beginning of the survey, but also in the middle

- Adjusting the input for numerical questions (such as age and years at UNM) to accept decimal as well as integer values
- Adding a progress bar so that the respondents can monitor how much they have accomplished and how long until they finish the survey
- Some questions were rephrased such as the direct attitude question. The original question "for me, using prescription drugs for nonmedical purpose to be …" was changed to "I consider the use of prescription drugs for nonmedical purpose to be…"
- The question to measure perceived behavioral control "How do the following factors make using medications for nonmedical purposes easy or difficult for you?" was changed to "How do you think the following factors make using medications for nonmedical purposes easy or difficult?"

Results from the Readability Tests of the Website

For the purpose of this study, the internal readability check of Microsoft Word Processing Software was used to analyze the readability of the website. Results from the readability tests of the website's text are summarized in Table 8. Flesch-Kincaid grade level and Flesch reading-ease tests were used to measure the difficulty in comprehending passages in the studied website.

Table 8 Readability evaluation of the web-based intervention

Readability Test	Score	Interpretation
Flesch Reading Ease	49.6	Fairly difficult to read by general public
Flesch-Kincaid Grade Level	9.6	Requires 9^{th} to 10^{th} grade level to read

The results of the Flesch-Kincaid Grade Level test indicate that a 9th to 10th school grade level is required to read and understand the educational website. The Flesch reading-ease readability tests indicated that the written materials of the website are somewhat fairly difficult to read by general public. However, given that the target population is composed of college students (some within graduate and professional degree levels) we expected that they would be able to read and understand the website.

Gift Cards Distribution for Participating in the Main Study

As a way of appreciation for their time and participation in the study, students who completed the survey were given the offer to enter in a drawing for one of the available 20 gift cards of $20 each. The students who wished to enter the drawing for the prizes were asked to send an e-mail to an “honest agent” who had no access to any of the survey responses. This honest agent handled all the requests and randomly selected 20 students (using random number generator in excel) from the entries to receive the gift cards. The winners were contacted by the honest agent via e-mail with the news and were given the directions on how they can get their gift card delivered. This procedure was used to maintain anonymity of the participants from the investigators.

Internal Consistencies of the Survey Instrument from the Full Study Sample

Internal consistency results using data collected from the full study sample were analyzed. Cronbach's alphas were calculated for all the direct and belief-based measure scales with three or more items. As presented in Table 9, all the scales with three or more items had a Cronbach's alpha value of more than 0.7, which suggested a high internal consistency. The direct measure of PBC scale had only two items and the Spearman's correlation coefficient for this scale was highly significant (rho = 0.73, $p<0.001$)(Table 9).

Table 9 Cronbach's alpha and Spearman correlation coefficients calculated based on results from the full study sample

Scale	Number of items	Cronbach's alpha	Spearman Coefficient
Attitude (Direct measure)[a]	6	0.94	
Attitude (Belief-based measure)[b]	8	0.75	
Subjective norms (Direct measure)[c]	4	0.86	
Subjective norms (Belief-based measures)[d]	4	0.87	
Behavioral Control (Direct measure)	2		0.73
Perceived Behavioral Control (Belief-based measures) [e]	8	0.83	
Intention	3	0.88	

a) Based on semantic differential scale
b) Based on behavioral belief by evaluation products
c) Including both the descriptive and injunctive norms
d) Based on normative belief by motivation to comply products
e) Based on control belief strength by power products.

Survey Dissemination and Response Rate

The first online survey was sent via email on December 4 of 2015, followed by reminders on December 8, December 15, January 5, and January 12

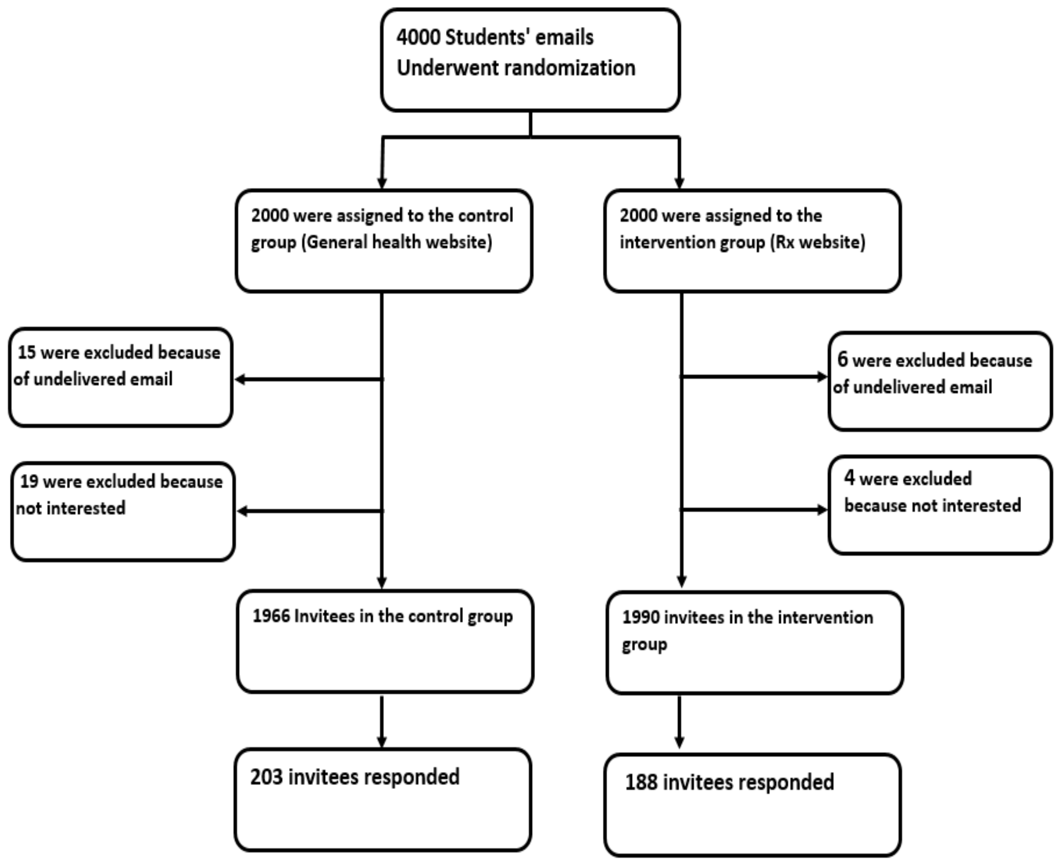
2016. Table 10 summarizes invitations' details. The survey was locked on January 19, and no further responses could be collected afterward.

Table 10 Send dates and times for the invitations and reminders of the web-survey

Invitation	Send date and time
First invitation	12/4/15 10:00 AM
Reminder 1	12/8/15 11:30 AM
Reminder 2	12/15/15 12:30 PM
Reminder 3	1/5/16 10:00 AM
Reminder 4	1/12/16 10:00 AM

A total of 4000 student emails were randomized equally (1:1 ratio) into the control or intervention groups. A total of 23 students indicated that they were not interested in participating in the study (4 from the intervention and 19 from the control group) and therefore were excluded. The email was not delivered to 21 addresses (6 in the intervention and 15 in the control group). After excluding uninterested students and undelivered emails, the number of invitees in the intervention group was 1,990 and in the control group was 1,966. A total of 188 invitees responded in the intervention group and 203 invitees responded in the control group. The response rate in the intervention group was 9.4% (188/1990) and in the control group was 10.3% (199/1966). The overall response rate was 9.9% (391/3956). Figure 3 demonstrates the flow chart for the study. Copies of the invitation emails are shown in APPENDIX B and APPENDIX C.

Figure 3 The flow chart for the study



The number of responses varied by day as demonstrated in Table 11 and Figure 4. Table 11 shows that the highest number of responses collected during the days in which the invitation and the reminders were sent. The response rate declined significantly in the following days.

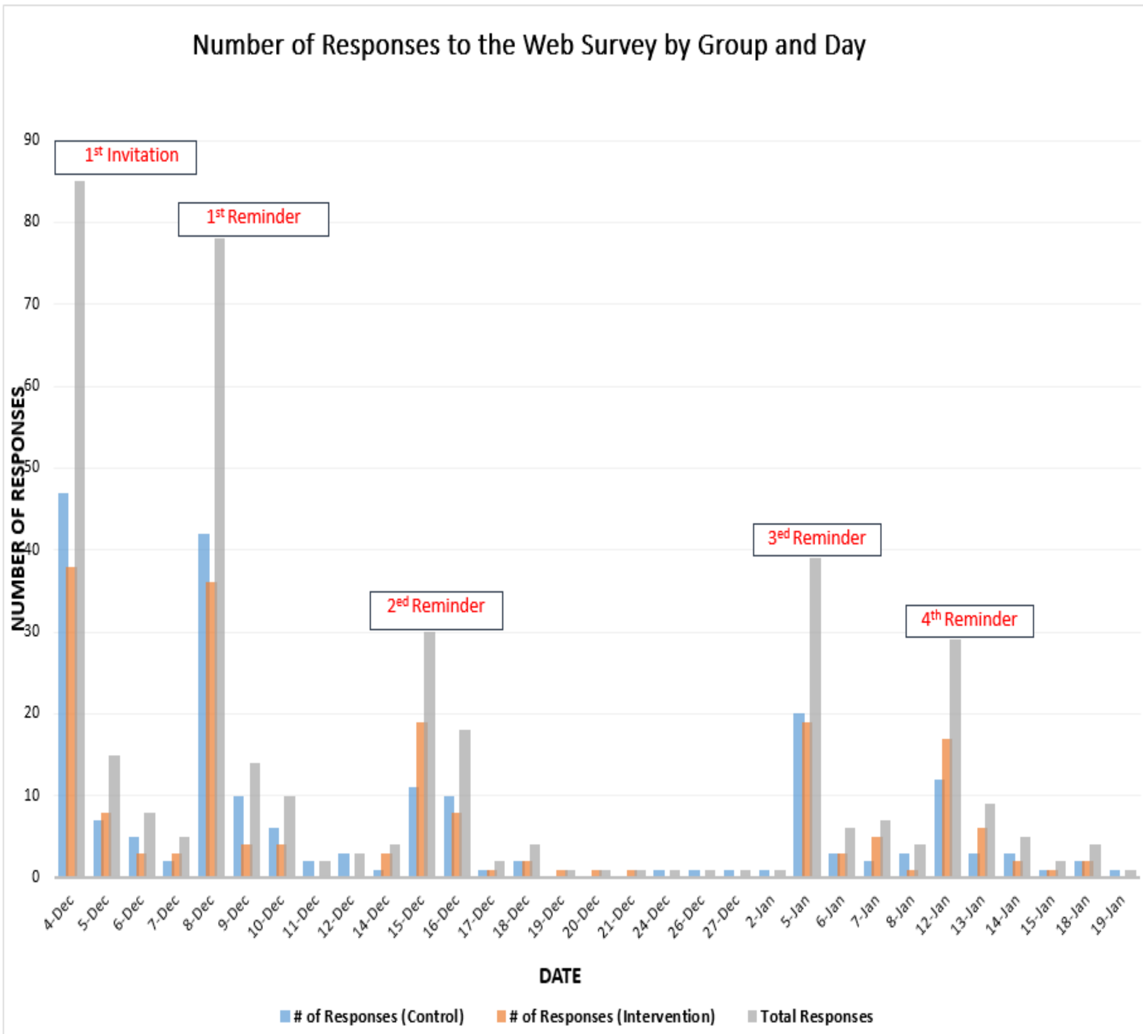
Table 11 Number Of responses in the control and intervention groups by day

Date	# of Responses (Control)	# of Responses (Intervention)	Total Responses
4-Dec	47	38	85
5-Dec	7	8	15
6-Dec	5	3	8
7-Dec	2	3	5
8-Dec	42	36	78
9-Dec	10	4	14
10-Dec	6	4	10
11-Dec	2	0	2
12-Dec	3	0	3
13-Dec	0	0	0
14-Dec	1	3	4
15-Dec	11	19	30
16-Dec	10	8	18
17-Dec	1	1	2
18-Dec	2	2	4
19-Dec	0	1	1
20-Dec	0	1	1
21-Dec	0	1	1
24-Dec	1	0	1
26-Dec	1	0	1
27-Dec	1	0	1
2-Jan	1	0	1
5-Jan	20	19	39
6-Jan	3	3	6
7-Jan	2	5	7
8-Jan	3	1	4
9-Jan	0	0	0
10-Jan	0	0	0
11-Jan	0	0	0
12-Jan	12	17	29
13-Jan	3	6	9
14-Jan	3	2	5
15-Jan	1	1	2
16-Jan	0	0	0
17-Jan	0	0	0
18-Jan	2	2	4
19-Jan	1	0	1

Date	# of Responses (Control)	# of Responses (Intervention)	Total Responses
Total	203	188	391

The highlighted rows represented the days in which the invitation or reminders were sent.

Figure 4 Number of responses by group and day



Differences between Early and Late Respondents

An analysis was done to assess if the demographic characteristics, intentions, attitudes, norms, and PBC were different between early and late responders. This analysis was done to assess the possibility for non-response bias because late responders are quite similar to non-responders. For this purpose, December 18, 2015 was chosen as the cut-off date because the response rate started to decline significantly afterward. Fortunately, no significant differences in the mean scores for any of the theory's constructs ($p=0.49$ for intentions, $p= 0.84$ for attitudes, $p= 0.7$ for perceived norms, and $p= 0.34$ for perceived behavioral control) were found before and after December 18, 2015. Furthermore, no significant differences were found in demographic characteristics, including gender ($p =0.82$), age ($p=0.8$), lifetime NMUPD ($p =0.2$), degree pursued ($p=0.5$), being a student in HSC ($p =0.16$), years spent at UNM ($p=0.06$), sorority/fraternity groups affiliation ($p=0.17$), race ($p=0.48$), and living on-campus ($p=0.20$). Therefore, early responders are similar to late responders, and consequently the possibility of non-response bias is reduced.

Tracking the Utilization of the Website

Google analytics[174] was used to track the utilization of the website by participants. There were 764 sessions took place in the website. A session is defined as the period of time a user is actively engaging with the website. This may include page or screen views or interaction with activities provided on the website. A total of 533 users (having at least one session within a specific time frame) explored the website of which 30.6% were new visitors, and 69.4% were returning users. The total number of page views were 1,808 (repeated views of a single page are also counted). The average number of pages viewed during a session was 2.37. The average session duration was 3:48 minutes. The bounce rate (the visits in which the person left the website from the entrance page without engaging with the page) was 77.4%. The average time spent on any page was 2:47 minutes. This information can be found in APPENDIX E.

Additionally, the utilization of the website was tracked by counting the number of respondents who took the included quiz or pledge. The number of participants who made the pledge was 20, and who took the quiz was 49.

Data Cleaning and Inspection

Data was imported from Excel sheets into Stata® and inspected for the presence of outliers, missing data, and normality assumptions.

Outliers

Since this is a computerized survey, the presence of outliers was minimized by pre-specifying minimum and maximum values for entry. If a respondent provided unusual input, a message would pop-up on the screen indicating that the value exceeded the possible range. Additionally, the minimum and maximum values for continuous variables were investigated to make sure that outliers were not present. For example, the range for age was 18 to 71, the range for age at first NMUPD was 12 to 35, and the range for the frequency of

NMUPD in the past year was 0 to 50 times. A decision was made to retain these values since they were considered reasonable.

Missing Data

The possibility of missing data was minimized by taking advantage of the features provided by Opinio® (the software used to generate the survey). A respondent can only proceed to the next section if the current questions were answered. If there were unanswered questions, a message would pop–out asking the respondent to select at least one option. Out of the 203 stored responses in the control group, 187 respondents provided completed responses (92.1% completion rate). In the intervention group, 174 out of 188 respondents provided complete response (92.6% completion rate). Stata performs list-wise deletion for some statistical tests such as correlations and regression whenever the variables have missing data.

Normality Assumptions

For multiple regressions, it is important to check for the normality of residuals to make sure that the results from t-test, F-test and p-values are valid. For this reason, after the regression analysis was performed, the command **predict** was used to create residuals and other commands were used to check for normality. Results from kernel density plot clearly showed that the residuals were normally distributed (Figure 5). The standardized normal probability plot also showed no evidence against normality (Figure 6).

Figure 5 Kernel density graph for the distribution of residuals imposed over the normal density graph

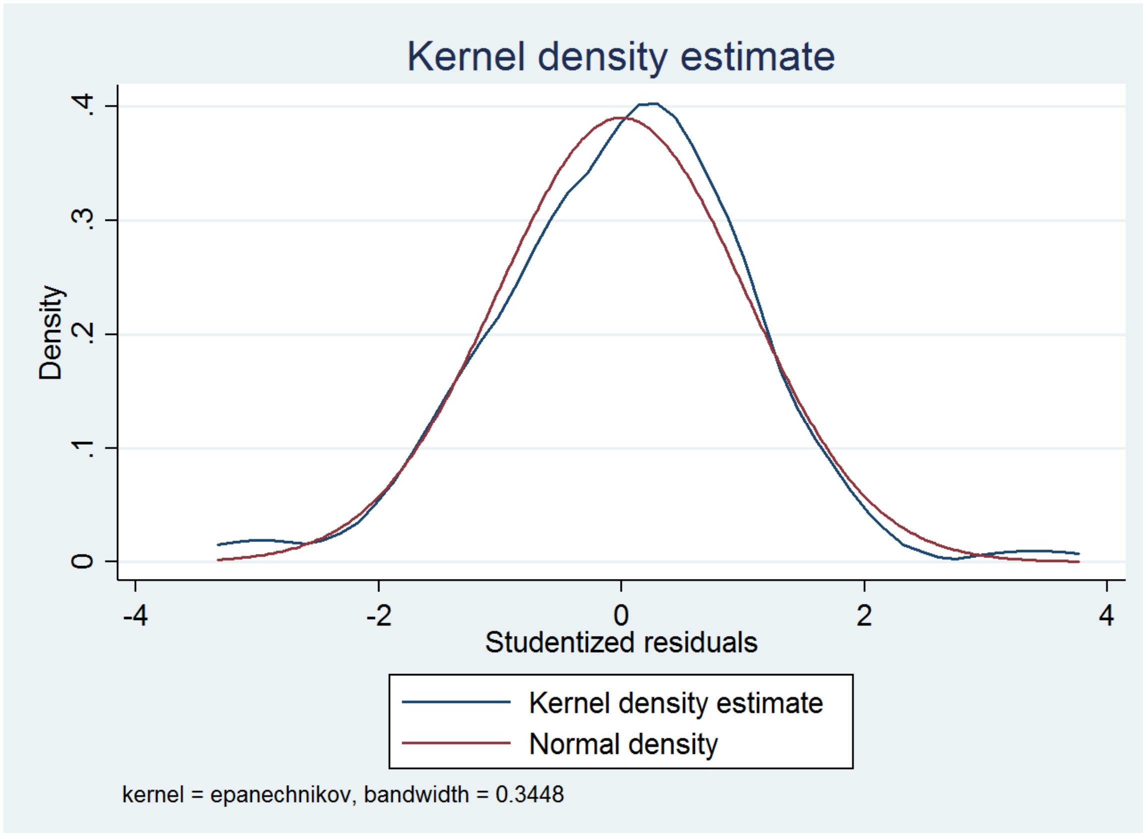
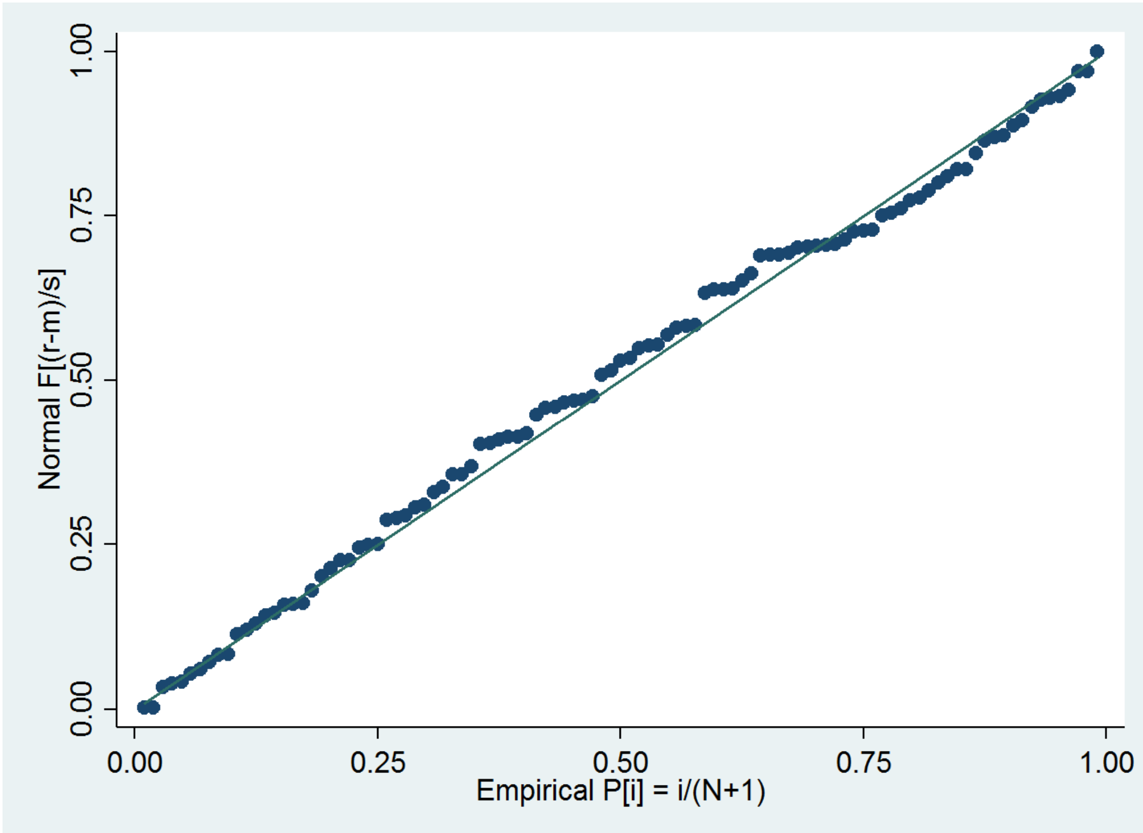


Figure 6 The standardized normal probability plot for residuals



Characteristics of Respondents by Group Assignment (Intervention or Control group)

Assessment of students' demographics by group assignment demonstrated no statistically significant differences between the control and intervention groups in any variable (Table 12). This was an indication of successful randomization and, therefore, any differences between the two groups would be attributed to the intervention.

Table 12 Analysis of student characteristics by group assignment

Characteristic	Control (%)	Intervention (%)	P-value
Total	n= 199	n= 188	
Ever used Rx nonmedically	59 (29.7%)	53 (28.2%)	0.75
Female (%)	122 (61.9%)	112 (60.9%)	0.83
Age –mean (SD)	28.9 (10.8)	28.2 (10.6)	0.56
Race			0.67
Non-Hispanic/White	97 (49.2%)	87 (47.3%)	
Non-Hispanic/African American	6 (3.1%)	2 (1.1%)	
Hispanic	58 (29.4%)	59 (32.1%)	
Native American/American Indian	13 (6.6%)	10 (5.4%)	
Asian	10 (5.1%)	14 (7.6%)	
Other	13 (6.6%)	12 (6.5%)	
Type of UNM degree			0.06
Undergraduate	132 (67.0%)	103 (56.0%)	
Graduate	46 (23.4%)	62 (33.7%)	
Professional degree	19 (9.6%)	19 (10.3%)	
HSC---yes	39 (19.8%)	27 (14.7%	0.19
Years at UNM	3.0 (2.5)	3.1 (2.6)	0.75
Member of sorority group---Yes	8 (4.1%)	10 (5.4%)	0.53
Live on-campus ---Yes	23 (11.7%)	23 (12.5%)	0.81
Tobacco use			0.21
Non-tobacco user	141(71.6%)	142 (77.2%)	
Former tobacco user	39 (19.8%)	24 (13.0%)	
Current tobacco user	17(8.6%)	18 (9.8%)	
Alcohol consumption			0.57
Non-drinker	60 (30.5%)	53 (28.8%)	
Former-drinker	14 (7.1%)	10 (5.4%)	
Occasional drinker	106 (53.8%)	110 (59.8%)	
Frequent drinker	17 (8.6%)	11 (5.9%)	
Marijuana user			0.34
Non-marijuana user	119 (60.4%)	119 (64.7%)	
Former marijuana user	35 (17.8%)	31 (16.9%)	
Occasional marijuana user	28 (14.21%)	16 (8.7%)	
Frequent marijuana user	15 (7.6%)	18 (9.8%)	

Students' Demographic Characteristics in the Overall Sample

In the overall sample (intervention and control groups combined), most of the respondents were female (n = 234, 61.4%), the average age was 28.6 years (SD = 10.7), with a range from 18 to 71. The number of students who indicated ever using prescription drugs for nonmedical purposes was 112 (28.9%). Regarding race/ethnicity, most respondents identified themselves as Non-Hispanic White (n = 184, 48.3%) followed by Hispanic (n = 117, 30.7%), Asian (n = 24, 6.3%), other races/ethnicities (n = 25, 6.6%), Native American/American Indian (n = 23, 6.0%), and Non-Hispanic/African American (n = 8, 2.1%) (Table 13).

The majority of respondents were undergraduate students (n = 235, 61.7%), followed by graduate (n = 108, 28.4%) and professional degree students (n = 38, 10.0%). Only 66 (17.3%) were students in the Health Sciences Center (HSC), and only 18 (4.7%) students were members of a sorority group. Most of the respondents indicated living off-campus (n = 335, 87.9%). The average period for being a student at UNM was 3.1 years (SD = 2.5).

Regarding tobacco use, 283 (73.8%) students were non-tobacco users, 63 (16.9%) were former tobacco users, and 35 (9.4%) were current tobacco users. Regarding alcohol consumption, 113 (29.7%) were non-drinkers 24 (6.3%) were former drinkers, 216 (56.7%) were occasional drinkers and 28 (7.4%) were frequent drinkers. As for marijuana use, 238 (62.4%) were non-users, 66 (17.3%) were former users, 44 (11.6%) were occasional users and 33 (8.7%) were frequent users (Table 13).

Table 13 Characteristics of students in the overall sample, and those who reported NMUPD in the past (N=391)

Variable	Total Number of respondents (%)[@]	Students who ever used Rx Nonmedically (%)[#]	P-value*
Total	391	112 (28.9%)	
Gender			
Female (%)	234 (61.4 %)	65 (27.8%)	0.65
Male (%)	147 (38.6 %)	44 (29.93%)	
Age -yr	28.6	27.6	0.26
Race (%)			<0.01
Non-Hispanic/White	184 (48.3%)	65 (35.3%)	
Non-Hispanic/African American	8 (2.1%)	0 (0%)	
Hispanic	117 (30.7%)	31(26.5%)	
Native American/American Indian	23 (6.0%)	5 (21.7)%	
Asian	24 (6.3%)	(0)0%	
Other	25 (6.6%)	8 (32%)	
Type of UNM degree			0.95
Undergraduate	235 (61.7%)	68 (28.9)%	
Graduate	108 (28.4%)	31 (28.7)%	
Professional degree	38 (10.0%)	10 (26.3)%	
HSC			0.98
Yes	66 (17.3%)	19 (28.8)%	
No	315 (82.7 %)	90 (28.6)%	
Years at UNM	3.1 years	3.3 years	0.35
Member of sorority group			0.25
Yes	18 (4.8%)	3 (16.7%)	
No	363 (95.2%)	106 (29.2%)	
Live on-campus			0.69
Yes	46(12.3%)	12 (26.1%)	
No	335 (87.7%)	97 (29.3%)	
Tobacco use			<0.01
Non-tobacco user	283 (73.8%)	69 (24.6%)	
Former tobacco user	63 (16.9%)	23 (36.5%)	
Current tobacco user	35 (9.4%)	17 (48.6%)	
Alcohol consumption			<0.01
Non-drinker	113 (29.7)%	13 (11.5%)	
Former-drinker	24 (6.3)%	11 (45.8%)	
Occasional drinker	216 (56.7)%	68 (32.1%)	

Variable	Total Number of respondents (%)@	Students who ever used Rx Nonmedically (%)#	P-value*
Frequent drinker	28 (7.4%)	28 (60.7%)	
Marijuana user			<0.01
Non-marijuana user	238 (61.8%)	29 (12.1%)	
Former marijuana user	66 (17.7%)	33 (50%)	
Occasional marijuana user	44 (11.8%)	23 (52.3%)	
Frequent marijuana user	33 (8.8%)	24 (72.7%)	

*P-values were generated to compare characteristics of those who reported NMUPD in the past compared to those who never reported NMUPD.
@ The percentages are relative to the total number of respondents. For example, there was a total of 234 female respondent, so the frequency will be 61.4% (234/381)
#The percentages are relative to the number of respondents in each category. For example, there were 65 female students who reported NMUPD, and the total number of female respondents in the sample was 234, so the percentage will be 27.8% (65/234)

Analysis According to History of NMUPD

An analysis was performed to see the difference between students who reported nonmedical use of prescription drugs in the past compared to those who never used prescription drugs nonmedically (Table 13). There were no statistically significant differences by gender ($p = 0.65$), age ($p = 0.26$), type of degree ($p = 0.95$), years spent at UNM ($p = 0.35$), being a student at HSC ($p = 0.98$), being a member of a sorority group ($p = 0.25$), and living on-campus ($p = 0.69$).

However, there were significant differences by race ($p < 0.01$). Non-Hispanic Whites reported the highest NMUPD, ($n = 65$, 35.3%), followed by Hispanics ($n = 31$, 26.5%), other races ($n = 8$, 32%); and Native Americans ($n = 5$, 21.7%). Asians or African Americans reported no use.

Tobacco use was also associated significantly with NMUPD ($p < 0.01$), with the highest frequency reported by current users (48.6%, n = 17) followed by former users (36.5%, n = 23), and lastly by non-tobacco users (24.4%, n = 6). Drinking alcohol was significantly associated with NMUPD ($p < 0.01$). As can be seen from Table 13, the frequency of nonmedical use of prescription drugs was highest among frequent drinkers 60.7% (n = 17), followed by former drinkers (45.8%, n = 11), occasional drinkers (32.1%, n = 68), and lastly non-drinkers (11.5%, n = 13). Marijuana use was also significantly associated with NMUPD ($p < 0.01$). The highest frequency of NMUPD was reported by frequent marijuana users 72.7% (n = 24), then by occasional marijuana users 52.3% (n = 23) followed by former marijuana users 50.0 % (n = 33), and the lowest frequency was reported by non- marijuana users 12.2 %(n = 29) (Table 13).

Among those who reported NMUPD in their lifetime, 46.4% reported using them in the past 12 months. The average age for first-time use was 19.1 (SD = 4.7, min = 12, max = 35). The average number of times a drug was used nonmedically in the last year was 4.2 (SD = 9.1) with a maximum use of 50 times.

Regarding specific prescription drugs, 60% reported using a painkiller, 44.0% reported using a stimulant, and 35.3% reported using a depressant. A total of 40 students (35.7%) reported using at least two different types, and 13 (11.6%) students reported using three types of prescription drugs. Regarding reasons for nonmedical use, 52.6% indicated self-medication, 32.8% to study for an exam, 5.1% to lose weight, and 27.6% to party with friends (Table 14).

Table 14 Analysis of students' characteristics who reported NMUPD, specific prescription drug used, and reasons for nonmedical use

Characteristic	Absolute Number	Frequency (%) relative to only those who reported NMUPD (n=112)	Frequency (%) relative to the overall sample (n=391)	Mean(SD)
Used in the past 12 months	51	(46.4%)	13%	
Age at first use				19.1 (4.7)
Number of times used				4.2 (9.1)
Nonmedical use of the specific prescription drug				
Painkillers	70	(60%)	18%	
Stimulants	51	(44%)	13%	
Depressants	41	(35.3%)	10.5%	
Using at least 2 drugs	40	(35.7%)	10.0%	
Using 3 drugs	13	(11.6%)	3.3%	
Reasons for nonmedical use				
Self-medication	61	(52.6%)	15.6%	
Study for an exam	38	(32.8%)	9.7%	
Lose weight	6	(5.2%)	1.5%	
Party with friends	32	(27.6%)	8.2%	
Other reasons	32	(27.6%)	8.2%	

An open-ended question was included for respondents to state any other reason for nonmedical use of prescription drugs. A total of 32 students provided other reasons for NMUPD. These reasons are listed in Table 15. The most common other reasons were to "go to sleep," "to get high," "to concentrate," and "to try it out."

Table 15 Other reasons for using NMUPD as provided by students' words

"To see if it would increase my ability to concentrate"
"Recover from jetlag"
"To enjoy being high, alone or with others"
"In place of alcohol or other drug"
"To relax my body and feel nothing, and to feel far away from the real world"
"To go to sleep"
"Took a Xanax from a friend during a panic attack after learning of the death of my partner"
"Motivate me to do work"
"Psychic masochism & spiritual attainment"
"To quietly get high. No partying involved"
"To get high"
"I took a stimulant for fun, but not really in a party setting. I just took it and went about my day"
"To focus on getting my 100-page paper done on time. I struggle with staying focus"
"Going to see a movie"
"Death of a relative"
"Sleep"
"An extra boost to get through a productive day"
"Depression: I just wanted to sleep and forget everything"
"Depression and personal gain"
"Bored and stupid"
"To help with sleep"
"To go to bed"
"Finish homework, stay awake for road trips"
"To see if it was an interesting experience"
"Had them left over and wanted to see what it was like"
"To sleep"
"I was angry and sad and I wanted to get revenge by showing the other person that they were not the only person that could hurt themselves"
"music"
"To try it out"
"Leftover from surgery"
"Fun"
"To relax and fall asleep"
"To relax and sleep"

Variables Related to the Reasoned Action Approach

In this section, constructs related to the reasoned action approach were analyzed. The direct and belief-based measures for attitudes, perceived social norms, and perceived behavioral control were presented and described.

Intentions

Intentions to avoid NMUPD were measured using a three-item question. All items were on 7-point scales ranging from -3 to +3; the greater the number, the higher the intentions to avoid NMUPD. The means for these individual items in the overall sample were 2.3 (SD =1.4), 1.9 (SD = 1.8), and 2.3 (SD = 1.4). A total of 318 (81.3%) students agreed that they intended to avoid NMUPD, 293 (74.9%) indicated that they were not willing to use prescription drugs for nonmedical reasons, and 322 (82.4%) indicated that they planned not to use prescription drugs for nonmedical reasons. The mean intention score from these three items was 2.2 (SD = 1.4). All the details are summarized in Table 16.

Table 16 Mean, SD, and relative frequency of students' intentions to avoid NMUPD In the overall sample (N=391)

Items	Mean	SD	Absolute Number of Responses and Relative Frequencies (%)						
			Strongly Disagree (-3)	(-2)	(-1)	Neither disagree nor agree (0)	(+1)	(+2)	Strongly agree (+3)
1. I intend to AVOID using prescription drugs for nonmedical purposes over the next 3 months.	2.3	1.4	8 (2.2)	6 (1.6)	6 (1.6)	30 (8.2)	12 (3.3)	49 (13.3)	257 (69.8)
2. I am NOT willing to use prescription drugs for nonmedical purposes over the next 3 months.	1.9	1.8	14 (3.8)	19 (5.2)	10 (2.7)	32 (8.7)	17 (4.6)	38 (10.3)	238 (64.7)
3. I plan to NOT use prescription drugs for nonmedical purposes over the next 3 months.	2.3	1.4	9 (2.5)	7 (1.9)	5 (1.4)	25 (6.8)	16 (4.4)	53 (14.4)	253 (68.8)
Mean intention score	2.2	1.4							

Note: intention scale can range from -3 to +3. The question for these items was "Please choose the number that closely matches your level of agreement/disagreement with the following statements"

The same analysis was done for the intervention and control groups separately. The means for these individual items in the intervention group were 2.3 (SD =1.4), 1.9 (SD =1.8), and 2.3 (SD =1.4), and for the control group were 2.3(SD = 1.4), 2.0(SD =1.7), and 2.3 (SD = 1.4) (Table 17).

In the intervention group, 155 (82.5%) students agreed that they intended to avoid NMUPD in the next 3 months, 138 (73.4%) indicated that they were not willing to use prescription drugs for nonmedical reasons, and 155(82.5%) indicated that they planned not to use prescription drugs for nonmedical reasons. As many as 163(80.3%) students in the control group agreed that they intended to avoid NMUPD in the next 3 months, 155(76.4%) indicated that they were not willing to use prescription drugs for nonmedical reasons, and 167 (82.3%) indicated that they planned not to use prescription drugs for nonmedical reasons (Table 17).

The mean intention score for the three items was 2.2 (SD =1.4) for both groups. All the above details are summarized in Table 17.

Table 17 Mean, SD, and Relative frequency of student's intentions to avoid NMUPD in the control (n=176) and intervention groups (n =192)

Items	Intervention N= 176		Control N= 192		Absolute Number of Responses and Relative Frequencies (%)													
					Strongly Disagree (-3)		(-2)		(-1)		Neither disagree nor agree (0)		(+1)		(+2)		Strongly agree (+3)	
	Mean	SD	Mean	SD	I	C	I	C	I	C	I	C	I	C	I	C	I	C
1. I intend to **AVOID** using prescription drugs for nonmedical purposes over the next 3 months.	2.3	1.4	2.3	1.4	3 (1.7)	5 (2.6)	4 (2.3)	2 (1.0)	3 (1.7)	3 (1.6)	11 (6.3)	19 (9.9)	6 (3.4)	6 (3.3)	26 (14.8)	23 (12.0)	123 (69.9)	134 (69.8)
2. I am **NOT** willing to use prescription drugs for nonmedical purposes over the next 3 months.	1.9	1.8	2.0	1.7	8 (4.6)	6 (3.1)	9 (5.1)	10 (5.2)	5 (2.8)	5 (2.6)	16 (9.1)	16 (8.3)	5 (2.8)	12 (6.3)	19 (10.8)	19 (9.9)	114 (64.8)	124 (64.6)
3. I plan to **NOT** use prescription drugs for nonmedical purposes over the next 3 months.	2.3	1.4	2.3	1.4	4 (2.3)	5 (2.6)	4 (2.3)	3 (1.6)	3 (1.7)	2 (1.0)	10 (5.7)	15 (7.8)	7 (4.0)	9 (4.7)	28 (15.9)	25 (13.0)	120 (68.2)	133 (69.3)
The mean intention score	2.2	1.4	2.2	1.4														
I: Intervention group C: Control group																		

Note: Intention scale can range from -3 to +3. The question for these items was "Please choose the number that closely matches your level of agreement/disagreement with the following statements"

Attitudes (Direct and Belief-Based Measures)

Attitudes were measured directly using a 6-item question of two extreme evaluative scales with 7-point alternatives. The first three items were used to measure experiential attitudes [(irritating (-3) to relaxing (+3), unenjoyable (-3) to enjoyable (+3), and unpleasant (-3) to pleasant (+3)] while the next 3 items were used to evaluate instrumental attitudes [(bad (-3) to good (+3), irresponsible (-3) to responsible (+3), and harmful (-3) to not-harmful (+3)].

In the overall sample, students on average considered the use of prescription drugs for nonmedical purposes to be irritating (mean = -0.78, SD =1.7), unpleasant (mean = -0.82, SD = 1.7), unenjoyable (mean = -0.80, SD =1.7), bad (mean = -1.5, SD = 1.6), harmful (mean = -1.8, SD = 1.4), and irresponsible (mean = -1.8, SD = 1.4). The mean attitude score from those six items was -1.3 (SD =1.4, min = -3, max = 2.7) (Table 18). Generally speaking, students had negative attitudes toward the NMUPD.

In the overall sample (N= 391), 16.6 % of the students considered the nonmedical use of prescription drugs to be relaxing, pleasant, and enjoyable. While only 9.2 % of the respondents considered the nonmedical use of prescription drugs to be good, 7.4% did not consider NMUPD to be harmful, and 5.6% considered NMUPD to be responsible (Table 18).

Table 18 Mean, SD, and relative frequency of students' attitudes (direct measures) toward NMUPD in the overall sample (N= 391)

			Absolute number of responses and relative frequencies (%)						
Items	**Mean**	**SD**	**Irritating (-3)**	**-2**	**-1**	**0**	**1**	**2**	**Relaxing (3)**
Irritating-Relaxing	-0.78	1.7	96 (25.8)	39 (10.5)	38 (10.2)	134 (36.0)	32 (8.6)	17 (4.6)	16 (4.3)
			Unpleasant (-3)	**-2**	**-1**	**0**	**1**	**2**	**Pleasant (3)**
Unpleasant - Pleasant	-0.82	1.7	101 (27.2)	35 (9.4)	44 (11.8)	127 (34.1)	32 (8.6)	20 (5.4)	13 (3.5)
			Unenjoyable (-3)	**-2**	**-1**	**0**	**1**	**2**	**Enjoyable (3)**
Unenjoyable - Enjoyable	-0.80	1.7	101(27.2)	34 (9.1)	40 (10.8)	132 (35.5)	28 (7.5)	24 (6.5)	13 (3.5)
			Bad (-3)	**-2**	**-1**	**0**	**1**	**2**	**Good (3)**
Bad- Good	-1.5	1.6	151 (40.6)	62 (16.7)	49 (13.2)	74 (19.9)	18 (4.8)	9 (2.4)	9 (2.4)
			Harmful (-3)	**-2**	**-1**	**0**	**1**	**2**	**Not harmful (3)**
Harmful- Not harmful	-1.8	1.4	169 (45.4)	74 (19.9)	48 (12.9)	52 (14.0)	18 (4.8)	8 (2.2)	3 (0.8)
			Irresponsible(-3)	**-2**	**-1**	**0**	**1**	**2**	**Responsible (3)**
Irresponsible-Responsible	-1.8	1.4	184 (49.5)	56 (15.1)	43 (11.6)	67 (18.0)	14 (3.8)	7 (1.9)	1 (0.3)
Mean attitude score	-1.3	1.4							

Note: Attitudes' scale can range from -3 to +3, the question for these items was "I consider the use of prescription drugs for nonmedical purposes to be:…

The same analysis was conducted for the intervention and control groups separately. Students in the intervention group, on average, considered the use of prescription drugs for nonmedical purposes to be irritating (mean = -0.92, SD = 1.7, n = 179), unpleasant (mean = -1.0, SD = 1.7, n = 179), unenjoyable (mean = -1.0, SD = 1.7, n = 179), bad (mean = -1.7, SD = 1.5, n = 179), harmful (mean = -1.9, SD = 1.5, n = 179), and irresponsible (mean = -1.9, SD = 1.4, n = 179) (Table 19).

Students in the control group, on average, also considered the use of prescription drugs for nonmedical purposes to be irritating (mean = -0.65 , SD =1.7, n = 193), unpleasant (mean = -0.64, SD = 1.7, n = 193), unenjoyable (mean = -0.56, SD = 1.7, n = 193), bad (mean = -1.3, SD = 1.7, n = 193), harmful (mean = -1.7, SD = 1.4, n = 193), and irresponsible (mean = -1.7, SD = 1.4, n = 193) (Table 20).The mean direct attitude score for the intervention group was -1.4 (SD = 1.4) while for the control group was -1.1 (SD = 1.4) (Table 19 & Table 20).

Table 19 Mean, SD, and relative frequency of Students' Attitudes (direct measures) toward NMUPD in the intervention group (N= 179)

			Absolute number of responses and relative frequencies (%)						
Items	**Mean**	**SD**	**Irritating (-3)**	**-2**	**-1**	**0**	**1**	**2**	**Relaxing (3)**
Irritating-Relaxing	-0.92	1.7	54 (30.2)	17 (9.5)	14 (7.8)	66 (36.9)	15 (8.4)	8 (4.5)	5 (2.8)
			Unpleasant (-3)	**-2**	**-1**	**0**	**1**	**2**	**Pleasant (3)**
Unpleasant - Pleasant	-1.0	1.7	60 (33.5)	18 (10.1)	13 (7.3)	58 (32.4)	16 8.9)	12 (6.7)	2 (1.1)
			Unenjoyable (-3)	**-2**	**-1**	**0**	**1**	**2**	**Enjoyable (3)**
Unenjoyable -Enjoyable	-1.0	1.7	60 (33.5)	18 (10.1)	15 (8.4)	60 (33.5)	10 (5.6)	14 (7.8)	2 (1.1)
			Bad (-3)	**-2**	**-1**	**0**	**1**	**2**	**Good (3)**
Bad- Good	-1.7	1.5	81 (45.3)	31 (17.3)	19 (10.6)	35 (19.6)	7 (3.9)	4 (2.2)	2 (1.1)
			Harmful (-3)	**-2**	**-1**	**0**	**1**	**2**	**Not harmful (3)**
Harmful- Not harmful	-1.9	1.5	91 (50.8)	32 (17.9)	20 (11.2)	21 (11.7)	10 (5.6)	3 (1.7)	2 (1.1)
			Irresponsible (-3)	**-2**	**-1**	**0**	**1**	**2**	**Responsible (3)**
Irresponsible- Responsible	-1.9	1.4	92 (51.4)	28 (15.6)	16 (8.9)	32 (17.9)	8 (4.5)	3 (1.7)	0 (0)
Mean attitude score	-1.4	1.4							

Table 20 Mean, SD, and relative frequency of students' attitudes (direct measures) toward NMUPD in the control group (N= 193)

			Absolute number of responses and relative frequencies (%)						
Items	**Mean**	**SD**	**Irritating (-3)**	**-2**	**-1**	**0**	**1**	**2**	**Relaxing (3)**
Irritating-Relaxing	-0.65	1.7	42 (21.8)	22 (11.4)	24 (12.4)	68 (35.2)	17 (8.8)	9 (4.7)	11 (5.7)
			Unpleasant (-3)	**-2**	**-1**	**0**	**1**	**2**	**Pleasant (3)**
Unpleasant - Pleasant	-0.64	1.7	41 (24.2)	17 (8.8)	31 (16.1)	69 (35.8)	16 (8.3)	8 (4.2)	11 (5.7)
			Unenjoyable (-3)	**-2**	**-1**	**0**	**1**	**2**	**Enjoyable (3)**
Unenjoyable -Enjoyable	-0.56	1.7	41 (21.2)	16 (8.3)	25 (13.0)	72 (37.3)	18 (9.3)	10 (5.2)	11 (5.7)
			Bad (-3)	**-2**	**-1**	**0**	**1**	**2**	**Good (3)**
Bad- Good	-1.3	1.7	70 (36.3)	31 (16.1)	30 (15.5)	39 (20.0)	11 (5.7)	5 (2.6)	7 (3.6)
			Harmful (-3)	**-2**	**-1**	**0**	**1**	**2**	**Not harmful (3)**
Harmful- Not harmful	-1.7	1.4	78 (40.4)	42 (21.8)	28 (14.5)	31 (16.1)	8 (4.2)	5 (2.6)	1 (0.5)
			Irresponsible (-3)	**-2**	**-1**	**0**	**1**	**2**	**Responsible (3)**
Irresponsible- Responsible	-1.7	1.4	92 (47.7)	28 (14.5)	27 (14.0)	35 (18.1)	6 (3.1)	4 (2.1)	1 (0.5)
Mean attitude score	-1.1	1.4							

Students' attitudes toward NMUPD were also assessed through behavioral beliefs. Eight behavioral beliefs were used to assess students' attitudes on a 7-point scale ranging from 1 to 7. Overall, respondents did not believe that the nonmedical use of prescription drugs would help them stay focused and improve their grades (mean = 2.6, SD = 1.8), lose weight (mean = 3.0, SD =1.6), get high (mean = 3.3, SD =1.9), or feel more socially accepted (mean = 2.2, SD = 1.5). On the other hand, they feared that the nonmedical use of prescription drugs can cause them physical problems (mean = 5.5, SD = 1.5), mental health problems (mean = 5.2, SD = 1.6), addiction (mean =5.3, SD =1.7), and get them arrested (mean = 4.9, SD = 1.8) (Table 21)

Table 21 Mean, SD, and relative frequency of students' behavioral belief strength (b_i) regarding NMUPD in the overall sample (N= 373)

			Absolute Number of Responses and Relative Frequencies (%)						
Behavioral Belief Strength (b_i)	**Mean**	**SD**	**Strongly Disagree (1)**	**(2)**	**(3)**	**Neither disagree nor agree (4)**	**(5)**	**(6)**	**Strongly agree (7)**
Help me stay focused and improve my grades	2.6	1.8	146 (39.1)	83 (22.3)	20 (5.4)	51 (13.7)	44 (11.8)	19 (5.1)	10 (2.7)
Cause me physical health problems	5.5	1.5	14 (3.8)	8 (2.1)	15 (4.0)	44 (11.8)	70 (18.8)	105 (28.2)	117 (31.4)
Cause me mental health problems	5.2	1.6	17 (4.6)	16 (4.3)	19 (5.1)	51 (13.7)	75 (20.1)	97 (26.0)	98 (26.3)
Cause me to be addicted	5.3	1.7	23 (6.2)	17 (4.6)	12 (3.2)	44 (11.8)	62 (16.6)	109 (29.2)	106 (28.4)
Get me arrested	4.9	1.8	25 (6.7)	20 (5.4)	25 (6.7)	69 (18.5)	68 (18.2)	75 (20.1)	91 (24.4)
Help me lose weight	3.0	1.6	93 (24.9)	79 (21.2)	33 (8.9)	98 (26.3)	45 (12.1)	21 (5.6)	4 (1.1)
Help me get high and party	3.3	1.9	100 (26.8)	67 (18.0)	16 (4.3)	85 (22.8)	50 (13.4)	37 (9.9)	18 (4.8)
Make me feel more socially accepted by my group	2.2	1.5	180 (48.3)	76 (20.4)	21 (5.6)	62 (16.6)	22 (5.9)	10 (2.7)	2 (0.54)

Note: Behavioral belief strength can range from 1 to 7. The question for these items was "Using prescription drugs for nonmedical purposes will:"

Students in the intervention group did not believe that the nonmedical use of prescription drugs would help them stay focused and improve their grades (mean = 2.5, SD = 1.8), lose weight (mean = 2.9, SD =1.7), get high and to party (mean =3.2, SD =2.0), or feel more socially accepted (mean = 2.2, SD =1.6). On the other contrary, they feared that the nonmedical use of prescription drugs can cause them physical problems (mean = 5.6, SD =1.5), mental health problems (mean = 5.3, SD = 1.6), addiction (mean =5.3, SD =1.7), and get them arrested (mean = 5.0, SD =1.8) (Table 22).

Students in the control group did not believe that the nonmedical use of prescription drugs would help them stay focused and improve their grades (mean = 2.7, SD = 1.8), lose weight (mean =3.1, SD =1.6) get high and to party (mean =3.3, SD = 1.8), or feel more socially accepted (mean =2.2, SD =1.5). On the contrary, they feared that the nonmedical use of prescription drugs can cause them physical problems (mean = 5.4, SD =1.6), mental health problems (mean =5.2, SD =1.7), addiction (mean = 5.3, SD = 1.7), and get them arrested (mean = 4.9, SD = 1.8) (Table 22).

Table 22 Mean, SD, and relative frequency of students' behavioral belief strength (b_i) regarding NMUPD in the intervention group (n= 179) and control group (n= 194)

					Absolute Number of Responses and Relative Frequencies (%)													
Behavioral Belief Strength (b_i)	**Intervention**		**Control**		**Strongly Disagree (1)**		**(2)**		**(3)**		**Neither disagree nor agree (4)**		**(5)**		**(6)**		**Strongly agree (7)**	
	Mean	**SD**	**Mean**	**SD**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**
Help me stay focused and improve my grades	2.5	1.8	2.7	1.8	73 (40.8)	73 (37.6)	44 (24.6)	39 (20.1)	4 (2.2)	16 (8.3)	25 (14.0)	26 (13.4)	20 (11.2)	24 (12.4)	8 (4.5)	11 (5.7)	5 (2.8)	5 (2.6)
Cause me physical health problems	5.6	1.5	5.4	1.6	5 (2.8)	9 (4.6)	2 (1.1)	6 (3.1)	9 (5.0)	6 (3.1)	25 (14.0)	19 (9.8)	29 (16.2)	41 (21.1)	49 (27.4)	56 (28.9)	60 (33.5)	57 (29.4)
Cause me mental health problems	5.3	1.6	5.2	1.7	7 (3.9)	10 (5.2)	7 (3.9)	9 (4.6)	10 (5.6)	9 (4.6)	25 (14.0)	26 (13.4)	31 (17.3)	44 (22.7)	49 (27.4)	48 (24.7)	50 (27.9)	48 (24.7)
Cause me to be addicted	5.3	1.7	5.3	1.7	12 (6.7)	11 (5.7)	7 (3.9)	10 (5.2)	4 (2.2)	8(4.1)	19 (10.6)	25 (12.9)	32 (17.9)	30 (15.5)	55 (30.7)	54 (27.8)	50 (27.9)	56 (28.9)
Get me arrested	5.0	1.8	4.9	1.8	10 (5.6)	15 (7.7)	10 (5.6)	10 (5.2)	12 (6.7)	13 (6.7)	35 (19.6)	34 (17.5)	29 (16.2)	39 (20.1)	38 (21.2)	37 (19.1)	45 (25.1)	46 (23.7)
Help me lose weight	2.9	1.7	3.1	1.6	53 (29.6)	40 (20.6)	39 (21.8)	40 (20.6)	10 (5.6)	23 (11.9)	44 (24.6)	54 (27.8)	21 (11.7)	24 (12.4)	11 (6.2)	10 (5.2)	1 (0.6)	3 (1.6)
Help me get high and party	3.2	2.0	3.3	1.8	51 (28.5)	49 (25.3)	33 (18.4)	34 (17.5)	8 (4.5)	8 (4.1)	35 (19.6)	50 (25.8)	22 (12.3)	28 (14.4)	20 (11.2)	17 (8.8)	10 (5.6)	8 (4.1)
Make me feel more socially accepted by my group	2.2	1.6	2.2	1.5	92 (51.4)	88 (45.4)	31 (17.3)	45 (23.2)	14 (7.8)	7 (3.6)	23 (12.9)	39 (20.1)	12 (6.7)	10 (5.2)	5 (2.8)	5 (2.6)	2 (1.1)	0 (0)

Note: "I" stands for intervention and "C" for control Note: Behavioral belief strength can range from 1 to 7. The question for these items was "Using prescription drugs for nonmedical purposes will:

In the combined sample, students rated two behavioral outcomes as good: stay focused and improve their grades (mean = 5.5, SD = 1.4, range 1 to 7) and losing weight (mean = 4.2, SD = 1.6, range 1 to 7). The remaining items were generally rated as bad, including having physical health problems (mean = 2.3, SD = 1.4, range 1 to 7), having mental health problems (mean = 2.1, SD = 1.4, range 1 to 7), developing addiction (mean = 1.8, SD = 1.3, range 1 to 7), getting arrested (mean = 1.8, SD = 1.6, range 1 to 7), getting high and to party (mean = 2.9, SD = 1.6, range 1 to 7), and being socially acceptable by group (mean = 3.7, SD = 1.7, range 1 to 7) (Table 23).

Table 23 Mean, SD, and relative frequency of students' behavioral outcome evaluations (e_i) in the overall sample (N=373)

			Absolute Number of Responses and Relative Frequencies (%)						
Behavioral Outcome evaluations (e_i)	**Mean**	**SD**	**Extremely bad (1)**	**(2)**	**(3)**	**Neutral (4)**	**(5)**	**(6)**	**Extreme good (7)**
Stay focused and improve my grades	5.5	1.4	14 (3.8)	13 (3.5)	17 (4.6)	43 (11.6)	52 (14.0)	116 (31.2)	117 (31.5)
Have physical health problems	2.3	1.4	147 (39.5)	110 (29.6)	37 (10.0)	51 (13.7)	11 (3.0)	11 (3.0)	5 (1.3)
Have mental health issues	2.1	1.4	170 (45.7)	102 (27.4)	24 (6.5)	55 (14.8)	8 (2.2)	8 (2.2)	5 (1.3)
Develop addiction	1.8	1.3	220 (59.1)	77 (20.7)	15 (4.0)	42 (11.3)	6 (1.6)	8 (2.2)	4 (1.1)
Get arrested	1.8	1.6	232 (62.4)	65 (17.5)	21 (5.7)	41 (11.0)	4 (1.1)	4 (1.1)	5 (1.3)
Lose weight	4.2	1.6	31 (8.3)	30 (8.1)	32 (8.6)	138 (37.1)	64 (17.2)	51 (13.7)	26 (7.0)
Get high and enhance my partying experience	2.9	1.6	111 (28.8)	55 (14.8)	40 (10.8)	109 (29.3)	42 (11.3)	11 (3.0)	4 (1.1)
Feel more socially accepted by my group	3.7	1.7	66 (17.7)	38 (10.2)	30 (8.1)	128 (34.4)	55 (14.8)	41 (11.0)	14 (3.8)

Note: Outcome evaluation can range from 1 to 7. The question for these items was "Generally speaking, how good or bad do you feel about the following outcomes?"

The same trend was observed in the intervention group. Students rated two behavioral outcomes as good: stay focused and improve their grades (mean = 5.4, SD = 1.7, range 1 to 7) and losing weight (mean = 4.1, SD = 1.6, range 1 to 7). The remaining items were generally rated as bad, including having physical health problems (mean = 2.1, SD = 1.3, range 1 to 7), having mental health problems (mean = 2.0, SD = 1.3, range 1 to 7), developing addiction (mean = 1.8, SD = 1.3, range 1 to 7), getting arrested (mean = 1.7, SD = 1.2, range 1 to 7), getting high and to party (mean = 2.8, SD = 1.6, range 1 to 7) and being socially acceptable by their group (mean = 3.5, SD = 1.8, range 1 to 7) (Table 24).

In addition, in the control group, students rated two behavioral outcomes as good: stay focused and improve their grades (mean = 5.5, SD = 1.5, range 1 to 7) and losing weight (mean = 4.2, SD = 1.5, range 1 to 7). The remaining items were generally rated as bad, including having physical health problems (mean = 2.4, SD = 1.5, range 1 to 7), having mental health problems (mean = 2.2 , SD = 1.5, range 1 to 7), developing addiction (mean = 1.9 , SD = 1.4, range 1 to 7) ,getting arrested (mean = 1.9 , SD = 1.4, range 1 to 7), getting high and to party (mean = 3.0, SD = 1.6, range 1 to 7), and being socially acceptable by their group (mean = 3.8, SD = 1.6, range 1 to 7) (Table 24).

Table 24 Mean, SD, and relative frequency of students' behavioral outcome evaluations (e_i) in the intervention (n=179) and control group (n =193)

					Absolute Number of Responses and Relative Frequencies (%)													
Behavioral Outcome evaluations (e_i)	**Intervention**		**Control**		**Extremely bad (1)**		**(2)**		**(3)**		**Neutral (4)**		**(5)**		**(6)**		**Extremely good (7)**	
	Mean	**SD**	**Mean**	**SD**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**
Stay focused and improve my grades	5.4	1.7	5.5	1.5	10 (5.6)	4 (2.1)	6 (3.4)	7 (3.6)	6 (3.4)	11 (5.7)	20 (11.2)	23 (11.9)	27 (15.1)	25 (13.0)	57 (31.8)	59 (30.1)	53 (29.6)	64 (33.2)
Have physical health problems	2.1	1.3	2.4	1.5	76 (42.5)	71 (36.8)	50 (27.9)	60 (31.1)	18 (10.1)	19 (9.8)	26 (14.5)	25 (13.0)	4 (2.2)	7 (3.6)	5 (2.8)	6 (3.1)	0 (0)	5 (2.6)
Have mental health issues	2.0	1.3	2.2	1.5	87 (48.6)	83 (43.0)	45 (25.1)	57 (29.5)	13 (7.3)	11 (5.7)	27 (15.1)	28 (14.5)	3 (1.7)	5 (2.6)	3 (1.7)	5 (2.6)	1 (0.6)	4 (2.1)
Develop addiction	1.8	1.3	1.9	1.4	107 (59.8)	113 (58.6)	35 (19.6)	42 (21.8)	8 (4.5)	7 (3.6)	23 (12.9)	19 (9.8)	2 (1.1)	4 (2.1)	3 (1.7)	5 (2.6)	1 (0.6)	3 (1.6)
Get arrested	1.7	1.2	1.9	1.4	117 (65.4)	115 (59.6)	30 (16.8)	35 (18.1)	9 (5.0)	12 (6.2)	19 (10.6)	22 (11.4)	1 (0.6)	3 (1.6)	1 (0.6)	3 (1.6)	2 (1.1)	3 (1.6)
Lose weight	4.1	1.6	4.2	1.5	19 (10.6)	12 (6.2)	13 (7.3)	17 (8.8)	15 (8.4)	17 (8.8)	65 (36.3)	73 (37.8)	31 (17.3)	33 (17.1)	24 (13.4)	27 (14.0)	12 (6.7)	14 (7.3)
Get high and enhance my partying experience	2.8	1.6	3.0	1.6	61 (34.1)	50 (25.9)	23 (12.9)	32 (16.6)	19 (10.6)	21 (10.9)	54 (30.2)	55 (28.5)	14 (7.8)	28 (14.5)	6 (3.4)	5 (2.6)	2 (1.1)	2 (1.0)
Feel more socially accepted by my group	3.5	1.8	3.8	1.6	40 (22.4)	26 (13.5)	18 (10.1)	20 (10.4)	15 (8.4)	15 (7.8)	55 (30.7)	73 (37.8)	25 (14.0)	30 (15.5)	20 (11.2)	21 (10.9)	6 (3.4)	8 (4.2)

Note: "I" stands for intervention and "C" for control. Note: Outcome evaluation can range from 1 to 7. The question for these items was "Generally speaking, how good or bad do you feel about the following outcomes?"

The behavioral strength and outcome evaluation products (b_ie_i) were generated after multiplying each behavioral belief strength with the corresponding attribute evaluation. The product (b_ie_i) mean for the overall sample (N = 372) was 10.9 (SD = 10.9, range 1 – 29), for the intervention group (N= 179) was 10.4 (SD = 4.8, range 1-29), and for the control group (N=193) was 11.4 (SD = 5.2, range 2.4 to 28.8) (Table 25). These numbers indicate that students generally have negative attitudes toward NMUPD.

Table 25 Behavioral belief strength and outcome evaluation product (belief-evaluation product) (b_ie_i) for the overall sample, Intervention and control groups

	Overall sample (b_ie_i)				**Intervention (b_ie_i)**				**Control (b_ie_i)**			
Behavioral belief	**N**	**Mean**	**SD**	**Range**	**N**	**Mean**	**SD**	**Range**	**N**	**Mean**	**SD**	**Range**
1.Stay focused and improve my grades	372	14.6	11.3	1 - 49	179	14.0	11.0	1 - 49	193	15.2	11.6	1 - 49
2.Have physical health problems	372	11.9	8.5	1 - 49	179	11.5	7.6	1 - 42	193	12.3	9.2	1 - 49
3.Have mental health issues	372	10.7	8.2	1 - 49	179	10.5	7.7	1 - 49	193	11.0	8.8	1 - 49
4.Develop addiction	372	9.6	8.1	1 - 49	179	9.4	7.3	1 - 49	193	9.7	8.8	1 - 49
5.Get arrested	372	8.6	7.2	1 - 49	179	8.2	6.4	1 - 49	193	8.9	8.0	1 - 49
6.Lose weight	372	12.8	9.3	1- 42	179	12.1	9.3	1- 42	193	13.5	9.3	1- 42
7.Get high and enhance my partying experience	372	10.6	9.4	1 - 49	179	9.9	9.1	1 - 42	193	11.2	9.6	1 - 49
8.Feel more socially accepted by my group	372	8.7	7.7	1-36	179	8.2	7.7	1-36	193	9.1	7.7	1-36
Overall mean	372	10.9	5.1	1-29	179	10.4	4.8	1-29	193	11.4	5.2	2.4-28.8

Note: Belief strength and outcome evaluation can range from 1 to 7, and the possible range for the belief-evaluation product (b_ie_i) is 1 to 49

Perceived Norms

The direct measures of perceived norms were evaluated using four items (range: -3 to +3). The first two items represented injunctive norms and the second two items descriptive norms. The average perceived norm score across these four items in the overall sample was 1.8 (SD=1.2) (Table 26), in the intervention group was 1.5 (SD=1.5); and in the control group was 1.2 (SD = 1.6) (Table 27).

In the overall sample, 319 (81.6%) students believed that important people to them think that they should not use prescription drugs for nonmedical reasons (mean = 2.1, SD = 1.3, range +3 to -3, and 314 (80.3%) believed that people whose opinion they valued would not approve their NMUPD (mean = 2.0, SD = 1.4). A total of 296 respondents (75.7%) agreed that people whom they respect and admire do not use prescription drugs for nonmedical reasons (mean = 1.9, SD = 1.4 and 254 (65%) agreed that people like them do not use prescription drugs for nonmedical reasons (mean = 1.3, SD = 1.6) (Table 26).

Table 26 Mean, SD, and relative frequency of direct measures of perceived norms in the overall sample (N= 364)

			Absolute Number of Responses and Relative Frequencies (%)						
	Mean	**SD**	**Strongly Disagree (-3)**	**(-2)**	**(-3)**	**Neither disagree nor agree (0)**	**(1)**	**(2)**	**Strongly agree (3)**
1.Most people who are important to me think I should NOT use medications for nonmedical purposes	2.1	1.3	6 (1.7)	5 (1.4)	7 (1.9)	27 (7.4)	45 (12.4)	77 (21.2)	197 (54.1)
2. Most people whose opinions I value would NOT approve my using of medications for nonmedical purposes:	2.0	1.4	5 (1.4)	9 (2.5)	14 (3.9)	22 (6.0)	46 (12.6)	78 (21.4)	190 (52.2)
3. Most people whom I respect and admire DO NOT use medications for nonmedical purposes:	1.9	1.4	5 (1.4)	5 (1.4)	16 (4.4)	42 (11.5)	33 (9.1)	75 (20.6)	188 (51.7)
4. Most people, like me, DO NOT use medications for nonmedical purposes	1.3	1.6	9 (2.5)	12 (3.3)	27 (7.4)	62 (17.0)	52 (14.3)	93 (25.6)	109 (30.0)
Mean perceived norm	1.8	1.2							

Note: The first two items reflect injunctive norms and the next 2 items reflect descriptive norms. Possible range is from -3 to +3

In the intervention group, 157 (83.5) students believed that important people to them think that they should not use prescription drugs for nonmedical reasons (mean = 2.2, SD=1.3) and 151 (80.3%) believed that people whose opinion they valued would not approve their NMUPD (mean = 2.0, SD = 1.4). A total of 147 (78.2%) agreed that people whom they respect and admire do not use prescription drugs for nonmedical reasons (mean = 2.1, SD =1.3) and 128 (68.1%) agreed that people like them do not use prescription drugs for nonmedical reasons (mean = 1.5, SD = 1.5) (Table 27).

In the control group, 162 (79.8%) students believed that important people to them think that they should not use prescription drugs for nonmedical reasons (mean = 2.0, SD=1.4) and 163 (80.3%) believed that people whose opinion they valued would not approve their NMUPD (mean = 1.9, SD = 1.4). A total of 149 (73.4%) agreed that people whom they respect and admire do not use prescription drugs for nonmedical reasons (mean = 1.8, SD = 1.5) and 126 (62.1%) agreed that people like them do not use prescription drugs for nonmedical reasons (mean = 1.2, SD = 1.6) (Table 27)

Table 27 Mean, SD, and relative frequency of direct measures of perceived norms in the intervention (n = 175) and control groups (n = 189).

					Absolute Number of Responses and Relative Frequencies (%)													
	Intervention		Control		Strongly Disagree (-3)		(-2)		(-1)		Neither disagree nor agree (0)		(1)		(2)		Strongly agree (3)	
	Mean	SD	Mean	SD	I	C	I	C	I	C	I	C	I	C	I	C	I	C
1.Most people who are important to me think I should NOT use medications for nonmedical purposes	2.2	1.3	2	1.4	4 (2.3)	2 (1.1)	0 (0)	5 (2.7)	4 (2.3)	3 (1.6)	10 (5.7)	17 (9.0)	21 (12.0)	24 (12.7)	36 (20.6)	41 (21.7)	100 (57.1)	97 (51.3)
2. Most people whose opinions I value would NOT approve my using of medications for nonmedical purposes	2.0	1.4	1.9	1.4	3 (1.7)	2 (1.1)	3 (1.7)	6 (3.2)	7 (4.0)	7 (3.7)	11 (6.3)	11 (5.8)	18 (10.3)	28 (14.8)	37 (21.1)	41 (21.7)	96 (54.9)	94 (49.7)
3. Most people whom I respect and admire DO NOT use medications for nonmedical purposes	2.1	1.3	1.8	1.5	2 (1.1)	3 (1.6)	0 (0)	5 (2.7)	8 (4.6)	8 (4.2)	18 (10.3)	24 (12.7)	15 (8.6)	18 (9.5)	36 (20.6)	39 (20.6)	96 (54.9)	92 (48.7)
4. Most people, like me, DO NOT use medications for nonmedical purposes	1.5	1.5	1.2	1.6	3 (1.7)	6 (3.2)	4 (2.3)	8 (4.2)	14 (8.00)	13 (6.9)	26 (14.9)	36 (19.1)	24 (13.7)	28 (14.8)	43 (24.6)	50 (26.5)	61 (34.9)	48 (25.4)
Mean perceived norm score	1.5	1.5	1.2	1.6														

Note: “I” stands for intervention and “C” for control. Possible range from -3 to +3

Perceived norms were also assessed through normative beliefs and motivation to comply using four items each. Normative belief strengths were assessed on a scale ranging from -3 to +3, and motivation to comply on a scale ranging from 1 to 7.

In the overall sample (N= 301), 82.6 % of students agreed that their HCPs would not approve their NMUPD (mean = 2.3, SD = 1.5, range: -3 to +3). The majority also agreed that their family members (82.6%, mean = 2.2, SD = 1.5, range: -3 to +3), partners (66.2%, mean = 1.6, SD = 1.8, range: -3 to +3), and close friends (67.3%, mean = 1.48, SD = 1.8, range: -3 to +3) would not approve their NMUPD (Table 28).

Table 28 Mean, SD, and relative frequency of normative belief strength (n_i) in the overall sample (N= 364)

			Absolute Number of Responses and Relative Frequencies (%)						
Normative Referent	**Mean**	**SD**	**Extremely unlikely (-3)**	**(-2)**	**(-1)**	**Neutral (0)**	**(+1)**	**(+2)**	**Extremely likely (+3)**
Partner (spouse, girlfriend, or boyfriend)	1.6	1.7	11 (3.0)	17 (4.7)	16 (4.4)	61 (16.8)	31 (8.5)	57 (15.7)	171 (47.0)
Close friends	1.4	1.8	18 (5.0)	20 (5.5)	23 (6.3)	40 (11.0)	54 (14.8)	69 (19)	140 (38.5)
Doctor, nurse or pharmacist	2.3	1.5	17 (4.7)	4 (1.1)	2 (0.6)	18 (5.0)	15 (4.1)	47 (12.9)	261 (71.7)
Family members	2.2	1.5	16 (4.4)	4 (1.1)	7 (1.9)	14 (3.9)	29 (8.0)	46 (12.6)	248 (68.1)

Note: Possible range for the normative belief strength is from -3 to +3. The question was "How likely would each of the following individuals ***disapprove*** your use of prescription drugs for nonmedical purposes?"

In the intervention group (N= 175), 83.5% of students agreed that their HCP would not approve their NMUPD (mean = 2.3, SD= 1.6, range: -3 to +3). The majority also agreed that their family members (81.4%, mean = 2.1, SD = 1.7, range: -3 to +3), partners (66.5%, mean = 1.6, SD = 1.7, range: -3 to +3), and close friends (69.2%, mean = 1.5, SD = 1.8, range: -3 to +3) would not approve their NMUPD (Table 29).

In the control group (n=189), 82.0% of students agreed that their HCP would not approve their NMUPD (mean = 2.3, SD= 1.4, range: -3 to +3). The majority also agreed that their family members (83.7%, mean = 2.3, SD = 1.4, range: -3 to +3), partners (66.0%, mean = 1.5, SD = 1.7, range: -3 to +3), and close friends (65.5%, mean = 1.2, SD = 1.8, range: -3 to +3) would not approve their NMUPD (Table 29).

Table 29 Mean, SD, and relative frequency of normative belief strength (n_i) in the intervention (n = 175) and control group (n =189)

					Absolute Number of Responses and Relative Frequencies (%)													
Normative Referent	**Intervention**		**Control**		**Extremely unlikely (-3)**		**(-2)**		**(-1)**		**Neutral (0)**		**(+1)**		**(+2)**		**Extremely likely (+3)**	
	Mean	**SD**	**Mean**	**SD**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**
Partner (spouse, girlfriend, or boyfriend)	1.6	1.7	1.5	1.7	6 (3.4)	5 (2.7)	7 (4.0)	10 (5.3)	7 (4.0)	9 (4.8)	30 (17.1)	31 (16.4)	14 (8.0)	17 (9.0)	25 (14.3)	32 (16.9)	86 (49.1)	85 (45.0)
Close friends	1.5	1.8	1.2	1.8	7 (4.0)	11 (5.8)	10 (5.7)	10 (5.3)	10 (5.7)	13 (6.9)	18 (10.3)	22 (11.6)	24 (13.7)	30 (15.9)	30 (17.1)	39 (20.6)	76 (43.4)	64 (33.9)
Doctor, nurse or pharmacist	2.3	1.6	2.3	1.5	9 (5.1)	8 (4.2)	3 (1.7)	1 (0.5)	2 (1.1)	0 (0)	4 (2.3)	14 (7.4)	7 (4.0)	8 (4.2)	20 (11.4)	27 (14.3)	130 (74.3)	131 (69.3)
Family members	2.1	1.7	2.3	1.4	10 (5.7)	6 (3.1)	3 (1.7)	1 (0.5)	5 (2.9)	2 (1.1)	4 (2.3)	10 (5.3)	11 (6.3)	18 (9.5)	28 (16.0)	18 (9.5)	114 (65.1)	134 (70.9)

Note: Possible range for the normative belief strength is from -3 to +3. The question was "How likely would each of the following individuals ***disapprove*** your use of prescription drugs for nonmedical purposes?"

In the overall sample (N = 364), when it comes to matters of health, students were more likely to follow their HCPs' recommendations (mean = 6.0, SD = 1.2, range: 1 to 7) followed by the recommendations of their family members (mean = 5.3, SD = 1.5, range : 1 to 7), partners (mean = 5.2 , SD = 1.4, range: 1 to 7), and lastly friends (mean = 4.8 , SD = 1.3, range: 1 to 7) (Table 30). The same trend was observed in the intervention and control groups. Details are presented in Table 31.

Table 30 Mean, SD, and relative frequency of motivation to comply (m_i) in the overall sample (N= 364)

			Absolute Number of Responses and Relative Frequencies (%)						
Motivation to comply with:	**Mean**	**SD**	**Extremely unlikely (1)**	**(2)**	**(3)**	**Neutral (4)**	**(5)**	**(6)**	**Extremely likely (7)**
Partner (spouse, girlfriend, or boyfriend)	5.2	1.4	10 (2.8)	7 (1.9)	11 (3.0)	77 (21.2)	90 (24.7)	99 (27.3)	70 (19.2)
Close friends	4.8	1.3	7 (1.9)	22 (6.0)	21 (5.8)	76 (20.9)	133 (39.5)	73 (20.1)	32 (8.8)
Doctor, nurse or pharmacist	6.0	1.2	5 (1.4)	3 (0.8)	6 (1.7)	26 (7.1)	54 (14.8)	113 (31.0)	157 (43.1)
Family members	5.3	1.5	12 (3.3)	14 (3.9)	12 (3.3)	49 (13.5)	94 (25.8)	111 (30.5)	72 (19.8)

Note: Possible range for motivation to comply is from 1 to 7. The question for these items was "When it comes to matters of health, how likely are you to do what the following individuals recommend?"

Table 31 Mean, SD, and relative frequency of the motivation to comply (m_i) in the intervention (n = 175) and control group (n = 189)

Motivation to comply with:	Intervention		Control		Absolute Number of Responses and Relative Frequencies (%)													
					Extremely unlikely (-3)		(-2)		(-1)		Neutral (0)		(+1)		(+2)		Extremely likely (+3)	
	Mean	**SD**	**Mean**	**SD**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**
Partner (spouse, girlfriend, or boyfriend)	5.2	1.4	5.2	1.4	6 (3.4)	4 (2.2)	1 (0.6)	6 (3.2)	5 (2.9)	6 (3.2)	39 (22.3)	38 (20.1)	42 (24.0)	48 (25.4)	53 (30.3)	46 (24.3)	29 (16.6)	41 (21.7)
Close friends	4.7	1.3	4.7	1.4	3 (1.7)	4 (2.2)	9 (5.1)	13 (6.9)	10 (5.7)	11 (5.8)	36 (20.6)	40 (21.2)	63 (36.0)	70 (37.0)	37 (21.1)	36 (19.1)	17 (9.7)	15 (7.9)
Doctor, nurse or pharmacist	6.1	1.2	5.9	1.2	2 (1.1)	3 (1.6)	1 (0.6)	2 (1.1)	4 (2.3)	2 (1.1)	10 (5.7)	16 (8.5)	24 (13.7)	30 (15.9)	52 (29.7)	61 (32.3)	82 (49.9)	75 (39.7)
Family members	5.3	1.4	5.2	1.5	5 (2.9)	7 (3.7)	6 (3.4)	8 (4.2)	3 (1.7)	9 (4.8)	25 (14.3)	24 (12.7)	46 (26.3)	48 (25.4)	55 (31.4)	56 (29.6)	35 (20.0)	37 (19.6)

Note: Possible range for motivation to comply is from 1 to 7. The question for these items was “When it comes to matters of health, how likely are you to do what the following individuals recommend?”

The products of normative belief by motivation to comply ($n_i m_i$) were generated for all the normative referents in the overall sample; intervention; and control groups (Table 32). The overall mean of $n_i m_i$ product for the combined sample was 10.7 (SD = 7.7, range = -21 to 21), for intervention group was 10.9 (SD = 8.1, range = -21 to 21), and for control group was 10.4 (SD = 7.4, range = -17.3 to 21).

These results indicated that students felt that their referents would not favor their nonmedical use of prescription drugs. The highest influence was observed for HCPs (mean = 14.2, SD = 9.2), followed by family members (mean=12.2, SD = 8.5), partners (mean = 9.1, SD = 9.6) and lastly by friends (mean = 7.1, SD =9.3). The same pattern was also observed in the intervention and control groups (Table 32).

Table 32 Normative belief strengths (*n_i*) and motivation to comply (*mi*) product (*n_im_i*) for the overall sample, the intervention and control groups.

	Overall sample (*n_im_i*)				**Intervention (*n_im_i*)**				**Control (*n_im_i*)**			
Normative referent	**N**	**Mean**	**SD**	**Range**	**N**	**Mean**	**SD**	**Range**	**N**	**Mean**	**SD**	1 - 49
Partner (spouse, girlfriend, or boyfriend)	364	9.1	9.6	-21 to +21	175	9.2	9.5	-21 to +21	189	8.9	9.7	-21 to +21
Close friends	364	7.1	9.2	21 to +21	175	7.9	9.4	21 to +21	189	6.4	9.1	-15 to 21
Doctor, nurse or pharmacist	364	14.2	9.2	21 to +21	175	14.6	9.4	21 to +21	189	14.0	9.0	-21 to +21
Family members	364	12.2	8.4	21 to +21	175	12.0	9.0	21 to +21	189	12.4	8.0	-18 to 21
Overall mean	364	10.7	7.7	21 to +21	175	10.9	8.1	21 to +21	189	10.4	7.4	-17.3 to 21

Note: Possible range for normative belief strength is -3 to +3, and for the motivation to comply is 1 to 7

Perceived Behavioral Control

Perceived behavioral control was measured directly using two questions (range from -3 to +3). In the combined sample, most of the students (88.8%, n = 391) agreed that it was completely up to them whether they used medications for nonmedical purposes (mean = 2.6, SD = 0.9). Also, most students (89.0%, n = 391) considered using medications for nonmedical reasons over the next three months to be under their control (mean = 2.6, SD = 0.9). The aggregate mean from these two items was 2.6 (SD = 0.8), reflecting that, overall, students have high control over using prescription drugs for nonmedical reasons (Table 33). The same trend was also observed in the intervention and control groups (Table 34).

Table 33 Mean, SD, and relative frequency of direct measures of perceived behavioral control in the overall sample (N= 361)

			Absolute Number of Responses and Relative Frequencies (%)						
	Mean	**SD**	**Strongly Disagree (-3)**	**(-2)**	**(-1)**	**Neither disagree nor agree (0)**	**(1)**	**(2)**	**Strongly agree (3)**
It is completely up to me whether or not I use medications for nonmedical purposes over the next 3 months:	2.6	0.9	3 (0.8)	2 (0.6)	2 (0.6)	7 (1.9)	14 (3.9)	66 (18.3)	267 (74.0)
For me, using medications for nonmedical reasons over the next 3 months is under my control:	2.6	0.9	4 (1.1)	0 (0)	0 (0)	9 (2.5)	7 (1.9)	67 (18.6)	274 (75.9)
Mean PBC score	2.6	0.8							

Note: PBC means Perceived Behavioral Control. The possible range is -3 to +3

Table 34 Mean, SD, and relative frequency of direct measures of perceived behavioral control in the intervention (n = 171) and control group (n= 187)

					Absolute Number of Responses and Relative Frequencies (%)													
	Intervention		**Control**		**Strongly Disagree (-3)**		**(-2)**		**(-1)**		**Neither disagree nor agree (0)**		**(1)**		**(2)**		**Strongly agree (3)**	
	Mean	**SD**	**Mean**	**SD**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**
It is completely up to me whether or not I use medications for nonmedical purposes over the next 3 months	2.6	1.0	2.6	0.9	2 (1.2)	1 (0.5)	2 (21.2)	0 (0)	1 (0.6)	1 (0.5)	2 (1.2)	5 (2.7)	3 (1.7)	11 (5.6)	33 (19.0)	33 (17.7)	131 (75.3)	136 (71.7)
For me, using medications for nonmedical reasons over the next 3 months is under my control	2.7	0.9	2.6	0.8	3 (1.7)	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1.7)	6 (3.2)	1 (0.6)	6 (3.2)	30 (17.2)	37 (19.8)	137 (78.7)	137 (73.3)
Mean PBC score	2.6	0.8	2.6	0.8														

Note: PBC: Perceived Behavioral Control. Possible range -3 to +3

Perceived behavioral control was also measured through control beliefs. Eight control beliefs were assessed by measuring control belief strengths (c_i) and power (p_i), in a range from 1 to 7.

In the combined sample, students believed that they have control over having a legitimate prescription for the medication (mean = 5.5, SD=1.6), having health insurance (mean = 5.5, SD=1.5), facing stressful personal situation (mean = 5.5, SD= 1.6), getting behind in schoolwork (mean = 5.8, SD= 1.3), and being a member of social/fraternity groups (mean = 5.5, SD= 1.6). However, on average, students felt that they had lesser control over having easy access to prescription medications (mean = 4.8, SD=1.8), over having a friend with a prescription for medication (mean = 4.2, SD = 2.0), and over being offered a prescription medication (mean = 4.6, SD = 1.9 (Table 35).

Table 35 Mean, SD, and Relative Frequency of control belief strength (c_i) in the overall sample (N= 361)

			Absolute Number of Responses and Relative Frequencies (%)						
Control belief	**Mean**	**SD**	**No control (1)**	**(2)**	**(3)**	**Neither no control nor complete control (4)**	**(5)**	**(6)**	**Complete control (7)**
Having a legitimate prescription for the medication	5.5	1.6	12 (3.3)	11 (3.1)	23 (6.4)	39 (10.8)	65 (18.0)	77 (21.3)	134 (37.1)
Having a friend with a prescription for the medication	4.2	2.0	38 (10.5)	52 (14.4)	35 (9.7)	84 (23.3)	46 (12.7)	37 (10.3)	69 (19.1)
Having easy access to prescription medications	4.8	1.8	19 (5.3)	38 (10.5)	27 (7.5)	69 (19.1)	64 (17.7)	58 (16.1)	86 (23.8)
Being offered a prescription medication by a friend or a family member	4.6	1.9	30 (8.3)	35 (9.7)	40 (11.1)	65 (18.0)	50 (13.9)	58 (16.1)	83 (23.0)
Having a health insurance	5.5	1.5	9 (2.5)	7 (2.0)	12 (3.3)	69 (19.1)	60 (16.6)	93 (25.8)	111 (30.8)
Getting behind in school work	5.8	1.3	3 (0.8)	3 (0.8)	12 (3.3)	43 (11.9)	60 (16.6)	112 (31.2)	128 (35.5)
Facing a stressful personal situation	5.0	1.6	17 (4.7)	10 (2.8)	39 (10.8)	50 (13.9)	97 (26.9)	64 (17.7)	84 (23.3)
Being a member of social fraternity/ sorority group	5.5	1.6	12 (3.3)	7 (1.9)	3 (0.8)	101 (28.0)	31 (8.6)	66 (18.3)	141 (39.1)

Note: Possible range for control belief strength is 1 to 7. The question for these items was “How much control do you feel you have over the following factors”.

In the intervention group, students had a mean perceived behavioral control of 2.6 (SD = 0.8) (Table 34). They believed that they had control over having a legitimate prescription for the medication (mean = 5.5, SD = 1.6), having health insurance (mean = 5.5, SD = 1.5), facing stressful personal situation (mean = 5.1, SD = 1.7), getting behind in schoolwork (mean = 5.8, SD = 1.2), and being a member of social/fraternity groups (mean = 5.6, SD = 1.6). However, on average, students felt that they had lesser control over having easy access to prescription medications (mean = 4.9, SD = 1.8), over having a friend with a prescription for medication (mean = 4.3, SD = 2.1), and over being offered a prescription medication (mean = 4.6, SD = 2.0) (Table 36).

In the control group, students have a mean perceived behavioral control of 2.6 (SD = 0.8) (Table 34). Students believed that they have control over having a legitimate prescription for the medication (mean = 5.4, SD = 1.6), having health insurance (mean = 5.4, SD = 1.4), facing stressful personal situation (mean = 5.0, SD = 1.5), getting behind in schoolwork (mean = 5.7, SD = 1.3), and being a member of social/fraternity groups (mean = 5.4, SD = 1.6). However, on average, students felt that they have lesser control over having easy access to prescription medications (mean = 4.7, SD = 1.8), over having a friend with a prescription for medication (mean = 4.1, SD = 1.9), and over being offered a prescription medication (mean = 4.6, SD = 1.9) (Table 36).

Table 36 Mean, SD, and Relative Frequency of control belief strength (c_i) in the intervention (n= 174) and control groups (n= 187)

					Absolute Number of Responses and Relative Frequencies (%)													
Control belief	**Intervention**		**Control**		**No control (1)**		**(2)**		**(3)**		**Neither no control nor complete control (4)**		**(5)**		**(6)**		**Complete control (7)**	
	Mean	**SD**	**Mean**	**SD**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**	**I**	**C**
Having a legitimate prescription for the medication	5.5	1.6	5.4	1.6	6 (3.5)	6 (3.2)	7 (4.0)	4 (2.1)	10 (5.8)	13 (7.0)	13 (7.5)	26 (13.9)	32 (18.4)	33 (17.7)	39 (22.4)	38 (20.3)	67 (38.5)	67 (35.8)
Having a friend with a prescription for the medication:	4.3	2.1	4.1	1.9	22 (12.6)	16 (8.6)	23 (13.2)	29 (15.5)	17 (10.0)	18 (9.6)	31 (17.8)	53 (28.3)	25 (14.4)	21 (11.2)	18 (10.3)	19 (10.2)	38 (21.8)	31 (16.6)
Having easy access to prescription medications	4.9	1.8	4.7	1.8	7 (4.0)	12 (6.4)	18 (10.3)	20 (10.7)	14 (8.1)	13 (7.0)	31 (17.8)	38 (20.3)	29 (16.7)	35 (18.7)	29 (16.7)	29 (15.5)	46 (26.4)	40 (21.4)
Being offered a prescription medication by a friend or a family member	4.6	2.0	4.6	1.9	16 (9.2)	14 (7.5)	17 (9.8)	18 (9.6)	18 (10.3)	22 (11.8)	25 (14.4)	40 (21.4)	27 (15.5)	23 (12.3)	28 (16.1)	30 (16.0)	43 (24.7)	40 (21.4)
Having a health insurance	5.5	1.5	5.4	1.4	5 (2.9)	4 (2.1)	4 (2.3)	3 (1.6)	7 (4.0)	5 (2.7)	27 (15.5)	42 (22.5)	31 (17.8)	29 (15.5)	38 (21.8)	55 (29.4)	62 (35.6)	49 (26.2)
Getting behind in school work	5.8	1.2	5.7	1.3	2 (1.2)	1 (0.5)	1 (0.6)	2 (1.1)	4 (2.3)	8 (4.3)	17 (9.8)	26 (13.9)	29 (16.7)	31 (16.6)	60 (34.5)	52 (27.8)	61 (35.1)	67 (35.8)
Facing a stressful personal situation	5.1	1.7	5.0	1.5	12 (6.9)	5 (2.7)	3 (1.7)	7 (3.7)	19 (10.9)	20 (10.7)	19 (10.9)	31 (16.6)	42 (24.1)	55 (29.4)	35 (20.1)	29 (15.5)	44 (25.3)	40 (21.4)
Being a member of social fraternity/ sorority group	5.6	1.6	5.4	1.6	5 (2.9)	7 (3.7)	4 (2.3)	3 (1.6)	1 (0.6)	2 (1.1)	42 (24.1)	59 (31.6)	15 (8.6)	16 (8.6)	34 (19.5)	32 (17.1)	7 (42.0)	68 (36.4)

In the overall sample, students believed that the following factors would make it easy for them to use prescription drugs for nonmedical reasons: having a legitimate prescription for the medication (mean = 5.6, SD = 1.5), having a friend with a prescription medication (mean = 5.2, SD = 1.4), having easy access, (mean = 5.7, SD = 1.3) and being offered a prescription medication (mean = 5.6, SD= 1.3). However, the following factors would only make it slightly easier to use prescription drugs for nonmedical reasons: having health insurance (mean = 4.4, SD = 1.2), facing a stressful situation (mean = 4.7, SD = 1.3), getting behind in schoolwork (mean = 4.4, SD = 1.3), and being a member of fraternity/sorority groups (mean = 4.6, SD =1.5) (Table 37).

Table 37 Mean, SD, and Relative Frequency of control belief power (p_i) in the overall sample (N = 361)

			Absolute Number of Responses and Relative Frequencies (%)						
Control belief	**Mean**	**SD**	**Extremely Difficult (1)**	**(2)**	**(3)**	**Neither difficult nor easy (4)**	**(5)**	**(6)**	**Extremely Easy (7)**
Having a legitimate prescription for the medication	5.6	1.5	11 (3.1)	8 (2.2)	16 (4.4)	40 (11.1)	52 (14.1)	102 (28.3)	132 (36.6)
Having a friend with a prescription for the medication	5.2	1.4	7 (1.9)	7 (1.9)	14 (3.9)	50 (13.9)	118 (32.7)	121 (33.5)	44 (12.2)
Having easy access to prescription medications	5.7	1.3	6 (1.7)	10 (2.8)	4 (1.1)	35 (9.7)	72 (19.9)	136 (37.7)	98 (27.2)
Being offered a prescription medication by a friend or a family member	5.6	1.3	5 (1.4)	12 (3.3)	12 (3.3)	36 (10.0)	59 (16.3)	14 (40.7)	90 (24.9)
Having a health insurance	4.4	1.2	8 (2.2)	13 (3.6)	36 (10.0)	162 (44.9)	71 (19.7)	52 (14.4)	19 (5.3)
Getting behind in school work	4.4	1.3	12 (3.3)	18 (5.0)	30 (8.3)	153 (42.4)	80 (22.2)	44 (12.2)	24 (6.7)
Facing a stressful personal situation	4.7	1.3	12 (3.3)	13 (3.6)	25 (6.9)	105 (29.1)	104 (28.8)	77 (21.3)	25 (6.9)
Being a member of social fraternity/ sorority group	4.6	1.5	18 (5.0)	14 (3.9)	15 (4.2)	147 (40.7)	73 (20.2)	53 (14.7)	41 (11.4)

Note: Possible range for control belief power is 1 to 7. The question for these items was “How do you think the following factors make using medications for nonmedical purposes easy or difficult?”

In the intervention, students believed that the following factors would make it easy for them to use prescription drugs for nonmedical reasons: having a legitimate prescription for the medication (mean = 5.7, SD = 1.6), having a friend with a prescription medication (mean = 5.3, SD = 1.3), having easy access (mean = 5.8, SD =1.3), and being offered a prescription medication (mean = 5.7, SD = 1.3). However, the following factors would only make it slightly easier to use prescription drugs for nonmedical reasons: having health insurance (mean = 4.3, SD = 1.3), facing a stressful situation (mean = 4.6, SD = 1.4), getting behind in schoolwork (mean = 4.3, SD =1.4), and being a member of fraternity/sorority groups (mean = 4.6, SD = 1.5) (Table 38).

In the control group, students believed that the following factors would make it easy for them to use prescription drugs for nonmedical reasons: having a legitimate prescription for the medication (mean = 5.6, SD = 1.5), having a friend with a prescription medication (mean = 5.4, SD = 1.2), having easy access, (mean = 5.6, SD = 1.3), and being offered a prescription medication (mean = 5.5, SD = 1.4). However, the following factors would only make it slightly easier to use prescription drugs for nonmedical reasons: Having health insurance (mean = 4.2, SD = 1.2), facing a stressful situation (mean = 4.7, SD = 1.3), getting behind in schoolwork (mean = 4.5, SD = 1.3), and being a member of fraternity/sorority groups (mean = 4.6, SD = 1.4) (Table 38).

Table 38 Mean, SD, and Relative Frequency of control belief power (p_i) in the intervention (n = 174) and control group (n= 187)

Control belief	Intervention		Control		Absolute Number of Responses and Relative Frequency (%)													
					Extremely Difficult (1)		(2)		(3)		Neither difficult nor easy (4)		(5)		(6)		Extremely Easy (7)	
	Mean	SD	Mean	SD	I	C	I	C	I	C	I	C	I	C	I	C	I	C
Having a legitimate prescription for the medication	5.7	1.6	5.6	1.5	8 (4.6)	3 (1.6)	2 (1.2)	6 (3.2)	8 (4.6)	8 (4.3)	16 (9.2)	24 (12.8)	22 (12.6)	30 (16.0)	51 (29.3)	51 (27.3)	67 (38.5)	65 (34.8)
Having a friend with a prescription for the medication:	5.3	1.3	5.4	1.2	3 (1.7)	4 (2.1)	6 (3.5)	1 (0.5)	3 (1.7)	11 (5.9)	17 (9.8)	33 (17.7)	60 (34.5)	58 (31.0)	59 (33.9)	62 (33.2)	26 (15.0)	18 (9.6)
Having easy access to prescription medications	5.8	1.3	5.6	1.3	3 (1.7)	3 (1.6)	6 (3.5)	6 (3.2)	3 (1.7)	2 (1.1)	17 (9.8)	19 (10.2)	60 (34.5)	43 (23.0)	59 (33.9)	71 (38.0)	26 (14.9)	43 (23.0)
Being offered a prescription medication by a friend or a family member	5.7	1.3	5.5	1.4	2 (1.2)	3 (1.6)	5 (2.9)	7 (3.7)	4 (2.3)	8 (4.3)	18 (10.3)	18 (9.6)	24 (13.8)	35 (18.7)	73 (42.0)	74 (39.6)	48 (27.6)	42 (22.5)
Having a health insurance	4.3	1.3	4.5	1.2	5 (2.9)	3 (1.6)	6 (3.5)	7 (3.7)	21 (12.1)	15 (8.0)	77 (44.3)	85 (45.5)	31 (17.8)	40 (21.4)	24 (13.8)	28 (15.0)	10 (5.8)	9 (4.8)
Getting behind in school work	4.3	1.4	4.5	1.3	7 (4.0)	5 (2.7)	12 (6.9)	6 (3.2)	17 (9.8)	13 (7.0)	71 (40.8)	82 (43.9)	38 (21.8)	42 (22.5)	17 (9.8)	27 (14.1)	12 (6.9)	12 (6.4)
Facing a stressful personal situation	4.6	1.4	4.7	1.3	6 (3.5)	6 (3.2)	7 (4.0)	6 (3.2)	14 (8.1)	11 (5.9)	50 (28.7)	55 (29.4)	51 (29.3)	53 (28.3)	33 (19.0)	44 (23.5)	13 (7.5)	12 (6.49)
Being a member of social fraternity/ sorority group	4.6	1.5	4.6	1.4	9 (5.2)	9 (4.8)	7 (4.0)	7 (3.7)	8 (4.6)	7 (3.7)	69 (39.7)	78 (41.7)	36 (20.7)	37 (19. 8)	24 (13.8)	29 (15.5)	21 (12.1)	20 (10.7)

Note: Possible range for control belief power is 1 to 7. The question for these items was "How do you think the following factors make using medications for nonmedical purposes easy or difficult?"

The products of belief strength by power (c_ip_i) were generated for the intervention, control groups, as well as for the overall sample (Table 39). The overall mean of c_ip_i for the combined sample was 25.6 (SD = 7.8, range = 1 to 46), for the intervention group was 25.9 (SD = 8.1, range = 1 to 46), and for the control group was 25.2 (SD = 7.6, range = 6.3 to 43.8). These numbers indicated that students felt that they had moderate control regarding nonmedical use of prescription drugs. The highest perceived control was for having a legitimate prescription for the medication (mean = 31.2, SD = 13.2), followed by having easy access to prescription medication (mean = 27.1, SD = 12.6), being offered a prescription medication by a friend or a family member (mean = 25.7, SD = 13.0), getting behind in school work (mean = 25.3, SD = 9.7), and being a member of social fraternity/sorority groups (mean = 25.3, SD = 11.6). A similar trend was also observed in the intervention and control groups (Table 39).

Table 39 control belief strengths (c_i) and perceived power (pi) product (c_ip_i) for the overall sample, Intervention and control groups.

	Overall sample (c_ip_i)				Intervention (c_ip_i)				Control (c_ip_i)			
Control belief	**N**	**Mean**	**SD**	**Range**	**N**	**Mean**	**SD**	**Range**	**N**	**Mean**	**SD**	**Range**
Having a legitimate prescription for the medication	361	31.2	13.2	1 - 49	174	31.5	13.4	1 - 49	187	30.9	13.0	1 - 49
Having a friend with a prescription for the medication:	361	22.2	12.1	1 - 49	174	23.0	12.8	1 - 49	187	21.5	11.3	1 - 49
Having easy access to prescription medications	361	27.1	12.6	1 - 49	174	28.3	12.6	1 - 49	187	26.0	12.5	1 - 49
Being offered a prescription medication by a friend or a family member	361	25.7	13.0	1 - 49	174	26.6	13.4	1 - 49	187	24.9	12.5	1 - 49
Having a health insurance	361	24.3	10.2	1 - 49	174	24.3	10.4	1 - 49	187	24.3	10.1	1 - 49
Getting behind in school work	361	25.3	9.7	1 - 49	174	24.7	9.5	1 - 49	187	25.8	9.9	1 - 49
Facing a stressful personal situation	361	23.3	10.5	1 - 49	174	23.1	10.7	1 - 49	187	23.5	10.3	1 - 49
Being a member of social fraternity/ sorority group	361	25.3	11.6	1 - 49	174	25.9	11.5	1 - 49	187	24.8	11.7	1 - 49
Overall mean	361	25.6	7.8	1 - 46	174	25.9	8.1	1 - 46	187	25.2	7.6	6.3 – 43.8

Note: Possible range for both the control belief strengths and perceived power is 1 to 7

Correlations between Theoretical Constructs

Correlations were generated between intention and its predictors (direct and belief-based measures) (Table 40). The highest correlation coefficient was observed between perceived norms (direct measure) and intentions ($r = 0.545$, $p < 0.001$) followed by attitudes (direct measure) ($r = -0.502$, $p < 0.001$). Perceived behavioral control had the lowest significant correlation ($r = 0.186$, $p < 0.001$) with intentions to avoid NMUPD (Table 40).

Table 40 Correlations between intention and its predictors (attitude, perceived norms, and perceived behavioral control)

	Correlation with Intention (r)	P-value
Attitude		
Direct measure [a]	-0.502	<0.001
Belief-Based measure [b]	-0.240	<0.001
Perceived norms		
Direct measure [c]	0.545	<0.001
Belief-Based measure [d]	0.372	<0.001
Perceived behavioral control		
Direct measure	0.186	<.001
Belief-Based measure [e]	0.093	0.08

a) Based on semantic differential scale
b) Based on behavioral belief by evaluation products
c) Including both the descriptive and injunctive norms
d) Based on normative belief by motivation to comply products
e) Based on control belief strength by power products

Additionally, correlations were generated between the theory's belief-based measures and direct measures. The highest correlation coefficient was between the direct and belief-based measures of perceived norms ($r = 0.551$, $p < 0.001$) followed by the correlation between the direct and belief-based measures of attitudes (r = 0.346, $p < 0.001$) and finally between the direct and belief-based measures of perceived behavioral control (r = 0.203, $p < 0.001$) (Table 41).

Table 41 Correlations between direct and belief-based measures of attitude, perceived norms, and perceived behavioral control

	Attitude (Belief based measure)[b]	**Perceived norms(Belief-Based measure)[d]**	**Perceived behavioral control (Belief-based measure)[e]**
Attitude a (Direct measure)	0.346 ($p<0.001$)		
Perceived norms (Direct measure)[c]		0.545 ($p<0.001$)	
Perceived behavior control (Direct measure)			0.186 ($p<0.001$)

a) Based on semantic differential scale
b) Based on behavioral belief by evaluation products
c) Including both the descriptive and injunctive norms
d) Based on normative belief by motivation to comply products
e) Based on control belief strength by power products

Hypotheses Testing

In this section, hypotheses testing are summarized and presented. The statistical methods used to test the hypotheses included correlations, chi-square test, ANOVA, t-test, and multiple regression. Hypotheses number 1 to 7 were related to testing the effectiveness of the website, and hypotheses number 8 to 22 were related to testing the predictive utility of the reasoned action approach in understanding NMUPD. Finally, a summary of all the results from hypotheses testing is provided.

H01: No significant difference exists in college students' intention to avoid NMUPD between the intervention and control groups

As presented in Table 42, there is no significant difference (p=0.97) in the mean intentions' score between the intervention (mean = 2.2, SD = 1.4) and control groups (mean = 2.2, SD = 1.4). There are no significant differences in any of the three items that measured the intention. **$H_0$1** is supported.

Table 42 Difference in intention to avoid NMUPD between the intervention and control group

	Mean intention score (SD)			
Items	**Intervention**	**Control**	**t-value**	**P-value**
1. I intend to **AVOID** using prescription drugs for nonmedical purposes over the next 3 months.	2.3 (1.4)	2.3 (1.4)	-0.43	0.7
2. I am **NOT** willing to use prescription drugs for nonmedical purposes over the next 3 months.	1.9 (1.8)	2.0 (1.7)	0.29	0.8
3. I plan to **NOT** use prescription drugs for nonmedical purposes over the next 3 months.	2.3 (1.4)	2.3 (1.4)	-0.05	0.96
The average intention score	2.2 (1.4)	2.2 (1.4)	-0.04	0.97

$H_0$2: No significant difference exists in college students' attitudes toward NMUPD between the intervention and control groups

Students in the intervention and control groups, on average, rated NMUPD as irritating, unpleasant, unenjoyable, bad, harmful, and irresponsible (Table 43).

As can be seen from Table 43, there are statistically significant differences (t = 2.0, p = 0.04) in the mean attitude score between the intervention (mean = -1.4, SD = 1.4) and control groups (mean = -1.1, SD = 1.4).

Students in the intervention group considered NMUPD to be unpleasant (mean = -1.02, SD = 1.7), unenjoyable (mean = -1.04, SD = 1.7), bad (mean = -1.7, SD = 1.5) and significantly more negatively (p = 0.03, p = 0.007, and p = 0.036 respectively) than the control group (Table 43). Therefore, **$H_0$2** is not supported.

Table 43 Mean attitude score between the intervention and control groups

	Mean score (SD)			
Items	**Intervention**	**Control**	**t-value**	**P-value**
Irritating-Relaxing	-0.92 (1.7)	-0.65 (1.7)	1.49	0.14
Unpleasant-Pleasant	-1.02 (1.7)	-0.64 (1.7)	2.2	0.03*
Unenjoyable-Enjoyable	-1.04 (1.7)	-0.56 (1.7)	2.7	0.007*
Bad-Good	-1.7(1.5)	-1.3(1.7)	2.1	0.036*
Harmful-Not harmful	-1.9 (1.5)	-1.7 (1.4)	1.3	0.21
Irresponsible-Responsible	-1.9 (1.4)	-1.8 (1.4)	0.6	0.52
Overall mean attitude score	-1.4(1.4)	-1.1(1.4)	2.0	0.04*

$H_0$3: No significant difference exists in college students' perceived social norms of NMUPD between the intervention and control groups

T-test showed no significant differences in mean injunctive norms' score between the control (mean = 2.0 SD = 1.3) and intervention (mean = 2.1 SD = 1.3) groups (t = -0.95, p = 0.34) (Table 44).

The mean descriptive norms' score for the intervention group (mean = 1.8 SD = 1.3) group was higher than the control group (mean= 1.5, SD= 1.4). Such findings indicated that students in the intervention group have higher perceived descriptive norms that people like them do not use prescription drugs for nonmedical reasons. However, this difference was not statistically significant (t= -1.95, p = 0.052).

There was also no statistically significant difference in the overall mean perceived social norms between the control (mean = 1.7 SD = 1.2) and intervention (mean = 1.9 SD = 1.2) groups (t= -1.58, p = 0.11) (Table 44). **$H_0$3** is supported.

Table 44 Mean perceived norm score between the intervention and control group

	Mean score (SD)			
Items	**Intervention**	**Control**	**t-value**	**P-value**
1. Most people who are important to me think I should NOT use medications for nonmedical purposes	2.2(1.3)	2.0(1.4)	-1.1	0.26
2. Most people whose opinions I value would NOT approve my using of medications for nonmedical purposes	2.0 (1.4)	1.9(1.4)	-0.7	0.48
Overall mean injunctive norms score	2.1(1.3)	2.0(1.3)	-0.95	0.34
3. Most people whom I respect and admire DO NOT use medications for nonmedical purposes:	2.1(1.3)	1.8(1.5)	-1.6	0.11
4. Most people, like me, DO NOT use medications for nonmedical purposes	1.5(1.5)	1.2(1.6)	-1.9	0.065
Overall mean descriptive norms score	1.8(1.3)	1.5(1.4)	-1.95	0.052
Overall mean perceived social norms score	1.9(1.2)	1.7(1.2)	-1.6	0.11

Injunctive norms score: the average score for the first 2 items. Descriptive norms score: the average score for items 3 and 4. The overall perceived social norms score is the average score from the 4 items.

$H_0$4: No significant difference exists in college students' perceived behavioral control of NMUPD between the intervention and control groups

The t-test showed that there were no statistically significant differences in the mean perceived behavioral control between the intervention (mean = 2.6, SD = 0.8) and control (mean = 2.6, SD = 0.8) groups (t = -0.41, p = 0.68) (Table 45). **$H_0$4** is supported.

Table 45 Mean perceived behavioral control score between intervention and control group

	Mean score (SD)			
Items	**Intervention**	**Control**	**t-value**	**P-value**
1. It is completely up to me whether or not I use medications for nonmedical purposes over the next 3 months	2.6(0.9)	2.6(1.0)	-0.2	0.84
2. For me, using medications for nonmedical reasons over the next 3 months is under my control	2.7(0.92)	2.6(0.81)	-0.6	0.58
Overall mean perceived behavioral control mean score	2.6(0.8)	2.6(0.8)	-0.41	0.68

$H_0$5: No significant difference exists in college students' behavioral beliefs of NMUPD between the intervention and control groups

As can be seen in Table 46, there are no statistically significant differences between the control and intervention groups in behavioral beliefs' strength (b_i), outcomes evaluations (e_i), and their products (b_ie_i). **$H_0$5** is supported.

Table 46 Mean behavioral belief strength (b_i), mean evaluation (e_i), and behavioral belief strength x evaluation (b_ie_i) between the intervention and control groups

	Mean behavioral belief strength (b_i)			Mean outcome evaluation (e_i)			Belief strength x evaluation (b_ie_i)		
Behavioral belief	**Intervention (SD)**	**Control (SD)**	**P-value**	**Intervention (SD)**	**Control (SD)**	**P-value**	**Intervention (SD)**	**Control (SD)**	**P-value**
Help me stay focused and improve my grades	2.5 (1.8)	2.7(1.8)	0.4	5.4(1.7)	5.5(1.5)	0.41	14.0 (11.0)	15.2(11.6)	0.31
Cause me physical health problems	5.6 (1.5)	5.4(1.6)	0.45	2.4(1.5)	2.1(1.3)	0.16	11.5(7.6)	12.3(9.2)	0.36
Cause me mental health problems	5.3 (1.6)	5.2(1.7)	0.43	2.0(1.3)	2.2(1.5)	0.25	10.5(7.7)	11.0(8.8)	0.52
Cause me to be addicted	5.3(1.7)	5.3(1.7)	0.71	1.8(1.3)	1.9(1.4)	0.7	9.4(7.3)	9.7(8.8)	0.73
Get me arrested	5.0 (1.8)	4.9(1.8)	0.6	1.7(1.2)	1.9(1.4)	0.19	8.2(6.4)	8.9(8.0)	0.32
Help me lose weight	2.9 (1.7)	3.1(1.6)	0.14	4.1(1.6)	4.2(1.5)	0.5	12.1(9.3)	13.5(9.3)	0.16
Help me get high and party	3.2 (2.0)	3.3 (1.8)	0.8	2.8(1.6)	3.0(1.6)	0.19	9.9(9.1)	11.2(9.6)	0.16
Make me feel more socially accepted by my group	2.2(1.6)	2.2(1.5)	0.73	3.5(1.8)	3.8(1.6)	0.09	8.2(7.7)	9.1(7.7)	0.22

$H_0$6: No significant difference exists in college students' normative beliefs of NMUPD between the intervention and control groups

According to the results from t-test and as can be seen in Table 47, there were no statistically significant differences between the intervention and control groups in the mean normative belief strength (n_i), mean motivation to comply (m_i), and normative belief strength x motivation to comply $(n_i m_i)$ products. **$H_0$6** is supported.

Table 47 Mean normative belief strength (n_i), mean motivation to comply (m_i), and normative belief strength x motivation to comply ($n_i m_i$) products between the intervention and control group

	Mean normative belief strength (n_i)			Mean motivation to comply (m_i)			Normative belief strength x motivation to comply ($n_i m_i$)		
Normative referents	**Intervention (SD)**	**Control (SD)**	**P-value**	**Intervention (SD)**	**Control (SD)**	**P-value**	**Intervention (SD)**	**Control (SD)**	**P-value**
Partner (spouse, girlfriend, or boyfriend)	1.6 (1.7)	1.5 (1.7)	0.69	5.2 (1.4)	5.2 (1.4)	0.82	1.6 (1.7)	1.5 (1.7)	0.69
Close friends	1.5 (1.8)	1.2 (1.8)	0.18	4.9 (1.3)	4.7 (1.4)	0.35	1.5 (1.8)	1.2 (1.8)	0.18
Doctor, nurse or pharmacist	2.3 (1.6)	2.3 (1.5)	0.86	6.1 (1.2)	5.9 (1.2)	0.23	2.3 (1.6)	2.3 (1.5)	0.86
Family members	2.1 (1.7)	2.3 (1.4)	0.23	5.3 (1.4)	5.2 (1.5)	0.40	2.1 (1.7)	2.3 (1.4)	0.22

$H_0$7: No significant difference exists in college students' control beliefs of NMUPD between the intervention and control groups

As can be seen in Table 48, there are no statistically significant differences between the intervention and control groups in control belief strength (c_i), perceived power (p_i), and control belief strength x power (b_ie_i) products. **$H_0$7** is supported.

Table 48 Mean control belief strength (c_i), Mean perceived power (p_i), and Control belief strength x power (b_ie_i) between the intervention and control groups

	Mean control belief strength (c_i)			Mean perceived power (p_i)			Control belief strength x power (b_ie_i)		
Control belief	**Intervention (SD)**	**Control (SD)**	**P-value**	**Intervention (SD)**	**Control (SD)**	**P-value**	**Intervention (SD)**	**Control (SD)**	**P-value**
Having a legitimate prescription for the medication	5.5(1.6)	5.4(1.6)	0.57	5.7(1.6)	5.6(1.5)	0.68	31.5(13.4)	30.9(13.0)	0.67
Having a friend with a prescription for the medication	4.3(2.1)	4.1(1.9)	0.58	5.3(1.3)	5.1(1.2)	0.12	23.0(12.8)	21.5(11.3)	0.23
Having easy access to prescription medications	4.9(1.8)	4.7(1.8)	0.25	5.8(1.3)	5.6(1.3)	0.15	28.3(12.6)	26.1(12.5)	0.09
Being offered a prescription medication by a friend or a family member	4.6(2.0)	4.7(1.9)	0.65	5.7(1.3)	5.5(1.4)	0.15	26.6(13.4)	24.9(12.5)	0.21
Having a health insurance	5.5(1.5)	5.4(1.4)	0.50	4.4(1.3)	4.5(1.2)	0.43	24.3(10.4)	24.3(10.1)	0.99
Getting behind in school work	5.1(1.7)	5.0(1.5)	0.70	4.6(1.4)	4.7(1.3)	0.50	23.1(10.7)	23.5(10.3)	0.73
Facing a stressful personal situation	4.3(1.4)	4.5(1.3)	0.1	4.3(1.4)	4.5(1.3)	0.10	24.7(9.5)	25.8(9.9)	0.31
Being a member of social fraternity/ sorority group	5.6(1.6)	5.4(1.6)	0.16	4.6(1.5)	4.6(1.4)	0.95	25.9(11.5)	24.8(11.7)	0.38

$H_0$8: Negative attitude is not a significant predictor of college students' intention to avoid NMUPD, after controlling for perceived norms and perceived behavioral control

First, this hypothesis was tested using direct measures of attitude, perceived norms, and perceived behavioral control. Multiple regression model was built with the intentions as the outcome (dependent variable) and attitude, perceived norms, and perceived behavioral control as the predictors (independent variables).

Direct measure of attitude was a statistically significant predictor of college students' intention toward NMUPD independent from perceived norms, and perceived behavioral control (B = -0.26, $p < 0.001$) (Table 49). **$H_0$8** is not supported.

Table 49 Prediction of college students' intention to avoid prescription drug use for nonmedical reasons from attitudes, perceived social norms, and perceived behavioral control

Independent variable*	B	SE	t	P
Attitude	-0.26	0.05	-5.01	<0.001
Perceived norms	0.44	0.06	7.11	<0.001
Perceived behavioral control	0.16	0.07	2.2	0.03
Constant	0.6	0.2	3.0	0.003
*Direct measures. The dependent variable is intention, B: coefficient, SE: Standard error N= 361, $F(3,357) = 69.0$ $p < 0.001$, R =0.61 $R^2 = 0.37$ Adjusted $R^2 = 0.36$				

Note: R is the multiple correlation coefficient. R-square is the square of this coefficient, and indicates the percentage of variation explained by the model out of the total variation. Adjusted R^2: is a modified R^2 penalize for adding more independent variables

Since attitudes were found to predict intentions, it is important to examine the underlying behavioral beliefs to fully understand why students intend or do not intend to avoid using prescription drugs for nonmedical reasons. Behavioral beliefs influence attitudes and therefore indirectly influence intention.

To examine this, the sample was divided into those who intended to void prescription drugs for nonmedical reasons and those who did not intend to avoid such use. The main beliefs were then compared in the two subsamples. Students with a mean intention score above zero were considered intenders and those with a mean intention score of zero and lower were considered non-intenders. A total of 43 (11.7%) students have no intention to avoid using prescription drugs for nonmedical reasons and thus were treated as non-intenders, and 325 (88.3%) were classified as intenders. It can be seen from Table 50 that all the $b_i e_i$ products significantly predict intention to avoid nonmedical use of Rx except of the $b_i e_i$ product for losing weight.

There were substantial differences in the mean belief strengths between intenders and non-intenders to avoid NMUPD (Table 50). While intenders did not believe that NMUPD would help them stay focused and improve their grades, non-intenders believed so. On the other hand, while intenders agreed that NMUPD would cause them to be addicted and get them arrested, non-intenders did not agree with these beliefs. Both groups agreed that prescription drugs would cause them physical problems, but intenders believed that more strongly than non-intenders did. Both groups disagreed on that NMUPD would help them get high and feel more socially acceptable, but the intenders held these last two beliefs stronger than non-intenders did. While intenders agreed that NMUPD would cause them mental problems, non-intenders neither agreed nor disagreed.

There were also significant differences in outcome evaluations between intenders and non-intenders. Respondents perceived having mental problems, physical problems, addiction, getting arrested, getting high and party as bad outcomes. However, intenders perceived these outcomes as significantly more bad than non-intenders. No significant differences in outcome evaluations were found between intenders and non-intenders with regard to staying focused and improving their grades, feeling more socially acceptable, or losing weight (Table 50).

Table 50 Correlation of behavioral belief x outcome evaluation products with intention to avoid NMUPD and mean belief strength and outcome evaluation of college student intenders and non-intenders to avoid NMUPD

Behavioral belief	Correlation b_ie_i-intention	Mean belief strength (b_i)		Mean evaluation (e_i)	
		Intenders# (SD)	Non-intenders (SD)	Intenders (SD)	Non-intenders (SD)
Help me stay focused and improve my grades	-0.45***	2.4 (1.6)	4.5*** (2.0)	5.5 (1.5)	5.5 (1.6)
Cause me physical health problems	0.29***	5.6 (1.5)	4.3*** (1.5)	2.1 (1.4)	3.0*** (1.3)
Cause me mental health problems	0.28***	5.4 (1.6)	4.0*** (1.8)	2.0 (1.4)	2.8*** (1.4)
Cause me to be addicted	0.27***	5.5 (1.6)	3.9*** (1.8)	1.7 (1.3)	2.7*** (1.4)
Get me arrested	0.24***	5.1 (1.7)	3.7*** (1.8)	1.7 (1.2)	2.6*** (1.5)
Help me lose weight	-0.06	2.9 (1.6)	3.4* (1.7)	4.2 (1.6)	3.9 (1.4)
Help me get high and party	-0.23***	3.2 (1.9)	3.5 (1.8)	2.8 (1.6)	4.0*** (1.5)
Make me feel more socially accepted by my group	-0.14**	2.1 (1.4)	2.7*** (1.6)	3.7 (1.8)	3.7 (1.4)

*p<0.05, **p<0.01, ***p<0.001
Belief strength and perceived power can range from 1 to 7.
#Intenders to avoid NMUPD

$H_0$9: Perceived norms is a significant predictor of college students' intention to avoid NMUPD, independent of attitudes and perceived behavioral control

As can be seen from Table 49, the direct measure of perceived norms was a significant predictor of students' intention to avoid NMUPD, independent of attitudes and perceived behavioral control(B= 0.44, p <0.001). **$H_0$9** is not supported.

Since perceived social norms were found to predict intentions, the underlying normative beliefs were also examined to fully understand why students intended or did not intend to avoid NMUPD. Normative beliefs influenced perceived norms and thus indirectly impacted intention.

Table 51 displays that all the four *n x m* products correlated significantly (p < 0.001) with intentions to avoid NMUPD, indicating that each referent exerted some influence on intention. By comparing the means for intenders and non-intenders, it can be seen from Table 51 that those who intended to avoid NMUPD, were more likely to believe that their partner, HCPs, and family members will not approve their NMUPD. There was one instance with substantial differences between intenders and non-intenders: while intenders believed that their close friends will not approve their NMUPD, non-intenders did not think so.

In terms of their motivation to comply with the four referent groups, there were significant differences between intenders and non-intenders. Intenders were more likely to comply with their partner, close friends, HCPs, and family members than non-intenders (Table 51).

Table 51 Correlations of injunctive normative belief x motivation to comply products with intention to avoid NMUPD, and mean belief strength, and motivation to comply of intenders and non-intenders.

Normative Referent	Correlation $n_i m_i$-intention	Mean injunctive normative belief strength (n_i)		Mean motivation to comply (m_i)	
		Intenders# (SD)	Non-intenders (SD)	Intenders (SD)	Non-intenders (SD)
Partner (spouse, girlfriend, or boyfriend)	0.33***	1.7 (1.6)	0.4*** (1.7)	5.3 (1.3)	4.4*** (1.5)
Close friends	0.41***	1.6 (1.6)	-0.3*** (1.9)	4.9 (1.3)	4.1* (1.4)
Doctor, nurse or pharmacist	0.27***	2.4 (1.4)	1.3*** (1.7)	6.1 (1.1)	5.4*** (1.4)
Family members	0.23***	2.3 (1.5)	1.7* (1.6)	5.3 (1.4)	4.6** (1.6)

Belief strength can range from -3 to +3, and motivation to comply from 1 to 7
#Intenders to avoid NMUPD
*p<0.05, **p<0.01, ***p<0.001.

$H_0$10: Perceived behavioral control is not a significant predictor of college students' intention to avoid NMUPD, after controlling for attitudes and perceived norms

As can be seen from Table 52, the direct measure of perceived behavioral control was a significant predictor of students' intention to avoid NMUPD, independent from attitudes and perceived norms (B = 0.16, $p < 0.05$. **$H_0$10** was not supported.

Since perceived behavioral control was found to predict intentions, the underlying control beliefs were also examined to fully understand why students intended or did not intend to avoid NMUPD. Control beliefs influenced perceived behavioral control and thus indirectly impacted intention.

As can be seen in Table 52, only the *c x p* [control belief strength x power] products associated with having a legitimate prescription for the medication and being a member of social fraternity/sorority groups predicted students' intentions to avoid NMUPD. There were little and non-significant differences between intenders and non-intenders in the perceived control (belief strength c_i, the last 2 columns) over having legitimate prescription, having a friend with a prescription medication, being offered a prescription medication, having a health insurance, getting behind in school work, and facing a stressful situation.

With regard to mean perceived power (pi), intenders were more likely to agree that having a legitimate prescription, having health insurance, getting behind in school work, and being a member of social fraternity/sorority group will make it easier to use prescription drugs for nonmedical reasons.

Table 52 Correlations of control belief x perceived power products with intention to avoid NMUPD, and mean belief strength, and perceived power of intenders and non-intenders.

Control factor	Correlation $c_i p_i$-intention	Mean perceived power (p_i)		Mean control belief strength (c_i)	
		Intenders (SD)	Non-intenders (SD)	Intenders (SD)	Non-intenders (SD)
Having a legitimate prescription for the medication	0.13*	5.6 (5.4)	4.9* (4.8)	5.7 (1.5)	5.4 (1.6)
Having a friend with a prescription for the medication	-0.02	4.2 (2.0)	4.3 (1.9)	5.2 (1.2)	5.3 (1.2)
Having easy access to prescription medications	0.02	4.8 (1.9)	4.6 (1.7)	5.6 (1.4)	5.7 (1.1)
Being offered a prescription medication by a friend or a family member	0.1	4.6 (2.0)	4.2 (1.8)	5.6 (1.4)	5.5 (1.3)
Having a health insurance	0.02	5.6 (1.4)	4.9** (1.6)	4.4 (1.2)	4.6 (1.3)
Getting behind in school work	0.07	5.9 (1.2)	5.4*** (1.3)	4.3 (1.3)	4.6 (1.4)
Facing a stressful personal situation	0.04	5.1 (1.7)	4.8 (1.5)	4.6 (1.3)	4.8 (1.3)
Being a member of social fraternity/ sorority group	0.13*	5.5 (1.6)	5.0* (1.6)	4.6 (1.5)	4.0* (1.2)

Both control belief strength and power can range from 1 to 7
*Intenders to avoid NMUPD
*p<0.05, **p<0.01, ***p<0.001.

$H_0 11$: Attitudes, perceived norms, and perceived behavioral control do not explain significant variance of college students' intention to avoid NMUPD

As can be seen in Table 49, the multiple correlation (R) is 0.61, indicating that attitudes, perceived norms, and perceived behavioral control simultaneously explain 37% of the variance (R^2) of intention to avoid NMUPD. This model is statistically significant F (3,357) = 69.0, p<0.001). **$H_0$11** is not supported.

$H_0$12: The previous use of prescription drugs for nonmedical purposes does not increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms and perceived behavioral control

Integrating previous NMUPD with the regression model, using the backward elimination process, increased the explained variance in intention from 37% to 40%. This increase of 3% is significant according to the likelihood-ratio test (LR chi(1) = 20.3, p<0.001) (Table 53). **$H_0$12** is not supported.

Table 53 Prediction of college students' intentions to avoid prescription after adding previous NMUPD

Independent variable*	B	SE	t-value	p-value
Attitude	-0.18	0.05	-3.4	0.001
Perceived norms	0.38	0.06	6.0	<0.001
Perceived behavioral control	0.18	0.07	2.5	0.012
Previous NMUPD	-0.68	0.15	-4.5	<0.001
Constant	0.96		4.6	<0.001
*Direct measures. The dependent variable is intention, B: coefficient, SE: Standard error N= 361, F (3, 357) =59.7 , p <0.001 , R = 0.64 R^2 = 0.41 Adjusted R^2= 0.39				

As can be seen in Table 54, those who never reported NMUPD in the past have significantly higher intentions to avoid NMUPD in the future, more negative attitudes, and higher perceived social norms compared to those who reported NMUPD.

Table 54 Means and standard deviations for reasoned action constructs: Differences between those who ever used Rx for nonmedical reasons and those who did not

Construct	Ever used RX nonmedically (n=106)	Never used Rx nonmedically (n=262)	t-test	P-value
	Mean (SD)	**Mean (SD)**		
Intention	1.2 (1.7)	2.6 (1.0)	10.0	<0.0001
Attitude	-0.2(1.3)	-1.7(1.2)	-11.1	<0.0001
Perceived norms	1.0 (1.3)	2.2(1.0)	9.6	<0.0001
Perceived behavioral control	2.6(0.7)	2.6(0.9)	0.30	0.76

Looking at the behavioral belief strengths from Table 55, it is clear that those who reported NMUPD were significantly less likely to believe that NMUPD would cause them physical problems, mental problems, or cause them to be addicted. Although both groups disagreed that NMUPD would help them stay focused and improve their grades, those who never reported NMUPD held this belief more strongly.

Outcome evaluations showed few differences between the two groups. There was a difference between the two groups in two beliefs; the belief that NMUPD would cause them addiction, and the belief that it would help them get high and party. While both groups agreed that becoming addicted is bad, those who never reported NMUPD, held this belief more strongly than those who reported NMUPD. Likewise, those who never reported NMUPD perceived getting high and partying as a bad thing more than those who reported NMUPD (Table 55).

Table 55 Mean belief strength and outcome evaluation of college students who ever reported NMUPD and those who never reported NMUPD

	Mean belief strength (b_i)		**Mean evaluation (e_i)**	
	Ever used Rx nonmedically		**Ever used Rx nonmedically**	
Behavioral belief	**Yes (n=107) Mean (SD)**	**No (n =266) Mean (SD)**	**Yes (n=107) Mean (SD)**	**No (n =265) Mean (SD)**
Help me stay focused and improve my grades	3.7 (2.1)	2.2*** (1.5)	5.6 (1.5)	5.4 (1.7)
Cause me physical health problems	4.8 (1.6)	5.8*** (1.4)	2.4 (1.4)	2.2 (1.5)
Cause me mental health problems	4.4 (1.8)	5.6*** (1.5)	2.3 (1.3)	2.0 (1.4)
Cause me to be addicted	4.4 (2.0)	5.7*** (1.5)	2.1 (1.3)	1.8* (1.4)
Get me arrested	4.0 (1.9)	5.3*** (1.6)	1.9 (1.3)	1.7 (1.3)
Help me lose weight	2.9 (1.6)	3.1 (1.6)	4.2 (1.6)	4.1 (1.4)
Help me get high and party	3.5 (1.9)	3.2 (1.9)	3.8 (1.5)	2.5*** (1.5)
Make me feel more socially accepted by my group	2.4 (1.6)	2.1 (1.5)	3.8 (1.5)	3.6 (1.8)

Examining the injunctive normative beliefs showed that those who reported NMUPD were less likely to believe that their referents would disapprove their NMUPD. Also, they were significantly less motivated to comply with what their referents suggested they do compared to those who never used prescription drugs for nonmedical reasons (Table 56).

Table 56 Mean injunctive normative belief strength and mean motivation to comply of students who reported past NMUPD and those who never reported NMUPD

	Mean injunctive normative belief strength (n_i)		Mean motivation to comply (m_i)	
	Ever used Rx nonmedically		Ever used Rx nonmedically	
Normative Referent	**Yes (n=105) Mean (SD)**	**No (n =259) Mean (SD)**	**Yes (n=105) Mean (SD)**	**No (n =259) Mean (SD)**
Partner (spouse, girlfriend, or boyfriend)	0.5 (1.7)	2.0*** (1.5)	4.8 (1.3)	5.4** (1.4)
Close friends	0.2 (1.8)	1.8*** (1.6)	4.7 (1.2)	4.8 (1.4)
Doctor, nurse or pharmacist	2.0 (1.6)	2.4* (1.5)	5.6 (1.2)	6.2*** (1.2)
Family members	1.8 (1.8)	2.3*** (2.4)	4.8 (1.6)	5.4** (1.4)

$H_0$13: The intervention does not significantly increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms, perceived behavioral control, and previous use of prescription drugs.

Integrating the intervention assignment, using the backward elimination process, with the regression model did not increase the explained variance of intention The result of the likelihood-ratio test was not significant (LR chi(1) = 1.95, p= 0.16) (Table 57). **$H_0$13** is supported.

Table 57 Prediction of college students' intention to avoid prescription after adding previous NMUPD and the web-based intervention

Independent variable*	B	SE	t-value	p-value
Attitude	-0.2	0.05	-3.5	<0.01
Perceived norms	0.4	0.06	6.1	<0.001
Perceived behavioral control	0.18	0.07	2.5	0.04
Previous NMUPD	-0.7	0.1	-4.4	<0.001
Web-intervention	-0.16	0.1	-1.4	0.17
Constant	1.0	0.2	4.7	<0.001
*Direct measures. The dependent variable is intention, B: coefficient, SE: Standard error N=361 , F (5, 355) =48.3 , p <0.001 , R = 0.61 R^2 = 0.40 Adjusted R^2= 0.39				

$H_0$14: No significant relationship exists between college students' intention to avoid NMUPD and gender.

As can be seen in Table 58, both female (mean = 2.3, SD =1.2) and male (mean = 2.0, SD =1.5) students had the intention to avoid NMUPD; however, female students had significantly higher intention (p = 0.02, t =2.4). **$H_0$14** is not supported.

It is important to track which predictors of intention are different between female and male students. As shown in Table 58, female students had significantly more negative attitudes toward NMUPD, compared to male students (female: mean = -1.4, SD = 1.3, male: mean = -1.0, SD =1.4, p =0.002). Also, female students had significantly higher mean perceived social norms (mean = 2.0, SD = 1.1) compared to male students (mean = 1.6, SD = 1.3, p<0.001). However, there was no statistically significant difference in perceived behavioral control (t = 0.32, p = 0.75) between male and female students.

Table 58 Means and standard deviations for reasoned action constructs: Differences between female and male students

Construct	Female (n=225) Mean (SD)	Male (n=143) Mean (SD)	t-test	P-value
Intention	2.3 (1.2)	2.0 (1.5)	2.4	0.02
Attitude	-1.4(1.3)	-1.0(1.4)	-3.2	0.002
Perceived norms	2.0 (1.1)	1.6(1.3)	3.5	0.0005
Perceived behavioral control	2.6(0.8)	2.6(0.8)	0.32	0.75

$H_0$15: No significant relationship exists between college students' intention to avoid NMUPD and race/ethnicity.

The results from ANOVA, indicated that there was no statistically significant difference between the various race/ethnicity groups with regard to intentions to avoid NMUPD ($F= 0.43$, $df = 5, 367$, $p = 0.825$). **$H_0$15** is supported.

$H_0$16: No significant relationship exists between college students' intention to avoid NMUPD and the degree pursued by the student.

The results from ANOVA, indicated that there was no significant relationship between the degree pursued by the student (undergraduate, graduate, professional degree) and intentions to avoid NMUPD ($F= 2.1$, $df = 2, 367$, $p = 0.13$). **$H_0$16** is supported.

$H_0$17: No significant relationship exists between college students' intention to avoid NMUPD and affiliation with sorority/fraternity groups.

A t-test showed that there was no significant relationship between college students intentions to avoid NMUPD and being a member of a sorority/fraternity group ($t = -0.47$, $df= 366$, $p= 0.64$). **$H_0$17** is supported.

$H_0$18: No significant relationship exists between college students' intention to avoid NMUPD and whether living on- or off-campus.

Results from the t-test indicated that no significant difference existed in intention to avoid NMUPD between students who lived on-campus and students who lived off-campus ($t = 1.8$, $df = 366$, $p = 0.07$). **$H_0$18** is supported.

$H_0$19: No significant relationship exists between college students' intention to avoid NMUPD and tobacco use.

Results from one-way ANOVA indicated a significant relationship between college students' intentions to avoid NMUPD and tobacco smoking ($F = 6.31$, $df = 2{,}367$, $p = 0.002$). **$H_0$19** is not supported.

Post hoc analyses were conducted given the statistically significant omnibus ANOVA test, specifically using Tukey's test on all possible pairwise contrasts. The greatest difference in the intentions score was observed for non-tobacco users (mean = 2.3, SD = 1.2) vs. current tobacco users (mean = 1.5, SD = 1.9, $t = 3.4$ $p = 0.002$). Conversely, there were no statistically significant differences in intentions score between non-tobacco and former-tobacco users, and former-tobacco and current-tobacco users (Table 59).

The same analysis was done for attitude, perceived social norms, and perceived behavioral control. Results from one-way ANOVA indicated a significant relationship between college students' attitude toward NMUPD and tobacco use ($F = 6.31$, $df = 2{,}371$, $p = 0.002$). Post hoc analyses were conducted given the statistically significant omnibus ANOVA test, specifically; Tukey's test was used on all possible pairwise contrasts. The greatest difference in attitude score was observed for non-tobacco users (mean = -1.4, SD = 1.3) vs. current tobacco users (mean = -0.62, SD = 1.6, t = -3.1 p = 0.006). There were no statistically significant differences in attitude between any other groups (Table 59).

Results from one-way ANOVA indicated a significant relationship between college students' perceived norms toward NMUPD and tobacco smoking (F = 6.2, df = 2,363, p = 0.002). Post hoc analyses were also conducted given the statistically significant omnibus ANOVA test, specifically, using Tukey's test on all possible pairwise contrasts. The greatest difference in perceived norms score was also observed for non-tobacco users (mean = 2.0, SD = 1.1) vs. current tobacco users (mean = 1.3, SD = 1.4, t = 3.2 p = 0.004). However, there were no statistically significant differences in perceived social norms among any other groups (Table 59).

Results from the ANOVA test showed no significant relationship between college students' perceived behavioral control and tobacco smoking (F= 0.9, df = 2,360, p = 0.41) (Table 59).

Table 59 Results from post hoc analysis using Tukey's test for reasoned action constructs: Differences between former, current, and non-tobacco users

	Former tobacco user vs current user			Non-tobacco user vs current user			Non-tobacco user vs former user		
Construct	**Contrast (SE)**	**t-Tukey**	**P-value**	**Contrast (SE)**	**t-Tukey**	**P-value**	**Contrast (SE)**	**t-Tukey**	**P-value**
Intention	0.53 (0.3)	1.8	0.16	0.83 (0.25)	3.4	<0.01	0.30 (0.2)	1.5	0.27
Attitude	-0.35 (0.3)	-1.2	0.46	-0.77 (0.25)	-3.1	<0.01	-0.4 (0.3)	-2.16	0.08
Perceived social norm	0.37 (0.26)	1.5	0.3	0.7 (0.22)	3.2	<0.01	0.3 (0.17)	1.9	0.15
Perceived behavioral control	0.22 (0.18)	1.3	0.4	0.1 (0.15)	0.7	0.8	-0.12 (0.12)	-1.1	0.54

$H_0$20: No significant relationship exists between college students' intention to avoid NMUPD and marijuana use.

Results from one-way ANOVA indicated a significant relationship between college students' intention to avoid NMUPD and marijuana use (F = 19.2, df = 367, p <0.001). **$H_0$20** is not supported.

Post hoc analysis using Tukey's test revealed that former marijuana users have higher intentions (mean = 2.0, SD =1.3) to avoid NMUPD compared to frequent marijuana users (mean =0.9, SD = 2.0, t = -4.10, p < 0.001). Also, non-marijuana users have significantly higher intentions (mean = 2.5, SD = 1.1) to avoid NMUPD compared to former users (mean = 2.0, SD = 1.3, p=0.03); frequent marijuana users (mean = 0.9, SD = 2.0, p<0.001); and occasional marijuana users (mean = 1.6, SD = 1.5, p<0.001). No other group comparisons showed statistically significant differences in intention to avoid NMUPD (Table 60)

The same analysis was done for attitude, perceived social norms, and perceived behavioral control. Results from one-way ANOVA indicated a significant relationship between college students' attitude toward NMUPD and marijuana use ($F = 20.8$, $df = 3, 371$, $p < 0.001$).

Post hoc analysis using Tukey's test revealed that former marijuana users have more negative attitudes (mean = -0.83, SD =1.4) toward NMUPD compared to frequent marijuana users (mean = 0.07, SD = 1.4, $t = -3.2$, $p < 0.01$). Also, non-marijuana users have significantly more negative attitudes toward NMUPD (mean = -1.6, SD = 1.2) compared to former users (mean = -0.83, SD =1.4, $p < 0.001$); frequent marijuana users (mean =0.07, SD =1.4, $p < 0.001$); and occasional marijuana users (mean = -0.9, SD = 1.3, $p < 0.01$).

Occasional marijuana users also have a significantly lower attitude score compared to frequent users ($t = 3.2$, $p < 0.01$). No significant difference in attitude was found between occasional and former marijuana users (Table 60). Also, results from one-way ANOVA indicated a significant relationship between college students' perceived social norms toward NMUPD and marijuana use ($F = 9.1$, $df = 3, 363$, $p < 0.001$).

Post hoc analysis using Tukey's test revealed that frequent marijuana users have a significantly lower perceived norm score (mean = 0.9, SD = 1.4) toward NMUPD compared to former marijuana users (mean = 1.7, SD =1.1, $t = -3.3$, $p < 0.01$). Also, non-marijuana users have significantly higher mean perceived norms' score (mean = 2.0, SD = 1.1) compared to frequent marijuana users ($p < 0.001$). Occasional marijuana users also have significantly higher mean perceived norms' score (mean = 1.7, SD = 1.3) compared to frequent users ($t = 2.8$, $p = 0.03$). No significant difference in perceived norms was found among any other groups (Table 60).

Although intention, attitude, and perceived norms have a significant relation with NMUPD; perceived behavioral control showed no significant relation ($F= 1.4$, $p = 0.25$) (Table 60).

Table 60 Results from post hoc analysis using Tukey's test for reasoned action constructs: differences between former, occasional, frequent, and non-marijuana users

	Intention			Attitude			Perceived norms		
Construct	**Contrast (SE)**	**t-Tukey**	**P-value**	**Contrast (SE)**	**t-Tukey**	**P-value**	**Contrast (SE)**	**t-Tukey**	**P-value**
Frequent vs former users	-1.1 (0.3)	-4.1	<.001	0.9 (0.3)	3.2	<.01	-0.8 (0.3)	-3.3	<.01
Non-users vs former users	0.5 (0.2)	2.8	0.03	-0.8 (0.2)	-4.4	<.001	0.3 (0.17)	1.7	0.32
Occasional vs former users	-0.4 (0.3)	-1.5	0.47	-0.1 (0.3)	-0.4	0.97	-0.1 (0.2)	-0.3	0.99
Non-users vs frequent	1.6 (0.24)	6.8	<.001	-1.7 (0.2)	-7.0	<.001	1.1 (0.2)	5.1	<.001
Occasional vs frequent	0.8 (0.3)	2.6	0.052	-1.0 (0.3)	-3.3	<.01	0.7 (0.3)	2.8	0.03
Occasional vs non-users	-0.9 (.21)	-4.1	<.001	0.7 (0.2)	3.2	<.01	-0.36 (0.2)	-1.8	0.3

Note: Perceived behavioral control is not shown in the table because there was no significant association with marijuana smoking.

$H_0$21: No significant relationship exists between college students' intentions to avoid NMUPD and alcohol consumption in the overall sample

Results from one-way ANOVA indicated a significant relationship between college students' intentions to avoid NMUPD and alcohol consumption ($F = 7.4$, $df = 3, 367$, $p < 0.001$). **$H_0$21** is not supported.

Post hoc analysis using Tukey's test revealed that non-drinkers have significantly higher intention (mean = 2.6, SD = 0.8) to avoid NMUPD compared to frequent drinkers (mean = 1.5, SD = 1.6, $t = 4.0$, $p < 0.01$), and occasional drinkers (mean = 2.0, SD = 1.5 $t = -3.9$, $p < 0.01$). No other between group comparisons showed statistically significant difference in mean intention score (Table 61)

The same analysis was done for attitude, perceived social norms, and perceived behavioral control. Results from one-way ANOVA indicated a significant relationship between college students' attitude toward NMUPD and alcohol drinking ($F = 10.0$, $df = 3, 371$, $p < 0.001$).

Post hoc analysis using Tukey's test revealed that non-alcohol drinkers have significantly more negative attitudes (mean = -1.8, SD = 1.3) toward NMUPD compared to frequent alcohol drinkers (mean = -0.4, SD = 1.3, $t = 4.0$, $p < 0.01$), and compared to occasional alcohol drinkers (mean = -1.1, SD = 1.3, $p < 0.01$). No significant differences in attitude were found among any other groups (Table 61). Also, results from one-way ANOVA indicated a significant relationship between college students' perceived social norms toward NMUPD and alcohol drinking ($F = 6.9$, $df = 3, 363$, $p < 0.001$).

Post hoc analysis using Tukey's test revealed that non-alcohol drinkers have a significantly higher perceived norm score (mean = 2.2, SD = 1.0) toward NMUPD compared to former drinkers (mean = 1.2, SD = 1.5, $t = 3.7$, $p < 0.01$), frequent drinkers (mean = 1.4, SD = 1.3, $t = 3.1$, $p < 0.01$) and occasional drinkers (mean = 1.8, SD = 1.2, $t = -3.0$, $p = 0.02$). No significant difference in perceived norms was found between any other groups (Table 61).

Although intention, attitude, and perceived norms have a significant relation with NMUPD, perceived behavioral control showed no significant relation ($F = 0.34$, $p = 0.8$) (Table 61).

Table 61 Results from post hoc analysis using Tukey's test for reasoned action constructs: differences between former, occasional, frequent, and non-alcohol drinker

	Intention			Attitude			Perceived norms		
Construct	**Contrast (SE)**	**t-Tukey**	**P-value**	**Contrast (SE)**	**t-Tukey**	**P-value**	**Contrast (SE)**	**t-Tukey**	**P-value**
Frequent vs former drinker*	-0.6 (0.4)	-1.6	0.4	0.4 (0.4)	1.1	0.7	0.3 (0.3)	0.8	0.9
Non- vs former drinker	0.5 (0.3)	1.6	0.4	-0.9 (0.3)	-3.0	0.02	1.0 (0.3)	3.7	<0.01
Occasional vs former drinker	-0.11 (0.3)	-0.4	0.98	-0.3 (0.3)	-1.0	0.8	0.6 (0.3)	2.3	0.11
Non- vs frequent drinker	1.1 (0.3)	4.0	<0.01	-1.3 (0.3)	-4.7	<.001	0.8 (0.3)	3.1	0.01
Occasional vs frequent drinker	0.5 (0.27)	1.9	0.2	-0.7 (0.3)	-2.6	0.052	0.3 (0.2)	1.4	0.5
Occasional vs non-drinker	-0.6 (0.16)	-3.9	<0.01	0.6 (0.16)	4.0	<.001	-0.4 (0.1)	-3.0	0.02

*drinker refer to alcohol consumption.

$H_0$22: No significant relationship exists between college students' intention to avoid NMUPD and age at first use of NMUPD in the overall sample.

Results from correlation tests showed no statistically significant relationship between intention to avoid NMUPD and onset of NMUPD ($r = 0.14$, $p = 0.14$). **$H_0$22** is supported.

$H_0$23: No significant relationship exists between college students' intention to avoid NMUPD and type of prescription drug used.

As can be seen in Table 62, an analysis restricted to those who previously reported NMUPD, showed that there is a significant difference in intention to avoid NMUPD between those who used stimulants, and those who never used stimulants. Yet, there is no significant difference in intention to avoid NMUPD with the use of painkillers or depressants. **$H_0$23** is supported for the use of painkillers and depressants but is not supported for the use of stimulants.

Those who reported using stimulants have lower intentions to avoid NMUPD (mean = 0.6, SD = 1.9) compared to those who did not report using stimulants (but may have used other prescription drugs nonmedically) (mean = 1.7, SD = 1.3) and this difference was significant at alpha level of 0.01 ($t = 3.3$). Additionally the difference in attitude was significant at alpha level of 0.01($t = -3.1$). Interestingly, those who reported using stimulants have a slightly positive attitude toward NMUPD (mean = 0.3, SD = 1.2), compared to those never used stimulant who have negative attitude toward NMUPD (mean = -0.5, SD =0.2) (Table 62).

Table 62 Means and standard deviations for reasoned action constructs: Differences according to type of prescription drug used

	Stimulants		Painkillers		Depressants	
Construct	**Yes (n=49)**	**No (n=57)**	**Yes (n=68)**	**No (n=38)**	**Yes (n=41)**	**No (n=65)**
Intention's mean score (SD)	0.6 (1.9)	1.7** (1.3)	1.3 (0.2)	1.0 (0.3)	0.9 (0.3)	1.3 (0.2)
Attitude's mean score (SD)	0.3 (0.2)	-0.5** (0.2)	-0.1 (0.2)	-0.2 (0.2)	-0.1 (1.3)	-0.2 (1.3)
Perceived norms' mean score (SD)	0.8 (0.2)	1.2 (0.2)	1.0 (0.2)	0.9 (0.2)	0.8 (0.2)	1.1 (0.2)
Perceived behavioral control's mean score (SD)	2.6 (0.1)	2.5 (0.1)	2.5 (0.1)	2.8 (0.1)	2.6 (0.1)	2.6 (0.1)

** $p<0.01$.
Scores can range from -3 to +3.
Analysis is only among those who reported using at least one of these drugs.

On average, those who reported using stimulants felt that NMUPD is pleasant (mean = 0.8, SD= 1.5) and enjoyable (mean = 0.9, SD= 1.4) more than those who never used stimulants (mean = 0.1, SD = 1.7, t = -2.2, $p <0.05$ versus mean = 0.0, SD= 1.7, t = -2.9, $p < 0.01$ respectively). On the other hand, those who used stimulants felt that NMUPD was good (mean = 0.2, SD= 1.6), but those who never used stimulants felt that NMUPD was bad (mean = -0.8, SD= 1.6), and such difference was significant at alpha level of 0.01 (Table 63).

Those who never used stimulants felt that NMUPD is harmful (mean = -1.2, SD = 1.5) and irresponsible (mean = -1.4, SD = 1.4), on average, more than those who reported using stimulants (mean = -0.6, SD = 1.5, t = -2.1, p = 0.04 & mean = -0.5, SD= 1.4, t =-3.3, $p < 0.01$ respectively) (Table 63).

Table 63 Mean attitude score between those who used stimulants and those who did not. (Analysis among those who reported using at least one type of prescription drug)

	Ever used stimulant			
Items	**Yes (n= 49) Mean(SD)**	**No (n =57) Mean (SD)**	**t-value**	**P-value**
Irritating-Relaxing	0.7(1.5)	0.2(0.2)	-1.5	0.13
Unpleasant - Pleasant	0.8(1.5)	0.1(1.7)	-2.2	0.03
Unenjoyable -Enjoyable	0.9(1.4)	0.0(1.7)	-2.9	<0.01
Bad- Good	0.2(1.6)	-0.8(1.6)	-3.0	<0.01
Harmful- Not harmful	-0.6(1.5)	-1.2(1.5)	-2.1	0.04
Irresponsible- Responsible	-0.5(1.4)	-1.4(1.4)	-3.3	<0.01
Overall mean attitude score	0.3(1.2)	-0.5(1.3)	-3.1	<0.01

Although the mean perceived norms' score was not significantly different among the groups, those who used stimulants were less likely to think that most people like them do not use medications for nonmedical reasons (mean = 0.06 SD = 1.7), compared to those who never used stimulants (mean = 0.9, SD =1.4, t= 2.6, p=0.01) (Table 64).

Table 64 Perceived norms between those who used stimulants and those who did not. (Analysis among those who reported using at least one type of prescription drug)

	Ever used stimulant			
Items	**Yes (n= 49) Mean(SD)**	**No (n =57) Mean (SD)**	**t-value**	**P-value**
1.Most people who are important to me think I should NOT use medications for nonmedical purposes	1.2(1.5)	1.4(1.4)	0.5	0.6
2. Most people whose opinions I value would NOT approve my using of medications for nonmedical purposes	0.9(1.6)	1.3(1.5)	1.1	0.3
3. Most people whom I respect and admire DO NOT use medications for nonmedical purposes:	0.9(1.7)	1.1(1.5)	0.6	0.5
4. Most people, like me, DO NOT use medications for nonmedical purposes	0.06(1.7)	0.9(1.4)	2.6	0.01

Analysis of normative belief strengths showed that those who used stimulants did not believe that their close friends would not approve their NMUPD (mean = -0.2, SD = 1.9) while those who never used stimulants o believed, on average, that close friends would approve their NMUPD (mean = 0.6, SD = 1.6, t = 2.1, p < 0.05) (Table 65).

Table 65 Mean, SD, of normative belief strength (*n_i*) between those who used stimulants, and those who did not.

	Ever used stimulant			
Normative Referent	**Yes (n= 49) Mean(SD)**	**No (n =57) Mean (SD)**	**t-value**	**P-value**
Partner (spouse, girlfriend, or boyfriend)	0.5(1.7)	0.6(1.7)	-0.1	0.9
Close friends	-0.17(1.9)	0.6(1.6)	2.1	0.04
Doctor, nurse or pharmacist	2.1(1.5)	1.9(1.7)	-0.4	0.7
Family members	2.1(1.6)	1.5(1.9)	-1.7	0.1

Analysis of behavioral belief strengths showed that those who used stimulants believed that NMUPD would help them stay focused and improve their grades (mean = 4.8, SD = 1.9), while non-stimulant users did not believe that (mean = 2.7, SD= 1.7, t=-6.0, p <0.001). Non-stimulant users were less likely to believe that NMUPD will cause them physical health problems (mean = 4.3, SD = 1.7) and mental health problems (mean = 4.0, SD = 1.8) compared to non-stimulant users (mean = 5.2, SD = 1.4, p<0.01, mean = 4.8, SD = 1.4, p = 0.02 respectively) (Table 66).

Table 66 Mean, SD, of belief strengths (bi) between those who used stimulants and those who did not.

	Mean belief strength (b_i)			
	Ever used stimulants			
Behavioral belief	**Yes (n= 49) Mean(SD)**	**No (n =57) Mean (SD)**	**t-value**	**p-value**
Help me stay focused and improve my grades	4.8 (1.9)	2.7 (1.7)	-6.0	<0.001
Cause me physical health problems	4.3 (1.7)	5.2 (1.4)	2.9	<0.01
Cause me mental health problems	4.0 (1.8)	4.8 (1.7)	2.3	0.02
Cause me to be addicted	4.1 (2.0)	4.7 (1.9)	1.7	0.09
Get me arrested	3.7 (1.7)	4.2 (2.0)	1.4	0.17
Help me lose weight	3.1 (1.7)	2.7 (1.6)	-1.2	0.24
Help me get high and party	3.7 (1.9)	3.4 (2.0)	-0.85	0.4
Make me feel more socially accepted by my group	2.5 (1.5)	2.4 (1.7)	-0.41	0.7

Summary of Hypotheses Testing

All the above hypotheses testing were summarized in Table 67. The table included the hypothesis title, main statistical tests, major finding, and whether the hypothesis was supported or not supported

Table 67 Summary of hypotheses testing

Hypothesis	Finding (Table #)	Comment
$H_0$1: No significant difference exists in college students' intention to avoid NMUPD between the intervention and control groups.	Table 42 Results from t-test showed no significant difference between the intervention and control groups ($p = 0.97$)	Supported
$H_0$2: No significant difference exists in college students' attitude toward NMUPD between the intervention and control groups	Table 43 Results from t-test showed significant difference between the intervention and control groups ($p = 0.04$)	Not supported
$H_0$3: No significant difference exists in college students' perceived social norms of NMUPD between the intervention and control groups	Table 44 Results from t-test showed no significant differences between the intervention and control groups ($p = 0.34$)	Supported
$H_0$4: No significant difference exists in college students' perceived behavioral control of NMUPD between the intervention and control groups	Table 45 Results from t-test showed no significant differences between the intervention and control groups ($p = 0.68$)	Supported
$H_0$5: No significant difference exists in college students' behavioral beliefs of NMUPD between the intervention and control groups	Table 46 Results from t-tests showed no statistically significant differences between the intervention and control groups for any behavioral belief	Supported
$H_0$6: No significant difference exists in college students' normative beliefs of NMUPD between the intervention and control groups	Table 47 Results from t-tests showed no statistically significant differences between the intervention and control groups for any normative belief	Supported
$H_0$7: No significant difference exists in college students' control beliefs of NMUPD between the intervention and control groups	Table 48 Results from t-tests showed no statistically significant differences between the intervention and control groups for any control belief	Supported

Hypothesis	Finding (Table #)	Comment
$H_0$8: Negative attitude is not a significant predictor of college students' intentions to avoid NMUPD, after controlling for perceived norms and perceived behavioral control	Table 49 Results from multiple regression revealed that beta coefficient associated with attitude = -0.26 ($p < 0.001$)	Not supported
$H_0$9: Perceived norm is not a significant predictor of college students' intention to avoid NMUPD after controlling for attitudes and perceived behavioral control	Table 49 Results from multiple regression revealed that beta coefficient associated with perceived norms = 0.44 ($p < 0.001$)	Not supported
$H_0$10: Perceived behavioral control is not a significant predictor of college students' intention to avoid NMUPD, after controlling for attitudes and perceived norms	Table 49 Results from multiple regression revealed that beta coefficient associated with perceived behavioral control = 0.16 ($p < 0.05$)	Not supported
$H_0$11: Attitudes, perceived norms, and perceived behavioral control do not explain significant variance of college students' intention toward NMUPD	Table 49 Results from multiple regression showed that R2 associated with the model = 0.37 and p-value <0.001	Not supported
$H_0$12: The previous use of prescription drugs for nonmedical purposes does not increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms and perceived behavioral control	Table 53. Adding previous behavior increased the explained variance by 3%, and this change was significant ($p< 0.001$)	Not supported
$H_0$13: The intervention does not increase the amount of explained variance of intentions to avoid NMUPD, beyond that explained by attitudes, perceived norms, perceived behavioral control, and previous use of prescription drugs	Table 57 Adding the intervention assignment to the regression model did not increase the explained variance ($p = 0.16$)	Supported

Hypothesis	Finding (Table #)	Comment
$H_0$14: No significant relationship exists between college students' intention to avoid NMUPD and gender	Table 58 T-test showed that female students have higher intentions to avoid NMUPD compared to male students ($p = 0.02$)	Not supported
$H_0$15: No significant relationship exists between college students' intention to avoid NMUPD and race/ethnicity	Results from ANOVA were not significant ($F = 0.43$, $p = 0.83$)	Supported
$H_0$16: No significant relationship exists between college students' intention to avoid NMUPD and type of degree pursued (i.e. graduate, undergraduate, or professional degrees)	Results from ANOVA were not significant ($F = 2.1$, $p = 0.13$)	Supported
$H_0$17: No significant relationship exists between college students' intention to avoid NMUPD and sorority/fraternity	Results from t-test were not significant ($t = -0.47$, $p = 0.64$)	Supported
$H_0$18: No significant relationship exists between college students' intention to avoid NMUPD and housing (i.e. on-campus vs. off-campus)	Results from t-test were not significant ($t = 1.8$, $p = 0.07$)	Supported
$H_0$19: No significant relationship exists between college students' intention to avoid NMUPD and tobacco use	Table 59 Results from ANOVA were significant ($F = 6.31$, $p = 0.002$).	Not supported
H020: No significant relationship exists between college students' intention to avoid NMUPD and marijuana use	Table 61Table 60 Results from ANOVA were significant ($F = 19.2$, $p < 0.001$).	Not supported
$H_0$21: No no significant relationship exists between college students' intentions toward NMUPD and alcohol consumption	Table 61 Results from ANOVA were significant ($F = 7.4$, $p < 0.001$).	Not supported
$H_0$22: No significant relationship exists between college students' intention to avoid NMUPD and age at first use of NMUPD	Results from correlation test showed no statistically significant relation ($r = 0.14$, $p = 0.14$)	Supported

Hypothesis	Finding (Table #)	Comment
$H_0$23: No significant relationship exists between college students' intention to avoid NMUPD and the class of prescription drug used (stimulants, painkillers, or depressants)	Table 62 Results from t-tests showed that who reported using stimulants have significantly lower intentions to avoid NMUPD compared to those who used other prescription drugs nonmedically $p<0.01$	Not supported

CHAPTER FIVE: DISCUSSION AND CONCLUSION

In this study, the reasoned action approach was utilized to design and evaluate an educational intervention to influence students' intentions, attitudes, perceived social norms, and perceived behavioral control of the nonmedical use of prescription drugs. Two random sample of students'' emails were randomly assigned into either the intervention (educational website) or the control group (general health website). The study used two-group post-test only randomized experimental design. Both groups were also asked to fill out the same survey, which was designed in accordance with the reasoned action approach. Results from the survey were used to (1) evaluate the effectiveness of the website and to (2) test the predictive validity of the reasoned action approach in explaining NMUPD behavior among college students.

The discussion section presents a comprehensive interpretation of the study's results, implications, limitations, and future directions.

Response Rate for the Study and the Survey's Dissemination Process

The overall response rate for the study was about 10%, which is lower compared to other web-based surveys used to assess NMUPD among college students (Table 1). The low response rate for this study can be attributed to several reasons: (1) Time burden: Students were not only asked to fill out a survey, but also to view a website. The time needed to view the website can be as long as 30 minutes, which might discourage some students from participating in the study. (2) Survey dissemination: Several studies have shown that response rates from web-surveys are declining over years.[182,183] Generally speaking, response rates from mail surveys are higher than web-based surveys.[162] (3) Timing of survey dissemination: The invitation and first reminder emails were sent during the end of the semester (exams week), which may have prevented some students from participating. (4) Asking about sensitive issues: Illicit drug use, in general, and the nonmedical use of prescription drugs, in particular are considered sensitive topics. Questionnaires about drug use, sexual behavioral and income, generally, have lower response rates compared to questionnaires on other topics.[184] A sensitive topic, such as NMUPD, may not only reduce response rates but can make the results of the study vulnerable to social desirability bias. This type of bias may occur when respondents answered questions in a manner that is perceived as socially acceptable.[185] Social desirability bias may cause some respondents to under-report socially unacceptable behaviors such as heavy alcohol drinking, tobacco use, frequent marijuana use, and NMUPD.

A major concern associated with low response rate is non-response bias. This bias occurs when those who chose to respond may differ significantly from those who chose not to respond. Non-response bias reduces the generalizability of a survey's results.[186] However, an analysis was done to see if the demographic characteristics, intention to avoid NMUPD, attitudes, perceived norms, and perceived behavioral control are different between early and late responders. The details for this analysis are described in chapter 4 under the section “Differences between Early and Late Responders.” Early responders were found to be similar to late responders, and, consequently, the possibility for non-response bias is reduced.

It was noticed during the dissemination of survey that the number of responses varied by day. The highest number of responses was recorded during the days when an invitation or reminder was sent. However, the number declined sharply on other days. This phenomenon has also been noticed in other studies as well.[187,188] The response rate for the control group was slightly higher than the intervention group. This may be because it took longer to view the educational website (intervention group) than the general health website (control group).

Demographic Characteristics of the Sample

This section describes the characteristics of our final sample and assesses its representativeness to the overall UNM students’ characteristics. More female students (61%) responded to the survey than male students (39%). Many studies show that gender can influence response rate in online surveys. Generally speaking, females are more likely to participate in online surveys than males.[189,190] Another possible justification for this gender variation in response rate is that there are more female students (55%) than male students (45%) at UNM. This is a reflection of the typical gender distribution in the US colleges, as women are currently the majority of college students.[191] Results from the US

Census Bureau also show that more women than men are earning college degrees.[192]

The average age for respondents in the overall sample (28.6 years) was similar to the average age of UNM students (28.0 years). However, the race distribution for respondents was different. Unlike race distribution at UNM [(Hispanic (40%), and White (39%)], most study respondents identified themselves as Non-Hispanic White (48.3%) followed by Hispanic (30.7%). A possible explanation for such discrepancy is that White individuals, in general, were found to participate in surveys more than non-White individuals.[193,194]

More undergraduate students (61.6%) took the survey than graduate (28.4%) and professional degree students (10%), which is a fair reflection of the degree's distribution at UNM [undergraduate (71%), graduate (16%), and professional degree students (13%)]. This also reflects the typical characteristics of the US postsecondary students. Reports from the national center for education and statistics (NCES) indicated that in fall 2013, there were more students enrolled in undergraduate than graduate programs in the United States. Specifically, there were 17.5 million undergraduate students and 2.9 million graduate students (enrolling in master's and doctoral programs, and programs such as medicine, dentistry, pharmacy and law programs).[195]

Overall, the study sample reflected the underlying distribution of UNM students for gender, age, and the degree pursued. However, race distribution was slightly different; non-Hispanic White students were over-representative in our sample compare to Hispanic students. The disproportionate representation of non-Hispanic White could have affected the findings of our study.

Rate of NMUPD in the Sample, Specific Prescription Drug's Category, and Motives for Nonmedical Use

In the current study, approximately 30% of respondents indicated that they used prescription drugs for nonmedical reasons at least once in their lifetime. This rate is not surprising given the high prevalence of substance abuse in New Mexico. Unfortunately, there is limited data regarding the exact rate of lifetime NMUPD among college students nationally. Data from Monitoring the Future (MTF) study examined NMUPD among college students and found that the lifetime prevalence of use for narcotics other than heroin to be 9.9%, amphetamines to be 15%, sedatives to be 5.9%, and tranquilizers to be 6.9%.[11] However, there are several issues related to this data: First, their definition of the nonmedical use has changed over the years. Second, the "street" drugs and prescription drugs were combined for some categories such as combining Adderall® (amphetamine and dextroamphetamine) with crystal methamphetamine under the same category (amphetamines). Third, there was no question related to the lifetime prevalence of the nonmedical use of any prescription drug. Data regarding NMUPD among college students from NESARC and NSDUH also have similar limitations.[4]

A recent study conducted by McCabe et al. (2014) among 21,771 undergraduate college students (over six-year period) found that the lifetime prevalence of NMUPD of any prescription drug was 19.4% and the past year use of any prescription medication was 13%.[27] Results from our study showed higher lifetime prevalence of NMUPD among UNM students (30%) but similar past year use (13%). In order to confirm such high prevalence of NMUPD, the study should be replicated among several other samples.

Regarding the specific prescription drug category used for nonmedical purposes, the highest lifetime prevalence of NMUPD in McCabe and colleagues' study was for stimulants (12.7%), followed by pain medications (8.8%), and lastly sedative/anxiety medications (5.4%).[27] This pattern is different from what had been found in our study, where the rate of nonmedical use of painkillers (18%) was higher than stimulants (13%) and depressants (10.5%). In fact, among the studies that explored pain medications, prescription stimulants, anxiolytics, and sleep medications, it has been found consistently that the illicit use of pain medications and stimulants exceeded anxiolytics and sleep medications.[69,75,85,87] However, there were inconsistencies regarding whether pain medications or stimulants have higher abuse rates. Some studies found that illicit use of pain medications to be higher than stimulants,[69,75,85,87] and other studies found the opposite scenario.[29,62,77,88,89]

The findings from the present study are not surprising; given that the rate of nonmedical use of opioid pain relievers in Albuquerque Metropolitan Statistical Area (MSA) is higher than the national rate; and the past year nonmedical use of opioid analgesics by adolescents in NM is among the top ten highest rates in the US.[30,33]

Most respondents indicated that their NMUPD motive was for self-medication, followed by studying for exam, and party with friends. Only a small percentage (5.2%) indicated that they used prescription drugs nonmedically to lose weight. These findings are reasonable because the most frequently used drugs in the sample were painkillers (which are used to relief pain) followed by stimulants (which are typically used to enhance academic performance).[65] Many studies found that attending college is a significant predictor for nonmedical use of prescription stimulants.[13,65,81] One study reported that the first nonmedical use of prescription stimulants started at colleges settings for the majority of cases.[65]

Recreational uses of prescription drugs were also among the common reasons as reported by other studies.[63,64,66,100,103] Using prescription drugs for recreational purposes includes the possibility of mixing them with alcohol to get high and party, which can lead to lethal consequences. Some students also listed other reasons for NMUPD in the free-text option such as “to go to sleep,” “to get high,” “to concentrate” and “to try it out.”

Predictors of the NMUPD and Implications for Addressing the Problem

The characteristics of nonmedical users of prescription drugs were compared to non-users. In the present study, the significant predictors for NMUPD were race, tobacco use, alcohol consumption, and marijuana use. There were no significant differences according to age, gender, type of degree pursued, and living on-campus, being a member of sorority, or being a student in the HSC.

Some of our findings are different from other studies. For example, most studies showed significant gender variations in NMUPD. Compared to female students, male students were more likely to report nonmedical use of prescription drugs.[75,93,104,105,110] Additionally, many studies revealed that Greek membership (sorority/fraternity groups) was a risk factor for NMUPD. In the present study, the reason for not finding a significant association between being a member of fraternity/sorority and NMUPD is that only 18 respondents were members of such groups. Little appears in the literature regarding the association between NMUPD and living arrangement, type of degree pursued, and being a student in any health sciences-related colleges. Future research should examine these demographic characteristics to provide conclusive evidence about their association with NMUPD.

Similar to findings from our study, consistent evidence from the literature exists that White college students have higher NMUPD rate compared to other races. [66,93,104,110,66] In our study, the higher rates of the NMUPD among White college students compared to other races may be a reflection of racial differences in prescription drug use among secondary school students.[196] Another possible explanation is the fact that some physicians prescribe these medications to patients differently dependent on their race/ethnicity. For example, one study based on retrospective national survey data over 13 years found that White patients with pain were more likely to receive an opioid analgesic compared to other racial groups.[197] Racial differences were also observed in prescribing rates of benzodiazepines[198] and stimulants. [199]

Similar to our findings, other studies have shown that those who used prescription drugs for nonmedical reasons were also more likely to report binge drinking, tobacco and marijuana use.[81,88,104] There are some common psychological issues related to NMUPD and other illicit drug uses that might explain their concomitant use. Examples of those common psychological issues include sensation seeking, impulsivity, low-risk perception, depression, and mental illnesses.[13,62,74,87,103,111–113] The association between the NMUPD and substance abuse is further discussed later in this chapter.

The findings from our survey about the prevalence and predictors of NMUPD have several important implications that may help addressing the problem. The high lifetime prevalence of NMUPD among the study sample might be a reflection of the increased prescribing rates of opioid analgesics, stimulants, and depressants in the US.[197–199] High prescribing rates of these drugs is due to increased diagnosis, awareness, and treatment of the related medical conditions such as chronic pain, ADHD, and depression. Clearly, a balance is needed between making these prescription drugs available for patients diagnosed with these medical conditions and reducing the potential of abuse. HCPs should educate patients who need any of these medications about the potential for addiction and instruct them about proper storage and disposal. HCPs may also recommend to patients that they limit telling their friends or peers about their prescription drugs to reduce the possibility of stealing or diversion.

The findings from the survey indicated that the NMUPD was higher among certain subgroups of students, in particular students of the White race, current tobacco users, frequent alcohol drinkers, and frequent marijuana users. These findings have important implications for college campus administrators; as such students are the ones who require most attention and prevention efforts. In addition, the findings provide evidence that the NMUPD problem is part of a larger issue of drug abuse and risky behaviors among college students. Prescribers in student health centers should be advised to use drugs with less abuse potential, such as non-steroidal anti-inflammatory drugs, for patients with chronic pain who are at risk for substance abuse.[200] Prescribers should also be advised to provide only enough prescription pills to manage the medical condition effectively and avoid prescribing more pills than needed.

The Impact of the Intervention on Students' Intentions, Attitudes, Perceived Norms, and Perceived Behavioral Control toward NMUPD

Analysis of students' intentions showed that both the intervention and control groups had high intentions to avoid NMUPD (Intervention: Mean = 2.2, SD = 1.4, Control: Mean =2.2, SD =1.4, possible range -3 to +3). These results are positive and encouraging, as they suggest that most students in both the intervention and control groups had no intention of NMUPD in the future. The results may also reflect the fact that most respondents (70%) never used prescription drugs for nonmedical purposes in the past, and therefore have no intentions to do so in the future.

Contrary to our hypothesis, the intervention did not cause changes in intentions between the intervention and control groups. There are four reasons for the lack of statistically significant differences in intentions between the two groups: First, the overall sample comprises mostly those who never used prescription drugs for nonmedical reasons in the past (70%), and consequently may have no intentions to do so in the future. An analysis to evaluate the effectiveness of the website was restricted only to those who reported previous NMUPD ($n = 106$) showed that students in the intervention group have higher intentions to avoid NMUPD in the future (mean = 1.3, SD =1.7, $n = 50$) compared to students in the control group (mean = 1.0, SD = 1.7, $n = 56$). However, this difference was not statistically significant ($p = 0.43$, effect size (Cohen's $d = 0.18$)). A power analysis conducted based on this effect size ($d = 0.18$) and power of 70% showed that at least 382 students are needed in each group to find statistically significant differences between the two groups. Recruiting a larger sample size and restricting the intervention only to those who have a history of NMUPD might have led to significant differences between the two groups.

Second, tracking the utilization of the website showed that the bounce rate (the visits in which a person left the website from the home page without engaging with the page) was as high as 77%, and the average session duration was 3:48 minutes. This was insufficient time to view the whole website, which would take approximately 20 to 30 minutes. Therefore, the effectiveness of the website in influencing students' intentions was reduced.

Third, by looking at results from hypotheses testing, it is clear that the underlying primary behavioral, normative, and control beliefs were not significantly changed between the intervention and control groups. Consequently, the intervention failed to produce any statistically significant changes in intentions.

Fourth, there is inconsistent evidence regarding the usefulness of theory-based interventions in influencing behavior change. [201,202] Challenges of applying theories in behavior-change interventions, as suggested by Brug et al. (2005), include the lack of a strong empirical foundation for some of these theories, and failing to use theories in the most effective way in the development of interventions. Furthermore, most of the commonly used theories “provide at best information on *what* needs to be changed to promote healthy behavior, but not on *how* changes can be induced” (Brug et al., 2005). Finally, “many theories explain behavioral intentions or motivation rather well, but are less well-suited to explaining or predicting actual behavior or behavior change” (Brug et al., 2005).[203]

The intervention was successful in causing changes in attitudes. Students in both the intervention and control groups had negative attitudes toward NMUPD. However, students in the intervention group had significantly lower negative attitudes score (mean = -1.4, SD = 1.4) toward NMUPD compared to the control group (mean = -1.1, SD = 1.4, p = 0.04). Particularly, students in the intervention group considered NMUPD to be unpleasant, unenjoyable, and bad, significantly, more negatively than the control group.

The change in descriptive norms between the two groups showed a clear tendency toward significance (p = .052); i.e., students in the intervention group were more likely to think that people like themselves, or people they respect and admire do not use medications for nonmedical reasons (mean = 1.8, SD = 1.3) compared to the control group (mean = 1.5, SD =1.4). This change in descriptive norms in the current study is a moderate effect size (Cohen's *d* = 0.21) between the control and intervention groups. A power analysis was conducted to find how many subjects are needed to achieve significant differences between the two groups given an effect size of 0.21 and a power of 70%. The minimum number of respondents needed in each group was found to be 281, about 120 more respondents per group. Students in the intervention and control groups had positive injunctive norms, i.e., both agreed that their important referents would not approve their NMUPD. There was no significant difference between the two groups.

In addition, no significant difference existed between the two groups with regard to perceived behavioral control. This can be tracked to the manner by which the website was utilized. The number of students who viewed pages related to influencing student norms and perceived behavioral control was low and, therefore, the effectiveness of the website was reduced in bringing changes to the PBC. Due to the anonymity of the survey it was not possible to correlate responses with number of pages viewed.

Although some studies have utilized the reasoned action approach to understand NMUPD among college students,[68,71,204] to our knowledge, no studies used this framework to develop an intervention to change students' intentions or behavior regarding NMUPD. More empirical research is needed to identify the best strategies to reach students who reported NMUPD, and the best ways to influence their intentions and ultimately their behavior.

Combined Effects of Attitudes, Perceived Social norms, and Perceived Behavioral Control on Intentions to Avoid NMUPD among College Students

The second main objective of the study was to evaluate the predictive validity of the reasoned action approach in understanding NMUPD among college students. For this reason, data from both the intervention and control group were combined into one overall sample.

In the current study, the multiple linear regression analysis was used to investigate the predictive validity of the theory in understanding students' intentions. Intention was regressed on attitudes, perceived norms, and perceived behavioral control. As can be seen from Table 49, the multiple correlation R was 0.61, which indicates that attitudes, perceived social norms, and perceived behavioral control concurrently accounted for 37% (R^2) of the variance in intentions to avoid NMUPD by college students. This explained variance is significant, encouraging, and it would be described as "large" effect size in Cohen's terms for multiple R^2.[205] Furthermore, this variance is very close to the weighted average variance of 39% produced by a meta-analysis of the studies that utilized the TPB (an earlier version of the reasoned action approach) to predict behaviors.[37] The explained percentage of variance in our study is similar to that obtained by Ponnet and colleagues (37%) to understand students' intentions to use a stimulant for academic purposes,[70] and McMillan and Conners' review for students' intentions to use LSD (39.4%), and amphetamines (45%).[206]

A systematic review of studies that apply the TPB (an earlier version of the reasoned action approach) to understand illicit drug use among students found that the TPB, on average, explained 49% (mean R^2) of variance in intentions and 45%(mean R^2) of the variance in behavior.[206] The TPB was also useful in predicting students' use of alcohol and tobacco.[175] Overall, the reasoned action approach and its earlier versions (TPB, TRA) are appropriate and useful frameworks for predicting students' drug abuse related behaviors.

It can be seen from Table 49 that each of the three predictors of intention correlates significantly with intention ($p<0.001$). These correlations were -0.5 for attitudes, 0.55 for perceived social norms, and 0.19 for perceived behavioral control. The highest regression coefficient was associated with perceived social norms (beta = 0.44), followed by attitudes (beta = -0.26), and lastly by perceived behavioral control (beta = 0.16). This significant association between attitudes, norms, perceived behavioral control, and intentions to avoid NMUPD is consistent with the results of two previous studies that examined the misuse of prescription stimulants among college students using the TPB.[68,204] However, a study conduct by Gallucci et al. (2014) did not find a significant association between misuse of prescription stimulants and attitudes and subjective norms.[71]

The Galluci et al. study is different from our study for two reasons: (1) Gallucci and colleagues only measured the misuse of prescription stimulants, and (2) they did not assess intentions but assumed that any respondent who indicated misusing prescription stimulants intended to do so in the future. [71]

The results from multiple linear regression indicated that each predictor (attitudes, norms, and perceived control) contributed independently to the prediction of intention. The highest contribution for the prediction of intention was for social norms, followed by attitudes, and finally by perceived behavioral control. The high impact of perceived social norms on students' intention was also observed with similar behaviors, such as using stimulants for academic performance and enhancement (beta = 0.45)[70] and other behaviors such as driving after drinking alcohol (beta = 0.41)[207] and condom use (beta = 0.36).[208]

Perceived Social Norms regarding NMUPD

Perceived social norms were evaluated by directly asking two questions that assessed injunctive norms (respondents' perception of others approval or disapproval of NMUPD) and two other questions that assessed descriptive norms (respondents' perception about the extent to which others are using prescription drugs nonmedically). The results from the current study indicated that most of the variance of students' intentions to avoid NMUPD was explained by perceived social norms, followed by attitudes and finally by perceived behavioral control. The same trend was observed in a previous study that utilized the theory of planned behavior to understand students' intentions to use stimulants for academic performance enhancement.[70]

The nonmedical use of prescription drugs by college students is not the only behavior that is influenced by social norms; other behaviors, such as alcohol misuse, marijuana smoking, and illicit drug use are also socially influenced.[209] College students generally tend to overestimate their peers' nonmedical use of prescription stimulants, nonmedical use of opioids, marijuana use, and alcohol consumption.[82] These misperceptions need to be corrected by future interventions.

In our intervention, we targeted normative misperceptions by emphasizing that nonmedical use of prescription drugs by college students is not as common as they might think. For example, the following paragraph was used in the intervention to influence students' norms regarding NMUPD:

> It is important to recognize that nonmedical use of prescription drugs is not the norm and not everyone is doing it. Most college students understand that it is never OK to use prescription drugs without prescription or for nonmedical purposes. College students overestimate the prevalence of nonmedical use of prescription drugs by their peers. Majority of students thought that their peers are using prescription stimulants for nonmedical reasons, in reality only a small percentage of students do that.

Unfortunately, no theoretically-based interventions have been used to reduce NMUPD among college students. Moreover, the mass media, such as films and popular music, contributes negatively to the issue of NMUPD by portraying and promoting drug use thereby increasing the social acceptability of drug use and consequently misuse.[210] Therefore, future research and prevention programs should strive to correct these misperceptions in an attempt to reduce

NMUPD among college students. Similar interventions based on correcting misperceptions of peers' norms have been shown to be successful in reducing alcohol misuse among college students. [211–213]

The role of Normative Beliefs

In this study, normative belief strengths were assessed with respect to four referents (partners, close friends, healthcare professionals, and family members) as shown in Table 51. Each of these four normative referents significantly influenced intentions to avoid NMUPD. Overall, students believed that these referents would not approve their NMUPD. Therefore, close friends, partners, HCPs, and family members could be targeted by interventions to influence college students' decisions regarding NMUPD.

The highest correlation of intentions to avoid NMUPD was with the $n_i m_i$ (injunctive normative belief x motivation to comply) index for close friends, followed by partner, doctor and nurses, and finally by family members. This result is in alignment with previous studies that found a significant association between friend/peer approval or disapproval of substance abuse and NMUPD among youth.[214,215] Similarly, close friends' substance abuse is one of the strongest and most consistent predictors of the NMUPD by young adults.[28,112,215,216]

Within the interpersonal context, the study results indicated that the partner (spouse, girlfriend, or boyfriend) also affected students' intentions to avoid NMUPD. When it comes to matter of health, most respondents (70%) were likely to comply with what their partner would want them to do. Furthermore, 72%

thought that their partner would not approve their NMUPD. Recently, partners' substance abuse behaviors among young adults have received increasing attention. A previous study among first year college students indicated that their partners' smoking behavior was strongly and positively associated with their likelihood of smoking.[217] Elsewhere, the propensity for partners to influence each other's health decisions and substance use behaviors is well-documented.[218–220]

When it comes to matters of health, 89% of respondents were motivated to comply with what their HCPs wanted them to do and 90% believed that their HCPs would not approve their NMUPD. Knowing that students are likely to follow the directions from their HCPs, these findings have important implications for preventions. HCPs can provide critical information about proper use and disposal of prescription medications for college students and advise them not to share these medications with their friends or family members. HCPs may also recommend that college students limit sharing information about their possession of these drugs to reduce the risk of theft and diversion. Before prescribing opioids, stimulants, or depressants, the treating provider should try medications with less abuse potential or non-pharmacological remedies. If long-term therapy is necessary, it should be conducted under close monitoring and frequent follow-ups. Previous studies found that interventions implemented by HCPs are successful in reducing substance abuse.[221–223] For example, a brief intervention and screening program implemented by physicians and nurses in community-based settings have proven to be effective in reducing alcohol use, healthcare utilization, and associated costs.[221,222]

In this study, family members were also found to be important referents for students' intentions to avoid NMUPD. Approximately, 90% of respondents believed that their family members would not approve their NMUPD. Previous studies have shown that parental monitoring and involvement dissuaded students from NMUPD.[224–226] Similarly, there is a significant association between parental disapproval and less NMUPD. One study found that students who reported more lenient parental disposition toward substance use were more likely to indicate using prescription drugs nonmedically in the past year.[215] Furthermore, family history of substance abuse is an established risk factor for NMUPD among young adults.[227] Most young adults reported obtaining prescription drugs from a friend or a family member.[228] Accordingly, intervention efforts could target parents to emphasize the importance of supervision, monitoring, and parent-child communication to prevent risky behaviors.[28]

Students who did not intend to avoid NMUPD were significantly less motivated to comply with their referents compared to intenders. This observation can be explained by the fact that students who have intentions to engage in risky behaviors such as NMUPD might be rebellious and, therefore, are less motivated to comply with their important referents.[159]

Students intending to avoid NMUPD were more likely to believe that their partner, HCPs, and family members would not approve their NMUPD than those not intending to avoid NMUPD. However, both groups held opposite beliefs in one instance; whereas intenders agreed that their close friends would not approve their nonmedical use, non-intenders disagreed. The differences in normative beliefs between intenders and non-intenders may be attributed to differential interpersonal social dynamics of these two groups.[28]

Attitudes toward NMUPD

The second major determinant of the NMUPD by college students from the current study was attitudes. For the purpose of this study, attitudes toward NMUPD were assessed via a set of six-item evaluative semantic differential that included three experiential adjective pairs (e.g., unenjoyable-enjoyable) and three instrumental adjective pairs (e.g., bad-good). Attitudes significantly predicted intentions to avoid NMUPD independent from social norms and perceived behavioral control. Most of the students in our randomly selected sample held negative attitudes toward NMUPD (mean = -1.3, SD = 1.4, possible range: -3 to +3). Students believed that NMUPD was irritating, unpleasant, unenjoyable, bad, harmful, and irresponsible. This is very encouraging and promising, however, there were some variations in the magnitude of these negative attitudes. Most notably, was the difference in attitudes between those who reported NMUPD and those who never reported NMUPD. Students who never reported NMUPD in the past had significantly lower mean attitude score (mean = -1.7, SD = 1.2) compared to students who reported NMUPD (mean = -0.2, SD = -1.3, $p < 0.001$). Another interesting observation was that students who used stimulants nonmedically had positive attitudes toward NMUPD compared to non-stimulant users. This is consistent with a previous study that found that students tend to have favorable attitudes toward using stimulants.[204] Another study found that the higher the positive attitudes toward stimulant use, the greater the intentions to take them to enhance academic performance.[70]

Future interventions should focus on changing neutral and favorable attitudes toward NMUPD into unfavorable ones. Changing attitudes might be more challenging with nonmedical users of stimulants because they viewed them as harmless and beneficial. The underlying behavioral beliefs must first be changed in order to achieve changes in attitudes. The intervention from the current study challenged the beliefs that prescription drugs are safer and less addictive than illicit street drugs. Specifically, for the nonmedical use of prescription stimulants, the following paragraph is directly quoted from the intervention:

> Actually, college students who use stimulants without a prescription have been found to skip classes, spend more time in social activities and less time studying. Many studies have shown that the nonmedical use of prescription stimulants is correlated with lower grades.

Findings from our study revealed that both students in the intervention and control groups held negative attitudes toward NMUPD. However, students in the intervention group had significantly more negative attitudes ($p < 0.05$) toward NMUPD. This provides evidence that our intervention was successful in changing attitudes toward NMUPD.

The Role of Behavioral Beliefs

Table 50 shows the impact of behavioral beliefs on intentions to avoid NMUPD. Eight behavioral beliefs were assessed: NMUPD help me stay focused and improve my grades, cause me physical health problems, cause me mental problems, cause me to be addicted, get me arrested, help me lose weight, help me get high and party, and make me feel more socially accepted. Except for the belief that NMUPD may help in losing weight, all *(b x e)* products [behavioral belief strength *(b)* and outcome evaluations *(e)*] correlated significantly with intentions.

The strongest correlation coefficient was observed with the belief that "NMUPD will help me stay focused and improve my grades." As might be anticipated, the more students believed that the NMUPD would help them stay focused and improve their grades, the less likely that they have the intentions to avoid NMUPD.[229] On the other hand, beliefs that NMUPD causes physical health problems, mental health problems, addictions, or get them arrested were strongly but positively correlated with intentions to avoid NMUPD. Similar to our findings, previous studies have found that greater perceived risk or harmfulness predict illicit drug use.[28,61,97,216,230] For example, in a study by Arria and colleagues (2008), individuals who have low-perceived sense of harmfulness from stimulants and analgesics were 10 times more likely to engage in NMUPD compared to those with high-perceived risk of harmfulness.[61]

The two beliefs that negatively correlated with intentions to avoid NMUPD were "using prescription drugs for nonmedical reasons will help me get high and party" and the belief that "NMUPD will make me feel socially accepted by my group". Elsewhere, it has been found that individuals seeking excitement from drugs were more likely to have low-risk perceptions and high rates of NMUPD.[28,61] Quintero (2009) suggested three reasons for recreational uses of prescription drugs by college student: First, these drugs are widely available and easy to acquire. Second, students perceived these drugs with low physical, legal, and social consequences. Third, it might be a way to increase the sense of belonging with their social networks.[63]

In the overall sample, results from hypotheses testing showed that students who were intending to avoid NMUPD believed that NMUPD would get them arrested and cause them to be addicted, while non-intenders did not believe so. Also, while non-intenders agreed that NMUPD would help them stay focused and improve their grades, intenders to avoid NMUPD did not agree. Consequently, future interventions should tailor messages differently for those intending to avoid NMUPD and those not intending to do so. Future interventions should highlight the risk of addiction from prescription drugs and the possibility of legal consequences.

Perceive Behavioral Control over NMUPD

Perceived behavioral control was assessed by asking respondents two seven-point questions about "whether it is completely up to them to use or not to use prescription drugs for nonmedical purposes" (strongly disagree-strongly agree), and "if using medications from nonmedical purposes is under their control" (strongly disagree-strongly agree). The results of our study showed that students strongly believed that it was completely up to them to use or not to use prescription drugs for nonmedical purposes and highly perceived using medications for nonmedical purposes under their control. There was no significant difference between the intervention and control groups with regard to perceived behavioral control. Moreover, the perceived behavioral control had the lowest significant weight in the regression model, and the control beliefs had no significant correlation with intentions to avoid NMUPD.

The results from the current study are different from another study, which examined the nonmedical use of stimulants among college students using the same theoretical framework. In their study, Gallucci et al. (2015) found that perceived behavioral control carried most of the weight in the regression analysis in predicting misusing prescription stimulants.[71] However, their study did not assess intention, instead they assumed that anyone who reported misusing prescription stimulants in the past have the intention to do so in the future. This assumption is not necessarily true, considering that the correlation between intentions and past behavior may not be much higher than 0.47.[37] Moreover, the items that they used to assess perceived behavioral control were not constructed according to the reasoned action standard questionnaire.

The low contribution of perceived behavioral control to the prediction of intention can be explained by the high volitional control regarding NMUPD in the overall sample (mean = 2.6, SD = 0.9, range: -3 to +3), and both the intervention (mean = 2.6, SD = 0.8) and control groups (mean = 2.6, SD = 0.8). Because college students' intention to avoid NMUPD is under complete volitional control, measuring perceptions of control did not make a significant contribution to the overall prediction of intentions to avoid NMUPD. Similarly, a study examined taking vitamin supplements among college students, found that the perceived behavioral control did not add much to the prediction of behavior.[231] This is because taking vitamin supplements was perceived to be under the individuals control to a high degree. Conversely, because students perceived relatively little control regarding quitting smoking, the measurement of perceived behavioral control significantly increased the variance in predicting smoking behavior significantly.[159]

Another possible explanation for the low contribution of perceived behavioral control on the prediction of intentions is the relatively small associated variance (SD =0.9). It is likely that the perceived behavioral control has about the same influence on the intentions for every individual, and therefore, cannot account for the observed variance in students' intentions.

The Role of Control Beliefs

The most important control beliefs determining perceived behavioral control regarding NMUPD were having a legitimate prescription for the drug, having a friend with a prescription drug, easy access to prescription medications, and being offered a prescription drug by a friend or a family member. Most respondents (79%) thought that having a legitimate prescription would make it easier for them to use these drugs nonmedically. Having a legitimate prescription may increase the risk of misuse if individuals are overusing their medications to manage symptoms without referring to their physicians. Such misuse increases the risk of dependence and addiction.[14] Also, in the current study, a majority of students believed that having a friend with a prescription (78.4%), an easy access (84.8%), and being offered a prescription drug by a friend or a family member (82.%) would make it easier to use prescription drugs nonmedically. Previous studies have shown that students who reported NMUPD, usually, have one or more friends who misused a prescription drug in their social network.[67,88,100] A study found that by year four of college 62% of students reported being offered a prescription drug.[156] These findings have important implications for prevention strategies. Poor refusal skills were found to be associated with more risk-taking behaviors such as drug and alcohol abuse.[232] Therefore, enhancing perceived personal competence to resist drug offers should be an important component of prevention strategies.

Both intenders and non-intenders to avoid NMUPD believed that they had good control over having a legitimate prescription for the medications, having easy access to prescription medications, having friend with a prescription a medication, being offered a prescription medication by a friend or a family member. However, both intenders and non-intenders had a slighter control over having health insurance, getting behind in schoolwork, facing a stressful personal situation, and being a member of social fraternity/sorority group. No significant differences between intenders and non-intenders were found for any of the control belief. This suggests that, overall, college students have high level of perceived behavioral control over NMUPD, regardless of their intentions toward the nonmedical use of prescription drugs. Looking at Table 40, it is evident that there is no significant correlation (p =0.08) between the control belief-based measure of PBC and intentions to avoid NMUPD. This might suggest that prescription drugs are generally available and accessible to college students, and their intentions to use prescription drugs for nonmedical reasons are largely determined their attitudes and perceived norms.

Today, there seems to be a wide environmental availability, accessibility, and even acceptance of prescription drug use among the public and, particularly, among college students. Medicalization, where normal life issues such as stress and fatigue are now being treated as medical problems greatly facilitates the possibility of nonmedical use of prescription drugs leading to what is known as "pill-popping culture." [66] Thus, preventive strategies at the policy level should ensure that prescription drugs are only accessible to those who need them.

Furthermore, physicians should be advised to not prescribe these medications in excess, reduce the duration of treatment, prescribe controlled drugs only for those who really need them, and try to start first with safer and less addictive drugs. Pharmacists can have roles by screening patients and identifying individuals who may be having drug abuse problems, and referring them to get an appropriate evaluation and treatment. Pharmacists should also discourage any prescribing behavior that facilitates drug misuse behavior, such as prescribing greater quantities than needed painkillers for short-term pain.[233]

College students, as patients, should be encouraged to take these medications only as prescribed by their doctors, not to take more than the prescribed dose, not to use another's student prescription, and to dispose drugs properly.

Students Intentions to Avoid NMUPD and the Role of Past Behavior

In the overall sample, students had high intention to avoid NMUPD with a mean score of 2.3 (SD = 1.4, possible range is -3 to +3). The reason for such high intention score may be that the sample was comprised mainly of students who had never used prescription drugs for nonmedical reasons in the past (70%) and, consequently may have no intention to do so in the future. This provides an evidence for the importance of measuring past behavior in predicting intentions. Furthermore, results from hypotheses testing showed that the addition of the past NMUPD construct to the regression model significantly improved the prediction of intention beyond that was explained by attitudes, norms, and perceived behavioral control. These results confirmed the findings from previous studies in which the addition of past behavior improved the prediction of intention.[234–238] Therefore, past NMUPD should be included in the theoretical models studying college students' intentions for NMUPD.

Clearly, our sample was composed of two different subpopulations, those who reported NMUPD in the past and those who never reported NMUPD. Results from t-tests showed that students who reported NMUPD in the past had significantly lower intentions to avoid NMUPD in the future (mean = 1.2, SD = 1.7) compared to those who never reported NMUPD (mean = 2.6, SD =1.0). They also had less negative attitudes and lower perceived social norms that others would not approve their NMUPD. Students who reported NMUPD in the past were less likely to believe that the NMUPD would cause them physical problems, mental problems, addiction, or get them arrested. In addition, they were less likely to agree that their referents would not approve their NMUPD. These findings highlight the importance of targeted communication to enhance the relevance of health messages to the intended population. Gaining more information about the intended recipients increases the relevancy of health messages to them.[239]

Gender Variations in Intentions to Avoid NMUPD

Gender variations were observed with regard to intentions to avoid NMUPD. Female students had significantly higher intention to avoid NMUPD compared to male students. There were also significant differences between male and female students with regard to attitudes and perceived norms, but not with perceived behavioral control. Apparently, peer pressure played a more important role for women than men to avoid NMUPD and women viewed NMUPD more negatively than men did. Likewise, a previous study found that female students had lower intentions to use stimulants for academic improvement purposes, less positive attitudes, and lower subjective norms scores compared to male students.[70] Similarly, several other studies confirmed that males were more likely than females to report NMUPD.[93,97,105,200] A study by Teter et al.(2005), however, found no gender differences in NMUPD.

Gender variations were also observed with other behaviors such as eating sweet snacks, where perceived social norms carried more weight than attitudes for female rather than male students. [240] Conversely, perceived social norms played a larger role in influencing males' drinking behavior than females'. [241]

More research is needed to verify whether college-age females or males are more vulnerable to peer pressure. Understanding gender differences in intentions, norms, attitudes, and perceived behavioral control may help shape gender-specific interventions to reduce NMUPD by both female and male students.

Differences in Intentions, Attitude, and Perceived Norms by the Category of Prescription Drug Used

Restricting the analysis only to those who reported NMUPD showed that stimulant users had significantly lower intentions (mean = 0.6, SD = 1.9) to avoid NMUPD in the future compared to non-stimulant users (mean = 1.7, SD = 1.3). There were no significant differences in mean intentions' score between painkillers users and non-users, and between depressant users and non-users.

Stimulant users had substantially different attitudes from non-stimulant users. While stimulant users, on average, held favorable attitudes (mean = +0.3, SD = 0.2) toward NMUPD, non-users had unfavorable attitudes (mean = -0.5, SD = 0.2, $P < 0.01$). Although both stimulant and non-stimulant users considered the NMUPD to be harmful and irresponsible, non-stimulant users held these attitudes more negatively than stimulant users. On the other hand, while stimulant users considered NMUPD as a good behavior, non-stimulant users considered NMUPD as a bad behavior.

Analysis of behavioral belief strengths and perceived norms showed substantial differences between stimulant users and non-users. To our knowledge, no known study had conducted head-to-head comparisons of students' characteristics and beliefs among the different prescription drug users. Data from laboratory animal and human studies found marked differences in the behavioral and physiological mechanisms underlying stimulant and opiate addictions. [242] Clearly, more research is needed to investigate differences in attitudes, norms, perceived behavioral control and intentions to use prescription drugs nonmedically among the different prescription drug users.

Interventions targeted toward college students, should continue to emphasize that stimulants are neither safer nor less addictive than other licit and illicit drugs, and if taken without a prescription or in excess may lead to serious mental and physical consequences including death. In fact, college students who use stimulants without a prescription have been found to skip classes, and to have lower GPAs.[12,109] It is important to disseminate the message that the nonmedical use of prescription drugs is not the norm. One example is the finding from our study, which indicated that only 10% of students used stimulants nonmedically in their lifetime. Developing specific prescription drug-targeted interventions may help in reducing NMUPD by opiates, stimulant, and depressant users.

Association between Intentions to Avoid NMUPD and Other Substance Abuse

This section describes the implications of the relationship between NMUPD and tobacco, marijuana, and alcohol consumption. Results from the current study indicated that there was a significant association between intentions to avoid NMUPD and tobacco use ($p < 0.01$), marijuana use ($p < 0.001$), and alcohol drinking ($p < 0.001$). Results from post hoc analysis showed that non-tobacco users had significantly higher intentions of avoiding NMUPD, more negative attitudes toward NMUPD, and higher perceived social norms that people important to them will not approve, or themselves are not using prescription drugs for nonmedical reasons, compared to current tobacco users. Similarly, non-marijuana users had significantly higher intentions to avoid NMUPD, and viewed the NMUPD more negatively compared to former, occasional, and frequent marijuana users. With respect to alcohol drinking, non-drinkers have significantly higher intentions to avoid NMUPD, more negative attitudes and higher perceived norms compared to frequent and occasional drinkers.

The findings of our study confirm the results of previous studies that students who reported nonmedical use of prescription drugs were also more likely to report tobacco use, heavy alcohol drinking, marijuana, and other illicit drugs use.[75,88,98] Also, nonmedical users are at a greater risk of suffering from marijuana and alcohol dependence. For example, one study has found that young individuals who reported lifetime NMUPD are almost two times more likely to suffer from alcohol dependence and four times more likely to suffer from marijuana dependence than those who never reported NMUPD.[88] Additionally, nonmedical users of prescription medications are more likely to meet DSM-IV criteria for alcohol and marijuana dependence, and mental illnesses.[243] A history of poly-drug use (marijuana, high-risk drinking, and illicit drug use) was found to be a more significant predictor of NMUPD than demographic characteristics (gender, race) and college characteristics (GPA, Greek affiliation, class).[108]

The results from the current study and the previous ones imply that the NMUPD should be seen as a part of greater problem of illicit drug use. Rather than being considered as a trivial issue, the NMUPD should be viewed as a warning sign of binge drinking, illicit drug use, and possible mental health issues.

For these reasons, it is important to perform drug abuse screening for college students who have any history of NMUPD.[81] They should be referred to get a thorough assessment, and considered for a drug with low abuse potential if they need a prescription medication. Moreover, colleges and universities are encouraged to develop early intervention programs to prevent the progression of nonmedical use of prescribed medications into poly-drug use, abuse, and addiction. It is also important to provide clear information and warnings to freshman students regarding the illegality of NMUPD to the same extent that this information is provided regarding other illicit drugs. This information can be explained in the student handbook or during freshman orientation.[243]

Institutional and Policy Implications

The escalating nonmedical use of prescription drugs is a major public health problem that has stimulated many policy changes and legislative acts. One example of a bill that was introduced in response to the increase in opioid prescription drug abuse is "The Prescription Drug Abuse Prevention and Treatment Act of 2011."[244] This bill calls for providing mandatory education for HCPs before they can prescribe controlled substances; supporting public education efforts on safe handling, disposal of pain medications, and prevention of abuse; developing clinical guidelines for optimal dosage of pain medications and ways to recognize populations at high risk for diversion and abuse; enhancing federal support for state prescription drug monitoring programs (PDMP) designed to monitor prescribing and dispensing data of controlled substances; and supporting comprehensive reporting of deaths due to opioid analgesics.[244]

Despite the multifaceted efforts by the government, states, and other stakeholders to combat drug abuse, the problem of nonmedical use of prescription drugs has continued to persist. This may suggest the need for more coordinated efforts to create a sustainable approach to identify, monitor, and develop better strategies to curb the misuse and abuse of prescription drugs. Some of the recommendations for policy changes are discussed below.

One of the most critical aspects to prevent drug abuse problem is educating physicians, researchers and the public. Expanding awareness to HCPs, for example, can be achieved through continuing education courses that may include learning about non-pharmacological treatment options, and the possibility of diversion of prescription medications.[245]

College-level prevention strategies may include developing programs to promote refusal skills to resist drug offers, provide information about proper handling and safe disposal of prescription drugs, and refute some of the myths related to prescription drugs. One program had been launched by Ohio State University known as Generation Rx Initiative to reduce prescription drug abuse among the collegiate population. This initiative provided many free educational and engaging resources for students and communities about the devastating consequences of nonmedical uses of prescription drugs as well as recommendations for safe disposable.[246] College campuses are encouraged to provide resources for students to promote their study skills (e.g. time management, removing distractions, and prioritizing studying over other tasks). Adopting good study skills may help reduce the potential for using stimulants without a prescription to enhance academic performance.[245]

At the state level, increased funding, support, and utilization of prescription drug monitoring programs (PDMPs) may limit access to prescription drugs. State PDMPs are key aspects in the national drug control effort to track the utilization and diversion of drugs.[247] Several studies provide evidence that PDMPs can be sucessful in reducing drug abuse and diversion.[248–250] However, the participation of prescribers and dispensers in the PDMPs is still voluntary in some states leading to low utilization rates. Mandating participation in PDMPs will increase utilization and can decrease the potential for drug diversion and doctor shopping rates.

Pharmaceutical companies can also have a role in reducing NMUPD by providing safer drug alternatives with lower abuse potential, and by developing novel drug delivery systems that are less prone to abuse (e.g. the extended-release form of methylphenidate have very little misuse potential compared to the immediate-release forms).[245]

Another possible recommendation to combat diversion, fraud, and abuse of prescription drugs is to enforce stricter policies by the Drug Enforcement Administration's (DEA)'s Office of Diversion Control. Some of the violations of controlled substances regulations include illegal purchasing of prescription drugs over the internet, unlawful prescription drug sales, and unauthorized drug distribution.[251]

The DEA should expand their policies regarding monitoring drugs and the FDA could require warnings for HCPs and the public about the safety and side effects of prescription drugs. The FDA should continue monitoring drug advertisement and promotion to ensure no false or misleading claims are made by the pharmaceutical companies. Also, the FDA should continue to encourage drug manufactures to notify HCPs about any significant changes in labeling, including prescribing information and new safety concerns.[252] With all these policies and regulations to prevent drug abuse, a balance could develop to make sure that these drugs continue to be available to appropriate patients.

Recommendations for Future Interventions

The findings from our study have several important implications for guiding future interventions and preventive strategies. First, future interventions should consider tailoring and targeting interventions to the appropriate audience. Clearly, there were two substantially different segments of population in the current study, those who used prescription drugs nonmedically, and those who never did. A secondary analysis showed significant differences in attitudes, norms, and intentions between those who reported NMUPD and those who did not (Table 54). Similarly, substantial differences were found in the underling behavioral (Table 55) and normative beliefs (Table 56). The information presented in our intervention appeared to be more relevant to those who previously used prescription drugs nonmedically. Therefore, failure to take targeting and segmentation into account during the designing phase of our intervention might have led to insufficiency of the intervention.

Second, future design of websites targeted toward students should focus more on strategies that make websites more engaging at the entry page and reduce the number of pages that a student has to navigate. Our website was probably too long to be viewed by students. Nowadays, students have short attention spans that can range from 10 to 15 minutes. Unfortunately, over years the average attention span of students is getting shorter.[253]

Third, future interventions should focus mainly on addressing normative and behavioral beliefs. Results from our study indicated that normative and behavioral beliefs were the factors that correlated significantly with intentions to avoid NMUPD (Table 40). Fewer efforts should be invested in changing control beliefs, since they were not found to correlate significantly with intentions to avoid NMUPD.

Fourth, future interventions should implement a multifaceted rather than a single component approach. To combat the escalating problem of the nonmedical use of prescription drugs among college students, an intervention should include more than one strategy and have multiple targets. This can be achieved by promoting collaborative efforts between students, parents, healthcare providers, and college administrators to formulate policies to create an environment that discourages and prevents the nonmedical use of prescription drugs. The following important stakeholders should be considered in a multifaceted approach to address NMUPD among college students:

- College administrators should be encouraged to provide programs that aim to recognize, screen, and assist students who might be at risk for drug abuse. These strategies can be implemented through student health centers or similar centers that deal with heath wellness and education programs.[229]
- HCPs should be made aware of the high prevalence and possibility of diversion of prescription drugs on college campuses. HCPs are encouraged to perform a thorough diagnosis and assessment for ADHD, and be mindful that students may fake symptoms of ADHD in order to get a prescription stimulant. Physicians should provide clear instructions to their patients about how to dispose any extra medications. Moreover, physicians are encouraged

to test students who used prescription drugs nonmedically, because of the high correlation between NMUPD and with other substance use.

- Parents should not facilitate the nonmedical use of prescription drugs in any way. Some parents may not act strictly knowing that their kids are using stimulants without a prescription, because they think stimulants may improve their children's' academic performance. Parents should seek help and proper evaluation for their children if they suspect NMUPD, in order to determine the presence of other substance abuse or undiagnosed illnesses such as ADHD, depression, anxiety and any other mental health problems.[229]
- Students should be advised to improve their academic performance without the need to use prescription medications. The following paragraph is directly quoted from our educational intervention to address the nonmedical use of stimulants to enhance academic performance and can be utilized by similar interventions :

> There is no evidence that prescription stimulants can increase performance among healthy individuals with ADHD. Usually nonmedical use of prescription stimulants is prevalent among students with lower grades. Those students use stimulants to catch up with their assignments and homework to compensate for partying and not attending classes. To improve your grades there is no better strategies than regularly attending classes, avoiding procrastination, and completing homework/assignments on time. If you struggle with keeping up with school requirements, seek help from professional resources around the campus. Using prescription stimulants is highly unlikely to help you achieve your goals. In fact, these shortcuts are more likely to be harmful and lead to addiction.

Also, students should be encouraged to manage their stress during college years by practicing healthy habits such as exercising regularly, learning relaxation techniques such as meditation and yoga, and to seek medical and professional help if faced with excessively stressful situation.

Implications for Future Research

Based on findings from our study, there are several important implications and recommendations for future research. First, the reasoned action approach should be further utilized in research designs (i.e. pretest-posttest control group, factorial, or repeated measure designs) to provide more guidance on how to make theory-based interventions more effective.[203] The existent evidence for the efficacy of the reasoned action approach comes mainly from cross-sectional studies.[254] Moreover, a majority of these cross-sectional studies only proves that the theory's main constructs can predict intentions but not necessarily cause behavioral change. Therefore, we suggest using the reasoned action approach in designing further interventions using well-designed experimental tests to improve its predictive validity in causing behavioral change.

Second, this study focused on changing students' intentions to avoid the NMUPD using the reasoned action approach. Future research utilizing this theoretical framework should focus on how to promote actual behavior change rather than mere intentions or motivation.[203] Similar to the reasoned action approach, most other theories explain behavioral intentions or motivations quite well, but are less successful in explaining actual behavior or behavioral change. Although, in most cases, lack of intention results in lack of behavioral performance, holding a positive intention is not a guarantee of carrying out a behavior. Future research should focus on designing studies to help bridge this intention-behavior gap.[203]

Third, the intervention utilized in our study aimed at changing students' intentions, attitudes, perceived norms, and perceived behavioral control at the individual level. However, in order to accomplish more effective and long lasting behavioral changes, future research should consider implementing environmental changes as well.[255] Additional work is needed to consider engaging interpersonal, institutional, and societal levels in the theoretical framework.

Fourth, the target population for this study consisted of UNM students, and therefore, the findings are not generalizable to students in other universities in NM or other states. More research is needed to validate our findings among different samples of college students.

Fifth, more work is needed to assess the impact of racial/ethnic variations, gender, and fraternity/sorority affiliation on the prevalence of NMUPD. The study sample consisted mainly of White (48%) and Hispanic (31%) students. Future research should enroll more racially diverse samples, or oversample minorities to understand the association between race and NMUPD. Although we did not find a significant difference between male and female students' nonmedical use of prescription drugs, we did find a significant association between intentions to avoid NMUPD and gender. Male students, in this study, were found to have significantly lower intentions to avoid NMUPD compared to female students. Our sample contained approximately 61% female and 39% male students, indicating a disproportionate number of female respondents. Future research should aim to recruit an equivalent number of female and male subjects in order to better detect any possible gender differences. Also, with regard to fraternity/sorority membership, only 4.8% of respondents reported belonging to a fraternity or sorority groups. Additional research should strive to oversample students affiliated with fraternity/sorority membership to gain better understanding of its impact on NMUPD.

Sixth, information was not collected about whether a respondent was domestic or international student. This information might be helpful in determining whether the NMUPD problem is rather unique to the US, especially that the US consumes 99% of the global hydrocodone [256] and the majority of methylphenidate supplies.[94] Future research may also enroll college students from several universities worldwide to determine if the NMUPD is evident in other countries.

Finally, while there is a plethora of research about prevalence, predictors, and motives for NMUPD, there is a lack of information about effective intervention programs to combat this problem in college campuses. Future research should start to implement theory-based interventions in an attempt to change students' attitudes, norms, behavioral control, intentions, and ultimately NMUPD behavior.

Limitations

Several limitations of the present study should be discussed. First, the low response rate (10%) limits the generalizability of the results and increases the possibility of non-response bias. Reasons for low-response rate included: lengthy survey and website, using an online survey (rather than mail of face-to-face survey), sending some of the reminders to participate in the study during the exam's week, and asking about sensitive topics such as frequent drinking, marijuana smoking, and NMUPD. However, a secondary analysis was done to evaluate the magnitude of non-response bias, in which early responders were compared to late responders (who are assumed to be similar to non-responders). Fortunately, there were no significant differences between early and late responders in demographics, mean intentions' score, attitudes, subjective norms, and perceived behavioral control. Consequently, the impact of non-response bias is not expected to be large.

Second, asking about topics that are associated with social stigma make the results from the study vulnerable to social desirability bias. Accordingly, students may under-report their lifetime nonmedical use of prescription drugs and other substance of abuse to provide more socially desirable responses. However, given the voluntary nature of the study, the absence of face-to face contact, and informing the respondents of the measures taken to preserve the confidentiality of their responses, the possibility of social desirability bias is minimized.

Third, the information obtained from the survey were based on self-report and were not confirmed by other objective measures. However, evidence exists from other studies indicating high validity and reliability of alcohol, tobacco, and illicit drug's self-report use by students if were asked under the right circumstances.[257]

Fourth, the low utilization of the website reduces the effectiveness of the website in bringing changes in the intentions, and underlying normative, behavioral and control beliefs between the intervention and control groups. Therefore, it is difficult to truly assess the success of the website, when not all the pages were viewed and the average time spent per session was less than 5 minutes.

Fifth, the sample was drawn only from UNM, therefore the results may not be generalizable to other settings. Additionally, even though the age, gender, and race distribution of the respondents is similar to UNM at large, the low response rate from the study limits the generalizability of the results to UNM.

Sixth, only the intentions were measured but not confirmed by measuring actual behavior in the future. Ideally, to confirm that intention is a good predictor of behavioral performance, their measurement should be done at two distinct points of time. Fortunately, several studies have shown that intention predicts behavior quite well.[40,150]

Seventh, no focus group was performed for identification of the underlying normative, behavioral, and control beliefs. In fact, Fishbein and Ajzen (2011) recommended caution against the use of focus groups for the elicitation process, because the beliefs obtained from the focus group may differ substantially from the population.[159] As an alternative here, the author performed an extensive literature review from both qualitative and quantitative research to obtain the most important predictors, beliefs, and misperceptions associated with the NMUPD among college students. These beliefs were used to formulate the website and survey, and were tested during the pilot testing process.

Eighth, the study only involved post-testing of the survey and website. There was no pre-testing performed. Pretest-posttest design allows for more ascertainment that the two groups are equivalent at the beginning of the study. However, pre-test may not be necessary here because participants were randomly assigned to the two groups. Also, the sample was large, which improved the chances that the two groups were not different in any way prior to the implementation of the intervention. Pretest-posttest design has some disadvantages such as being time consuming and may lead to interaction of testing with the intervention.

Conclusion

This study is the first to utilize the reasoned action approach as a theoretical framework to design an intervention to influence students' intentions regarding the use prescription drugs for nonmedical reasons. Results from the present study indicated that most students have high intentions to avoid NMUPD in the future, held negative attitudes, high-perceived social norms that others will not approve their NMUPD, and highly perceived NMUPD under their control.

The intervention was successful in bringing changes in attitudes between the intervention and control groups, but no changes were observed in perceived norms, perceived behavioral control, or intentions to avoid NMUPD. The insufficiency of the intervention can be attributed to low utilization rate of the website, long time needed to view the whole website, and failure to target the intervention to students who had previous experiences with NMUPD. Testing the predictive validity of the reasoned action approach in the combined sample showed that the theory was successful in predicting students' intentions to avoid NMUPD. Most of the variance was explained by perceived social norms and attitudes, and lastly by perceived behavioral control. Additional variables that were significantly associated with intentions to avoid NMUPD included past NMUPD, tobacco use, marijuana smoking, and alcohol drinking.

Using prescription drugs nonmedically is not a trivial behavior; it may lead to addiction, serious mental health and physical problems, and even death. It can be also a warning sign of illicit drug abuse, heavy drinking, and marijuana smoking. Therefore, collaborative efforts are needed from college administrators, healthcare professionals, and parents to identify, prevent and combat nonmedical use of prescription drugs among college students.

References

1. Hernandez SH, Nelson LS. Prescription drug abuse: insight into the epidemic. *Clin Pharmacol Ther*. 2010;88(3):307-317. doi:10.1038/clpt.2010.154.

2. Hall AJ, Logan JE, Toblin RL, et al. Patterns of abuse among unintentional pharmaceutical overdose fatalities. *JAMA*. 2008;300(22):2613-2620. doi:10.1001/jama.2008.802.

3. Prescription Drug Misuse and Abuse | SAMHSA. http://www.samhsa.gov/prescription-drug-misuse-abuse. Accessed February 13, 2015.

4. Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings - NSDUHresults2013.pdf. http://www.samhsa.gov/data/sites/default/files/NSDUHresultsPDFWHTML2013/Web/NSDUHresults2013.pdf. Accessed February 13, 2015.

5. McCabe SE, West BT, Boyd CJ. Medical use, medical misuse, and nonmedical use of prescription opioids: results from a longitudinal study. *Pain*. 2013;154(5):708-713. doi:10.1016/j.pain.2013.01.011.

6. Compton WM, Volkow ND. Abuse of prescription drugs and the risk of addiction. *Drug Alcohol Depend*. 2006;83 Suppl 1:S4-S7. doi:10.1016/j.drugalcdep.2005.10.020.

7. Centers for Disease Control and Prevention, USA. Emergency department visits involving nonmedical use of selected prescription drugs - United States, 2004-2008. *MMWR Morb Mortal Wkly Rep*. 2010;59(23):705-709.

8. Spiller HA, Hays HL, Aleguas A. Overdose of drugs for attention-deficit hyperactivity disorder: clinical presentation, mechanisms of toxicity, and management. *CNS Drugs*. 2013;27(7):531-543. doi:10.1007/s40263-013-0084-8.

9. Devlin RJ, Henry JA. Clinical review: Major consequences of illicit drug consumption. *Crit Care Lond Engl*. 2008;12(1):202. doi:10.1186/cc6166.

10. McCabe SE, Teter CJ, Boyd CJ. Illicit use of prescription pain medication among college students. *Drug Alcohol Depend*. 2005;77(1):37-47. doi:10.1016/j.drugalcdep.2004.07.005.

11. Johnston LD. *Monitoring the Future: National Survey Results on Drug Use, 1975-2008: Volume II: College Students and Adults Ages 19-50*. DIANE Publishing; 2010.

12. McCabe SE, Knight JR, Teter CJ, Wechsler H. Non-medical use of prescription stimulants among US college students: prevalence and

correlates from a national survey. *Addict Abingdon Engl*. 2005;100(1):96-106. doi:10.1111/j.1360-0443.2005.00944.x.

13. Herman-Stahl MA, Krebs CP, Kroutil LA, Heller DC. Risk and protective factors for methamphetamine use and nonmedical use of prescription stimulants among young adults aged 18 to 25. *Addict Behav*. 2007;32(5):1003-1015. doi:10.1016/j.addbeh.2006.07.010.

14. Garnier-Dykstra LM, Caldeira KM, Vincent KB, O'Grady KE, Arria AM. Nonmedical use of prescription stimulants during college: four-year trends in exposure opportunity, use, motives, and sources. *J Am Coll Health J ACH*. 2012;60(3):226-234. doi:10.1080/07448481.2011.589876.

15. Teter CJ, McCabe SE, LaGrange K, Cranford JA, Boyd CJ. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy*. 2006;26(10):1501-1510. doi:10.1592/phco.26.10.1501.

16. Carroll BC, McLaughlin TJ, Blake DR. Patterns and knowledge of nonmedical use of stimulants among college students. *Arch Pediatr Adolesc Med*. 2006;160(5):481-485. doi:10.1001/archpedi.160.5.481.

17. Glanz K, Rimer BK. *Theory Glance Guide Health Promot Pract*. 1997;(Journal Article).

18. Fishbein M, Ajzen I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*.; 1975.

19. Fishbein M, Ajzen I. *Predicting and Changing Behavior: The Reasoned Action Approach*. Taylor & Francis; 2011.

20. Critser G. *Generation Rx: How Prescription Drugs Are Altering American Lives, Minds, and Bodies*. Houghton Mifflin Harcourt; 2007.

21. Kuo Y-F, Raji MA, Chen N-W, Hasan H, Goodwin JS. Trends in Opioid Prescriptions Among Part D Medicare Recipients From 2007 to 2012. *Am J Med*. 2016;129(2):221.e21-e30. doi:10.1016/j.amjmed.2015.10.002.

22. Paulozzi LJ. Prescription drug overdoses: A review. *J Safety Res*. 2012;43(4):283-289. doi:10.1016/j.jsr.2012.08.009.

23. Olfson M, Wang S, Iza M, Crystal S, Blanco C. National trends in the office-based prescription of schedule II opioids. *J Clin Psychiatry*. 2013;74(9):932-939. doi:10.4088/JCP.13m08349.

24. McGerald G, Dvorkin R, Levy D, Lovell-Rose S, Sharma A. Prescriptions for schedule II opioids and benzodiazepines increase after the introduction

of computer-generated prescriptions. *Acad Emerg Med Off J Soc Acad Emerg Med*. 2009;16(6):508-512. doi:10.1111/j.1553-2712.2009.00398.x.

25. Hansen RN, Oster G, Edelsberg J, Woody GE, Sullivan SD. Economic costs of nonmedical use of prescription opioids. *Clin J Pain*. 2011;27(3):194-202. doi:10.1097/AJP.0b013e3181ff04ca.

26. MTF 2013 Volume II College Students and Adults Ages 19 to 55 - mtf-vol2_2013.pdf. http://monitoringthefuture.org/pubs/monographs/mtf-vol2_2013.pdf. Accessed June 29, 2015.

27. McCabe SE, West BT, Teter CJ, Boyd CJ. Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: Connecting the dots. *Addict Behav*. 2014;39(7):1176-1182. doi:10.1016/j.addbeh.2014.03.008.

28. Nargiso JE, Ballard EL, Skeer MR. A systematic review of risk and protective factors associated with nonmedical use of prescription drugs among youth in the United States: a social ecological perspective. *J Stud Alcohol Drugs*. 2015;76(1):5-20.

29. Brandt SA, Taverna EC, Hallock RM. A survey of nonmedical use of tranquilizers, stimulants, and pain relievers among college students: Patterns of use among users and factors related to abstinence in non-users. *Drug Alcohol Depend*. 2014;143:272-276. doi:10.1016/j.drugalcdep.2014.07.034.

30. Drug Abuse 2013 data for New Mexico. http://healthyamericans.org/reports/drugabuse2013/release.php?stateid=NM. Accessed February 17, 2015.

31. http://nmhealth.org/publication/view/data/269/. http://nmhealth.org/publication/view/data/269/. Accessed February 17, 2015.

32. The NSDUH Report Metro Brief: Substance Use and Mental Disorders in the Albuquerque Metropolitan Statistical Area - NSDUH-Metro-Albuquerque.pdf. http://www.samhsa.gov/data/sites/default/files/NSDUHMetroBriefReports/NSDUHMetroBriefReports/NSDUH-Metro-Albuquerque.pdf. Accessed June 5, 2015.

33. Albuquerque and New Mexico | National Institute on Drug Abuse (NIDA). http://www.drugabuse.gov/about-nida/organization/workgroups-interest-groups-consortia/community-epidemiology-work-group-cewg/albuquerque-new-mexico. Accessed February 17, 2015.

34. state_profile-new_mexico.pdf. http://www.whitehouse.gov/sites/default/files/docs/state_profile-new_mexico.pdf. Accessed February 22, 2015.

35. Harris SK, Louis-Jacques J, Knight JR. Screening and brief intervention for alcohol and other abuse. *Adolesc Med State Art Rev*. 2014;25(1):126-156.

36. Bully P, Sánchez Á, Zabaleta-Del-Olmo E, Pombo H, Grandes G. Evidence from interventions based on theoretical models for lifestyle modification (physical activity, diet, alcohol and tobacco use) in primary care settings: A systematic review. *Prev Med*. January 2015. doi:10.1016/j.ypmed.2014.12.020.

37. Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: A meta-analytic review. *Br J Soc Psychol*. 2001;40(4):471-499.

38. Coughlin SS. Recall bias in epidemiologic studies. *J Clin Epidemiol*. 1990;43(1):87-91.

39. Davern M. Nonresponse rates are a problematic indicator of nonresponse bias in survey research. *Health Serv Res*. 2013;48(3):905-912. doi:10.1111/1475-6773.12070.

40. Kamb ML, Fishbein M, Douglas Jr JM, et al. Efficacy of risk-reduction counseling to prevent human immunodeficiency virus and sexually transmitted diseases: a randomized controlled trial. *Jama*. 1998;280(13):1161-1167.

41. Jemmott JB 3rd, Jemmott LS, Fong GT. Reductions in HIV risk-associated sexual behaviors among black male adolescents: effects of an AIDS prevention intervention. *Am J Public Health*. 1992;82(3):372-377.

42. Abuse NI on D. Prescription Drug Abuse. https://www.drugabuse.gov/about-nida/legislative-activities/testimony-to-congress/2010/09/prescription-drug-abuse. Published September 22, 2010. Accessed March 4, 2016.

43. Huang B, Dawson DA, Stinson FS, et al. Prevalence, correlates, and comorbidity of nonmedical prescription drug use and drug use disorders in the United States: Results of the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry*. 2006;67(7):1062-1073.

44. Combating Misuse and Abuse of Prescription Drugs:Q&A with Michael Klein, Ph.D. - UCM220434.pdf. http://www.fda.gov/downloads/ForConsumers/ConsumerUpdates/UCM220434.pdf. Accessed February 25, 2015.

45. The DAWN Report: Highlights of the 2011 Drug Abuse Warning Network (DAWN) Findings on Drug-Related Emergency Department Visits. http://archive.samhsa.gov/data/2k13/DAWN127/sr127-DAWN-highlights.htm. Accessed February 15, 2015.

46. The DAWN Report: Benzodiazepines in Combination with Opioid Pain Relievers or Alcohol: Greater Risk of More Serious ED Visit Outcomes - DAWN-SR192-BenzoCombos-2014.pdf. http://www.samhsa.gov/data/sites/default/files/DAWN-SR192-BenzoCombos-2014/DAWN-SR192-BenzoCombos-2014.pdf. Accessed February 26, 2015.

47. The DAWN Report Data Spotlight: Emergency Department Visits Involving Nonmedical Use of Central Nervous System Stimulants among Adults Aged 18 to 34 Increased between 2005 and 2011 - spot103-cns-stimulants-adults.pdf. http://www.samhsa.gov/data/sites/default/files/spot103-cns-stimulants-adults/spot103-cns-stimulants-adults.pdf. Accessed February 25, 2015.

48. Boyd CJ, Teter CJ, West BT, Morales M, McCabe SE. Non-medical use of prescription analgesics: a three-year national longitudinal study. *J Addict Dis*. 2009;28(3):232-242. doi:10.1080/10550880903028452.

49. Katz C, El-Gabalawy R, Keyes KM, Martins SS, Sareen J. Risk factors for incident nonmedical prescription opioid use and abuse and dependence: Results from a longitudinal nationally representative sample. *Drug Alcohol Depend*. 2013;132(1–2):107-113. doi:10.1016/j.drugalcdep.2013.01.010.

50. Fenton MC, Keyes KM, Martins SS, Hasin DS. The Role of a Prescription in Anxiety Medication Use, Abuse, and Dependence. *Am J Psychiatry*. 2010;167(10):1247-1253. doi:10.1176/appi.ajp.2010.09081132.

51. Manchikanti L, Fellows B, Ailinani H, Pampati V. Therapeutic use, abuse, and nonmedical use of opioids: a ten-year perspective. *Pain Physician*. 2010;13(5):401-435.

52. Drug-Related Hospital Emergency Room Visits. http://www.drugabuse.gov/publications/drugfacts/drug-related-hospital-emergency-room-visits. Accessed February 25, 2015.

53. Dart RC, Surratt HL, Cicero TJ, et al. Trends in opioid analgesic abuse and mortality in the United States. *N Engl J Med*. 2015;372(3):241-248. doi:10.1056/NEJMsa1406143.

54. Watanabe M, Maemura K, Kanbara K, Tamayama T, Hayasaki H. GABA and GABA receptors in the central nervous system and other organs. *Int Rev Cytol*. 2002;213:1-47.

55. O'brien CP. Benzodiazepine use, abuse, and dependence. *J Clin Psychiatry*. 2005;66 Suppl 2:28-33.

56. Lader M. Benzodiazepine harm: how can it be reduced? *Br J Clin Pharmacol*. 2014;77(2):295-301. doi:10.1111/j.1365-2125.2012.04418.x.

57. Lader M. Anxiolytic drugs: dependence, addiction and abuse. *Eur Neuropsychopharmacol J Eur Coll Neuropsychopharmacol*. 1994;4(2):85-91.

58. Yu H-YE. The prescription drug abuse epidemic. *Clin Lab Med*. 2012;32(3):361-377. doi:10.1016/j.cll.2012.06.006.

59. McCarthy M. Prescription drug abuse up sharply in the USA. *Lancet*. 2007;369(9572):1505-1506. doi:10.1016/S0140-6736(07)60690-4.

60. Klein-Schwartz W. Abuse and toxicity of methylphenidate. *Curr Opin Pediatr*. 2002;14(2):219-223.

61. Arria AM, Caldeira KM, Vincent KB, O'Grady KE, Wish ED. Perceived Harmfulness Predicts Nonmedical Use of Prescription Drugs Among College Students: Interactions with Sensation-Seeking. *Prev Sci*. 2008;9(3):191-201. doi:10.1007/s11121-008-0095-8.

62. Arria AM, O'Grady KE, Caldeira KM, Vincent KB, Wish ED. Nonmedical use of prescription stimulants and analgesics: Associations with social and academic behaviors among college students. *J Drug Issues*. 2008;38(4):1045-1060.

63. Quintero G. Rx for a Party: A Qualitative Analysis of Recreational Pharmaceutical Use in a Collegiate Setting. *J Am Coll Health*. 2009;58(1):64-72. doi:10.3200/JACH.58.1.64-72.

64. Cutler KA. Prescription stimulants are "a okay": applying neutralization theory to college students' nonmedical prescription stimulant use. *J Am Coll Health J ACH*. 2014;62(7):478-486. doi:10.1080/07448481.2014.929578.

65. DeSantis AD, Webb EM, Noar SM. Illicit use of prescription ADHD medications on a college campus: a multimethodological approach. *J Am Coll Health J ACH*. 2008;57(3):315-324. doi:10.3200/JACH.57.3.315-324.

66. Ford JA, Arrastia MC. Pill-poppers and dopers: A comparison of non-medical prescription drug use and illicit/street drug use among college students. *Addict Behav*. 2008;33(7):934-941. doi:10.1016/j.addbeh.2008.02.016.

67. Ford JA, Ong J. Non-medical use of prescription stimulants for academic purposes among college students: A test of social learning theory. *Drug Alcohol Depend*. 2014;144:279-282. doi:10.1016/j.drugalcdep.2014.09.011.

68. Judson R, Langdon SW. Illicit use of prescription stimulants among college students: Prescription status, motives, theory of planned behaviour, knowledge and self-diagnostic tendencies. *Psychol Health Med*. 2009;14(1):97-104. doi:10.1080/13548500802126723.

69. Peralta RL, Steele JL. Nonmedical Prescription Drug Use Among US College Students at a Midwest University: A Partial Test of Social Learning Theory. *Subst Use Misuse*. 2010;45(6):865-887. doi:10.3109/10826080903443610.

70. Ponnet K, Wouters E, Walrave M, Heirman W, Van Hal G. Predicting students' intention to use stimulants for academic performance enhancement. *Subst Use Misuse*. 2015;50(3):275-282. doi:10.3109/10826084.2014.952446.

71. Gallucci A, Martin R, Beaujean A, Usdan S. An examination of the misuse of prescription stimulants among college students using the theory of planned behavior. *Psychol Health Med*. 2015;20(2):217-226. doi:10.1080/13548506.2014.913800.

72. Dart RC, Bartelson BB, Adams EH. Nonmedical use of tapentadol immediate release by college students. *Clin J Pain*. 2014;30(8):685-692.

73. Teter CJ, Falone AE, Cranford JA, Boyd CJ, McCabe SE. Nonmedical use of prescription stimulants and depressed mood among college students: Frequency and routes of administration. *J Subst Abuse Treat*. 2010;38(3):292-298. doi:10.1016/j.jsat.2010.01.005.

74. Wasserman J, Fitzgerald J, Sunny M, Cole M, Suminski R, Dougherty J. Nonmedical Use of Stimulants Among Medical Students. *J Am Osteopath Assoc*. 2014;114(8):643-653. doi:10.7556/jaoa.2014.129.

75. Lord S, Downs G, Furtaw P, et al. Nonmedical use of prescription opioids and stimulants among student pharmacists. *J Am Pharm Assoc JAPhA*. 2009;49(4):519-528. doi:10.1331/JAPhA.2009.08027.

76. Volger EJ, McLendon AN, Fuller SH, Herring CT. Prevalence of Self-Reported Nonmedical Use of Prescription Stimulants in North Carolina Doctor of Pharmacy Students. *J Pharm Pract*. 2014;27(2):158-168. doi:10.1177/0897190013508139.

77. Snipes DJ, Jeffers AJ, Benotsch EG, et al. Religiosity in the non-medical use of prescription medication in college students. *Am J Drug Alcohol Abuse*. 2015;41(1):93-99. doi:10.3109/00952990.2014.939755.

78. Egan KL, Reboussin BA, Blocker JN, Wolfson M, Sutfin EL. Simultaneous use of non-medical ADHD prescription stimulants and alcohol among undergraduate students. *Drug Alcohol Depend*. 2013;131(1-2):71-77. doi:10.1016/j.drugalcdep.2012.12.004.

79. Upadhyaya HP, Kroutil LA, Deas D, Durell TM, Van Brunt DL, Novak SP. Stimulant Formulation and Motivation for Nonmedical Use of Prescription Attention-Deficit/Hyperactivity Disorder Medications in a College-Aged Population: Stimulant Formulation and Nonmedical Use. *Am J Addict*. 2010;19(6):569-577. doi:10.1111/j.1521-0391.2010.00078.x.

80. McCabe SE, Teter CJ, Boyd CJ. Illicit use of prescription pain medication among college students. *Drug Alcohol Depend*. 2005;77(1):37-47. doi:10.1016/j.drugalcdep.2004.07.005.

81. McCabe SE, Teter CJ. Drug use related problems among nonmedical users of prescription stimulants: A web-based survey of college students from a Midwestern university. *Drug Alcohol Depend*. 2007;91(1):69-76. doi:10.1016/j.drugalcdep.2007.05.010.

82. McCabe SE. Misperceptions of non-medical prescription drug use: A web survey of college students. *Addict Behav*. 2008;33(5):713-724. doi:10.1016/j.addbeh.2007.12.008.

83. McCabe SE. Screening for drug abuse among medical and nonmedical users of prescription drugs in a probability sample of college students. *Arch Pediatr Adolesc Med*. 2008;162(3):225-231.

84. Rabiner DL, Anastopoulos AD, Costello EJ, Hoyle RH, Swartzwelder HS. Predictors of Nonmedical ADHD Medication Use by College Students. *J Atten Disord*. 2010;13(6):640-648. doi:10.1177/1087054709334505.

85. McCabe SE, Teter CJ, Boyd CJ. Medical use, illicit use, and diversion of abusable prescription drugs. *J Am Coll Health*. 2006;54(5):269-278.

86. Benotsch EG, Koester S, Luckman D, Martin AM, Cejka A. Non-medical use of prescription drugs and sexual risk behavior in young adults. *Addict Behav*. 2011;36(1-2):152-155. doi:10.1016/j.addbeh.2010.08.027.

87. Cabriales JA, Cooper TV, Taylor T. Prescription drug misuse, illicit drug use, and their potential risk and protective correlates in a Hispanic college student sample. *Exp Clin Psychopharmacol*. 2013;21(3):235-244. doi:10.1037/a0031973.

88. Meisel MK, Goodie AS. Predicting prescription drug misuse in college students' social networks. *Addict Behav*. 2015;45:110-112. doi:10.1016/j.addbeh.2015.01.025.

89. Rozenbroek K, Rothstein WG. Medical and nonmedical users of prescription drugs among college students. *J Am Coll Health*. 2011;59(5):358-363.

90. Desantis A, Noar SM, Webb EM. Nonmedical ADHD stimulant use in fraternities. *J Stud Alcohol Drugs*. 2009;70(6):952-954.

91. Advokat CD, Guidry D, Martino L. Licit and illicit use of medications for Attention-Deficit Hyperactivity Disorder in undergraduate college students. *J Am Coll Health J ACH*. 2008;56(6):601-606. doi:10.3200/JACH.56.6.601-606.

92. Rabiner DL, Anastopoulos AD, Costello EJ, Hoyle RH, McCabe SE, Swartzwelder HS. Motives and Perceived Consequences of Nonmedical ADHD Medication Use by College Students: Are Students Treating Themselves for Attention Problems? *J Atten Disord*. 2009;13(3):259-270. doi:10.1177/1087054708320399.

93. Garnier LM, Arria AM, Caldeira KM, Vincent KB, O'Grady KE, Wish ED. Nonmedical Prescription Analgesic Use and Concurrent Alcohol Consumption among College Students. *Am J Drug Alcohol Abuse*. 2009;35(5):334-338. doi:10.1080/00952990903075059.

94. Weyandt LL, Janusis G, Wilson KG, et al. Nonmedical Prescription Stimulant Use Among a Sample of College Students: Relationship With Psychological Variables. *J Atten Disord*. 2009;13(3):284-296. doi:10.1177/1087054709342212.

95. McNiel AD, Muzzin KB, DeWald JP, et al. The nonmedical use of prescription stimulants among dental and dental hygiene students. *J Dent Educ*. 2011;75(3):365-376.

96. McCabe SE, West BT, Wechsler H. Alcohol-use disorders and nonmedical use of prescription drugs among US college students. *J Stud Alcohol Drugs*. 2007;68(4):543.

97. Lord S, Brevard J, Budman S. Connecting to Young Adults: An Online Social Network Survey of Beliefs and Attitudes Associated With Prescription Opioid Misuse Among College Students. *Subst Use Misuse*. 2011;46(1):66-76. doi:10.3109/10826084.2011.521371.

98. McCabe SE. Correlates of nonmedical use of prescription benzodiazepine anxiolytics: results from a national survey of US college students. *Drug Alcohol Depend*. 2005;79(1):53-62.

99. McCabe SE, Boyd CJ. Sources of prescription drugs for illicit use. *Addict Behav*. 2005;30(7):1342-1350.

100. DuPont RL, Coleman JJ, Bucher RH, Wilford BB. Characteristics and Motives of College Students Who Engage in Nonmedical Use of Methylphenidate. *Am J Addict*. 2008;17(3):167-171. doi:10.1080/10550490802019642.

101. Teter CJ, McCabe SE, Cranford JA, Boyd CJ, Guthrie SK. Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. *J Am Coll Health*. 2005;53(6):253-262.

102. White BP, Becker-Blease KA, Grace-Bishop K. Stimulant medication use, misuse, and abuse in an undergraduate and graduate student sample. *J Am Coll Health J ACH*. 2006;54(5):261-268. doi:10.3200/JACH.54.5.261-268.

103. Low KG, Gendaszek AE. Illicit use of psychostimulants among college students: A preliminary study. *Psychol Health Med*. 2002;7(3):283-287. doi:10.1080/13548500220139386.

104. McCabe SE, West BT, Wechsler H. Trends and college-level characteristics associated with the non-medical use of prescription drugs among US college students from 1993 to 2001. *Addiction*. 2007;102(3):455-465.

105. Zullig KJ, Divin AL. The association between non-medical prescription drug use, depressive symptoms, and suicidality among college students. *Addict Behav*. 2012;37(8):890-899. doi:10.1016/j.addbeh.2012.02.008.

106. Hall KM, Irwin MM, Bowman KA, Frankenberger W, Jewett DC. Illicit use of prescribed stimulant medication among college students. *J Am Coll Health*. 2005;53(4):167-174.

107. McCabe SE, West BT, Morales M, Cranford JA, Boyd CJ. Does early onset of non-medical use of prescription drugs predict subsequent prescription drug abuse and dependence? Results from a national study. *Addiction*. 2007;102(12):1920-1930.

108. Lanier C, Farley EJ. What Matters Most? Assessing the Influence of Demographic Characteristics, College-Specific Risk Factors, and Poly-drug Use on Nonmedical Prescription Drug Use. *J Am Coll Health*. 2011;59(8):721-727. doi:10.1080/07448481.2010.546463.

109. Babcock Q, Byrne T. Student perceptions of methylphenidate abuse at a public liberal arts college. *J Am Coll Health J ACH*. 2000;49(3):143-145. doi:10.1080/07448480009596296.

110. McCabe SE, Teter CJ, Boyd CJ, Knight JR, Wechsler H. Nonmedical use of prescription opioids among U.S. college students: prevalence and

correlates from a national survey. *Addict Behav*. 2005;30(4):789-805. doi:10.1016/j.addbeh.2004.08.024.

111. Lookatch SJ, Dunne EM, Katz EC. Predictors of nonmedical use of prescription stimulants. *J Psychoactive Drugs*. 2012;44(1):86-91. doi:10.1080/02791072.2012.662083.

112. Stone AM, Merlo LJ. Psychiatric Medication-Seeking Beliefs and Behaviors among College Students. *Am J Drug Alcohol Abuse*. 2012;38(4):314-321. doi:10.3109/00952990.2011.643992.

113. Lo CC, Monge AN, Howell RJ, Cheng TC. The Role of Mental Illness in Alcohol Abuse and Prescription Drug Misuse: Gender-Specific Analysis of College Students. *J Psychoactive Drugs*. 2013;45(1):39-47. doi:10.1080/02791072.2013.763561.

114. Kypri K, Vater T, Bowe SJ, et al. Web-Based Alcohol Screening and Brief Intervention for University Students: A Randomized Trial. *JAMA*. 2014;311(12):1218. doi:10.1001/jama.2014.2138.

115. Duncan TE, Duncan SC, Beauchamp N, Wells J, Ary DV. Development and evaluation of an interactive CD-ROM refusal skills program to prevent youth substance use:“refuse to use.” *J Behav Med*. 2000;23(1):59-72.

116. Williams C, Griffin KW, Macaulay AP, West TL, Gronewold E. Efficacy of a Drug Prevention CD-ROM Intervention for Adolescents. *Subst Use Misuse*. 2005;40(6):869-878. doi:10.1081/JA-200042219.

117. Smith DC, Tabb KM, Fisher D, Cleeland L. Drug refusal skills training does not enhance outcomes of African American adolescents with substance use problems. *J Subst Abuse Treat*. 2014;46(2):274-279. doi:10.1016/j.jsat.2013.07.004.

118. Baker A, Lee NK, Claire M, et al. Brief cognitive behavioural interventions for regular amphetamine users: a step in the right direction. *Addiction*. 2005;100(3):367-378.

119. Fang L, Schinke SP, Cole KCA. Preventing substance use among early Asian-American adolescent girls: initial evaluation of a web-based, mother-daughter program. *J Adolesc Health Off Publ Soc Adolesc Med*. 2010;47(5):529-532. doi:10.1016/j.jadohealth.2010.03.011.

120. Schinke SP, Fang L, Cole KC. Computer-delivered, parent-involvement intervention to prevent substance use among adolescent girls. *Prev Med*. 2009;49(5):429-435. doi:10.1016/j.ypmed.2009.08.001.

121. Deitz DK, Cook RF, Hendrickson A. Preventing Prescription Drug Misuse: Field Test of the SmartRx Web Program. *Subst Use Misuse*. 2011;46(5):678-686. doi:10.3109/10826084.2010.528124.

122. Albarracín D, McNatt PS, Klein CT, Ho RM, Mitchell AL, Kumkale GT. Persuasive communications to change actions: an analysis of behavioral and cognitive impact in HIV prevention. *Health Psychol*. 2003;22(2):166.

123. Pischke CR, Zeeb H, Van Hal G, et al. A feasibility trial to examine the social norms approach for the prevention and reduction of licit and illicit drug use in European University and college students. *BMC Public Health*. 2012;12(1):882.

124. Tait RJ, McKetin R, Kay-Lambkin F, et al. A Web-Based Intervention for Users of Amphetamine-Type Stimulants: 3-Month Outcomes of a Randomized Controlled Trial. *JMIR Ment Health*. 2014;1(1):e1. doi:10.2196/mental.3278.

125. Osgood CE. Semantic differential technique in the comparative study of Cultures1. *Am Anthropol*. 1964;66(3):171-200.

126. Santos JRA. Cronbach's alpha: A tool for assessing the reliability of scales. *J Ext*. 1999;37(2):1-5.

127. Bland JM, Altman DG. Cronbach's alpha. *BMJ*. 1997;314(7080):572.

128. Fishbein M, Ajzen I, Albarracin D, Hornik R. *A Reasoned Action Approach: Some Issues, Questions, and Clarifications*. Hillsdale, NJ: Lawrence Erlbaum & Associates; 2007.

129. Likert R. A method of constructing an attitude scale. *Scaling Sourceb Behav Sci Chic Aldine*. 1974:233-243.

130. Albaum G. The Likert scale revisited. *J-Mark Res Soc*. 1997;39:331-348.

131. Ajzen I, Fishbein M. Scaling and testing multiplicative combinations in the expectancy–value model of attitudes. *J Appl Soc Psychol*. 2008;38(9):2222-2247.

132. Glanz K, Rimer BK, Viswanath K. *Health Behavior and Health Education: Theory, Research, and Practice*. John Wiley & Sons; 2008.

133. Bandura A. Self-efficacy mechanism in human agency. *Am Psychol*. 1982;37(2):122.

134. Ajzen I. Persuasive communication theory in social psychology: a historical perspective. In: *Influencing Human Behavior: Theory and Applications in Recreation, Tourism, and Natural Resource Management*. ; 1992:1-27.

135. Gallagher KM, Updegraff JA. Health message framing effects on attitudes, intentions, and behavior: a meta-analytic review. *Ann Behav Med*. 2012;43(1):101-116.

136. Rothman AJ, Bartels RD, Wlaschin J, Salovey P. The Strategic Use of Gain-and Loss-Framed Messages to Promote Healthy Behavior: How Theory Can Inform Practice. *J Commun*. 2006;56(s1):S202-S220.

137. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *Am J Public Health*. 2001;91(12):1995-2003.

138. Mistry N, Keepanasseril A, Wilczynski NL, et al. Technology-mediated interventions for enhancing medication adherence. *J Am Med Inform Assoc JAMIA*. February 2015. doi:10.1093/jamia/ocu047.

139. Amrhein PC, Miller WR, Yahne CE, Palmer M, Fulcher L. Client commitment language during motivational interviewing predicts drug use outcomes. *J Consult Clin Psychol*. 2003;71(5):862-878. doi:10.1037/0022-006X.71.5.862.

140. White KM, Terry DJ, Troup C, et al. An extended theory of planned behavior intervention for older adults with type 2 diabetes and cardiovascular disease. *J Aging Phys Act*. 2012;20(3):281-299.

141. Taymoori P, Molina Y, Roshani D. Effects of a Randomized Controlled Trial to Increase Repeat Mammography Screening in Iranian Women. *Cancer Nurs*. August 2014. doi:10.1097/NCC.0000000000000185.

142. O'Carroll RE, Chambers JA, Dennis M, Sudlow C, Johnston M. Improving medication adherence in stroke survivors: mediators and moderators of treatment effects. *Health Psychol Off J Div Health Psychol Am Psychol Assoc*. 2014;33(10):1241-1250. doi:10.1037/hea0000082.

143. Grimshaw JM, Presseau J, Tetroe J, et al. Looking inside the black box: results of a theory-based process evaluation exploring the results of a randomized controlled trial of printed educational messages to increase primary care physicians' diabetic retinopathy referrals [Trial registration number ISRCTN72772651]. *Implement Sci IS*. 2014;9:86. doi:10.1186/1748-5908-9-86.

144. McEachan RRC, Lawton RJ, Jackson C, Conner M, Meads DM, West RM. Testing a workplace physical activity intervention: a cluster randomized controlled trial. *Int J Behav Nutr Phys Act*. 2011;8:29. doi:10.1186/1479-5868-8-29.

145. French DP, Darker CD, Eves FF, Sniehotta FF. The systematic development of a brief intervention to increase walking in the general public

using an "extended" theory of planned behavior. *J Phys Act Health*. 2013;10(7):940-948.

146. Nikos L. D. Chatzisarantis MSH. Effects of a Brief Intervention Based on the Theory of Planned Behavior on Leisure-Time Physical Activity Participation. Human Kinetics Journals. http://journals.humankinetics.com/jsep-back-issues/jsepvolume27issue4december/effectsofabriefinterventionbasedontheTheoryofplannedbehavioronleisuretimephysicalactivityparticipation. Published April 21, 2010. Accessed May 11, 2015.

147. Coyle KK, Kirby DB, Robin LE, Banspach SW, Baumler E, Glassman JR. All4You! A randomized trial of an HIV, other STDs, and pregnancy prevention intervention for alternative school students. *AIDS Educ Prev Off Publ Int Soc AIDS Educ*. 2006;18(3):187-203. doi:10.1521/aeap.2006.18.3.187.

148. Sniehotta F. An Experimental Test of the Theory of Planned Behavior. *Appl Psychol Health Well-Being*. 2009;1(2):257-270. doi:10.1111/j.1758-0854.2009.01013.x.

149. Huang C-M, Chien L-Y, Cheng C-F, Guo J-L. Integrating life skills into a theory-based drug-use prevention program: effectiveness among junior high students in Taiwan. *J Sch Health*. 2012;82(7):328-335. doi:10.1111/j.1746-1561.2012.00706.x.

150. Jemmott JB, Jemmott LS, O'Leary A, et al. Cognitive-behavioural health-promotion intervention increases fruit and vegetable consumption and physical activity among South African adolescents: a cluster-randomised controlled trial. *Psychol Health*. 2011;26(2):167-185. doi:10.1080/08870446.2011.531573.

151. Milton AC, Mullan BA. An application of the theory of planned behavior--a randomized controlled food safety pilot intervention for young adults. *Health Psychol Off J Div Health Psychol Am Psychol Assoc*. 2012;31(2):250-259. doi:10.1037/a0025852.

152. Beaulieu D, Godin G. Staying in school for lunch instead of eating in fast-food restaurants: results of a quasi-experimental study among high-school students. *Public Health Nutr*. 2012;15(12):2310-2319. doi:10.1017/S1368980012000821.

153. Kothe EJ, Mullan BA, Butow P. Promoting fruit and vegetable consumption. Testing an intervention based on the theory of planned behaviour. *Appetite*. 2012;58(3):997-1004. doi:10.1016/j.appet.2012.02.012.

154. Montanaro EA, Bryan AD. Comparing theory-based condom interventions: health belief model versus theory of planned behavior. *Health Psychol Off J*

Div Health Psychol Am Psychol Assoc. 2014;33(10):1251-1260. doi:10.1037/a0033969.

155. Feenstra H, Ruiter RAC, Kok G. Evaluating traffic informers: testing the behavioral and social-cognitive effects of an adolescent bicycle safety education program. *Accid Anal Prev*. 2014;73:288-295. doi:10.1016/j.aap.2014.09.024.

156. Garnier-Dykstra LM, Caldeira KM, Vincent KB, O'Grady KE, Arria AM. Nonmedical Use of Prescription Stimulants During College: Four-Year Trends in Exposure Opportunity, Use, Motives, and Sources. *J Am Coll Health*. 2012;60(3):226-234. doi:10.1080/07448481.2011.589876.

157. McCabe SE, Boyd CJ. Sources of prescription drugs for illicit use. *Addict Behav*. 2005;30(7):1342-1350.

158. Herman-Stahl MA, Krebs CP, Kroutil LA, Heller DC. Risk and protective factors for methamphetamine use and nonmedical use of prescription stimulants among young adults aged 18 to 25. *Addict Behav*. 2007;32(5):1003-1015. doi:10.1016/j.addbeh.2006.07.010.

159. Fishbein M, Ajzen I. *Predicting and Changing Behavior: The Reasoned Action Approach*. Taylor & Francis; 2011.

160. Two-Group Experimental Designs. http://www.socialresearchmethods.net/kb/expsimp.php. Accessed February 1, 2016.

161. Walters ST, Neighbors C. College Prevention: A View of Present (and Future) Web-Based Approaches. *Alcohol Res Health*. 2011;34(2):222-224.

162. Shih T-H, Fan X. Comparing Response Rates from Web and Mail Surveys: A Meta-Analysis. *Field Methods*. 2008;20(3):249-271. doi:10.1177/1525822X08317085.

163. Carey KB, Scott-Sheldon LAJ, Elliott JC, Bolles JR, Carey MP. Computer-delivered interventions to reduce college student drinking: a meta-analysis. *Addict Abingdon Engl*. 2009;104(11):1807-1819. doi:10.1111/j.1360-0443.2009.02691.x.

164. Health Literacy Online--Home. http://www.health.gov/healthliteracyonline/. Accessed June 18, 2015.

165. National Assessment of Adult Literacy (NAAL). https://nces.ed.gov/naal/fr_definition.asp. Accessed June 18, 2015.

166. People H. Healthy People 2020. 2011;(Journal Article).

167. Mas FS, Jacobson HE, Dong Y. Health literacy level of Hispanic college students. *South Med J*. 2014;107(2):61-65. doi:10.1097/SMJ.0000000000000050.

168. Ickes MJ, Cottrell R. Health literacy in college students. *J Am Coll Health J ACH*. 2010;58(5):491-498. doi:10.1080/07448481003599104.

169. Summers K, Summers M. Making the Web friendlier for lower-literacy users. *Intercom*. 2004;51(6):19-21.

170. Finnie RK, Felder TM, Linder SK, Mullen PD. Beyond reading level: a systematic review of the suitability of cancer education print and Web-based materials. *J Cancer Educ*. 2010;25(4):497-505.

171. Faul F, Erdfelder E, Lang A-G, Buchner A. G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007;39(2):175-191.

172. Sedgwick P. Randomised controlled trials: understanding effect sizes. *BMJ*. 2015;350:h1690. doi:10.1136/bmj.h1690.

173. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. Routledge Academic; 2013.

174. Google Analytics - Mobile, Premium and Free Website Analytics – Google. https://www.google.com/analytics/. Accessed January 27, 2016.

175. Mcmillan B, Conner M. Using the theory of planned behaviour to understand alcohol and tobacco use in students. *Psychol Health Med*. 2003;8(3):317-328. doi:10.1080/1354850031000135759.

176. Electronic Survey & Election Support | The University of New Mexico. https://esurveyinfo.unm.edu/. Accessed November 23, 2015.

177. Julious SA. Sample size of 12 per group rule of thumb for a pilot study. *Pharm Stat*. 2005;4(4):287-291. doi:10.1002/pst.185.

178. Billingham SA, Whitehead AL, Julious SA. An audit of sample sizes for pilot and feasibility trials being undertaken in the United Kingdom registered in the United Kingdom Clinical Research Network database. *BMC Med Res Methodol*. 2013;13(1):104.

179. Friedman DB, Hoffman-Goetz L. A systematic review of readability and comprehension instruments used for print and web-based cancer information. *Health Educ Behav*. 2006;33(3):352-373.

180. De Oliveira GS, Jung M, Mccaffery KJ, McCarthy RJ, Wolf MS. Readability evaluation of Internet-based patient education materials related to the anesthesiology field. *J Clin Anesth*. 2015.

181. StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. (Computer Program).

182. Fan W, Yan Z. Factors affecting response rates of the web survey: A systematic review. *Comput Hum Behav*. 2010;26(2):132-139. doi:10.1016/j.chb.2009.10.015.

183. Couper MP. Review: Web surveys: A review of issues and approaches. *Public Opin Q*. 2000:464-494.

184. Tourangeau R, Yan T. Sensitive questions in surveys. *Psychol Bull*. 2007;133(5):859.

185. Fisher RJ. Social Desirability Bias and the Validity of Indirect Questioning. *J Consum Res*. 1993;20(2):303-315.

186. Sax LJ, Gilmartin SK, Bryant AN. Assessing response rates and nonresponse bias in web and paper surveys. *Res High Educ*. 2003;44(4):409-432.

187. Lemon JS. The effect of reminder intervals on response rates for web surveys. *Assoc Surv Comput*. 2007:103.

188. Sheehan KB. E-mail survey response rates: A review. *J Comput Commun*. 2001;6(2):0-0.

189. Jackson LA, Ervin KS, Gardner PD, Schmitt N. Gender and the Internet: Women communicating and men searching. *Sex Roles*. 2001;44(5-6):363-379.

190. Porter SR, Whitcomb ME. Non-response in student surveys: The role of demographics, engagement and personality. *Res High Educ*. 2005;46(2):127-152.

191. Goldin C, Katz LF, Kuziemko I. *The Homecoming of American College Women: The Reversal of the College Gender Gap*. National Bureau of Economic Research; 2006.

192. Census Data Shows that More Women than Men Hold College Degrees. Study.com. http://study.com/articles/Census_Data_Shows_that_More_Women_than_Men_Hold_College_Degrees.html. Accessed March 28, 2016.

193. Voigt LF, Koepsell TD, Daling JR. Characteristics of telephone survey respondents according to willingness to participate. *Am J Epidemiol*. 2003;157(1):66-73.

194. Singer E, Van Hoewyk J, Maher MP. Experiments with incentives in telephone surveys. *Public Opin Q*. 2000;64(2):171-188.

195. The Condition of Education - Postsecondary Education - Characteristics of Postsecondary Students - Characteristics of Postsecondary Students - Indicator May (2015). http://nces.ed.gov/programs/coe/indicator_csb.asp. Accessed March 28, 2016.

196. Johnston LD, O'malley PM, Bachman JG, Schulenberg JE. Monitoring the Future National Survey Results on Drug Use, 1975-2010. Volume I, Secondary School Students. *Inst Soc Res*. 2011.

197. Pletcher MJ, Kertesz SG, Kohn MA, Gonzales R. TRends in opioid prescribing by race/ethnicity for patients seeking care in us emergency departments. *JAMA*. 2008;299(1):70-78. doi:10.1001/jama.2007.64.

198. Simoni-Wastila L. The use of abusable prescription drugs: the role of gender. *J Womens Health Gend Based Med*. 2000;9(3):289-297. doi:10.1089/152460900318470.

199. Zito JM, Safer DJ, DosReis S, et al. Psychotropic practice patterns for youth: a 10-year perspective. *Arch Pediatr Adolesc Med*. 2003;157(1):17-25.

200. McCabe SE, Teter CJ, Boyd CJ, Knight JR, Wechsler H. Nonmedical use of prescription opioids among U.S. college students: Prevalence and correlates from a national survey. *Addict Behav*. 2005;30(4):789-805. doi:10.1016/j.addbeh.2004.08.024.

201. Bélanger-Gravel A, Godin G, Vézina-Im L-A, Amireault S, Poirier P. The effect of theory-based interventions on physical activity participation among overweight/obese individuals: a systematic review. *Obes Rev*. 2011;12(6):430-439. doi:10.1111/j.1467-789X.2010.00729.x.

202. Prestwich A, Sniehotta FF, Whittington C, Dombrowski SU, Rogers L, Michie S. Does theory influence the effectiveness of health behavior interventions? Meta-analysis. *Health Psychol Off J Div Health Psychol Am Psychol Assoc*. 2014;33(5):465-474. doi:10.1037/a0032853.

203. Brug J, Oenema A, Ferreira I. Theory, evidence and Intervention Mapping to improve behavior nutrition and physical activity interventions. *Int J Behav Nutr Phys Act*. 2005;2:2. doi:10.1186/1479-5868-2-2.

204. Ponnet K, Wouters E, Walrave M, Heirman W, Van Hal G. Predicting students' intention to use stimulants for academic performance enhancement. *Subst Use Misuse*. 2015;50(3):275-282. doi:10.3109/10826084.2014.952446.

205. Cohen J, Cohen P, West SG, Aiken LS. *Applied Multiple Regression/correlation Analysis for the Behavioral Sciences*. Routledge; 2013.

206. Mcmillan B, Conner M. Applying an Extended Version of the Theory of Planned Behavior to Illicit Drug Use Among Students1. *J Appl Soc Psychol*. 2003;33(8):1662-1683. doi:10.1111/j.1559-1816.2003.tb01968.x.

207. Armitage CJ, Norman P, Conner M. Can the Theory of Planned Behaviour mediate the effects of age, gender and multidimensional health locus of control? *Br J Health Psychol*. 2002;7(Part 3):299-316. doi:10.1348/135910702760213698.

208. Villarruel AM, Jemmott JB, Jemmott LS, Ronis DL. Predictors of sexual intercourse and condom use intentions among Spanish-dominant Latino youth: a test of the planned behavior theory. *Nurs Res*. 2004;53(3):172-181.

209. Foxcroft DR, Moreira MT, Almeida Santimano NM, Smith LA. Social norms information for alcohol misuse in university and college students. *Cochrane Database Syst Rev*. 2015;12:CD006748. doi:10.1002/14651858.CD006748.pub4.

210. Gunasekera H, Chapman S, Campbell S. Sex and drugs in popular movies: an analysis of the top 200 films. *J R Soc Med*. 2005;98(10):464-470.

211. Perkins HW. Social norms and the prevention of alcohol misuse in collegiate contexts. *J Stud Alcohol Suppl*. 2002;(14):164-172.

212. Perkins HW, Craig DW. A successful social norms campaign to reduce alcohol misuse among college student-athletes. *J Stud Alcohol*. 2006;67(6):880-889.

213. Neighbors C, Larimer ME, Lewis MA. Targeting misperceptions of descriptive drinking norms: efficacy of a computer-delivered personalized normative feedback intervention. *J Consult Clin Psychol*. 2004;72(3):434.

214. Ford JA. Nonmedical prescription drug use among adolescents the influence of bonds to family and school. *Youth Soc*. 2009;40(3):336-352.

215. Young AM, Glover N, Havens JR. Nonmedical use of prescription medications among adolescents in the United States: a systematic review. *J Adolesc Health*. 2012;51(1):6-17.

216. Collins D, Abadi MH, Johnson K, Shamblen S, Thompson K. Non-medical use of prescription drugs among youth in an Appalachian population: prevalence, predictors, and implications for prevention. *J Drug Educ*. 2011;41(3):309-326.

217. Etcheverry PE, Agnew CR. Romantic partner and friend influences on young adult cigarette smoking: comparing close others' smoking and injunctive norms over time. *Psychol Addict Behav*. 2008;22(3):313.

218. Rempel LA, Rempel JK. Partner influence on health behavior decision-making: Increasing breastfeeding duration. *J Soc Pers Relatsh*. 2004;21(1):92-111.

219. Papp LM. Prescription drug misuse among dating partners: Within-couple associations and implications for intimate relationship quality. *Psychol Addict Behav*. 2010;24(3):415.

220. Leonard KE, Das Eiden R. Husband's and wife's drinking: unilateral or bilateral influences among newlyweds in a general population sample. *J Stud Alcohol Suppl*. 1999;(13):130-138.

221. Fleming MF, Barry KL, Manwell LB, Johnson K, London R. Brief physician advice for problem alcohol drinkers: a randomized controlled trial in community-based primary care practices. *Jama*. 1997;277(13):1039-1045.

222. Fleming MF, Mundt MP, French MT, Manwell LB, Stauffacher EA, Barry KL. Brief physician advice for problem drinkers: long-term efficacy and benefit-cost analysis. *Alcohol Clin Exp Res*. 2002;26(1):36-43.

223. Shen X, Bachyrycz A, Anderson JR, Tinker D, Raisch DW. Quitting patterns and predictors of success among participants in a tobacco cessation program provided by pharmacists in New Mexico. *J Manag Care Pharm*. 2014;20(6):579-587.

224. Cheng TC, Lo CC. Nonmedical use of prescription medications: A longitudinal analysis with adolescents involved in child welfare. *Child Youth Serv Rev*. 2012;34(4):859-864.

225. Ford JA, McCutcheon J. The misuse of Ambien among adolescents: Prevalence and correlates in a national sample. *Addict Behav*. 2012;37(12):1389-1394.

226. Vaughn MG, Fu Q, Perron BE, Wu L-T. Risk profiles among adolescent nonmedical opioid users in the United States. *Addict Behav*. 2012;37(8):974-977.

227. Gilson AM, Kreis PG. The burden of the nonmedical use of prescription opioid analgesics. *Pain Med*. 2009;10(S2):S89-S100.

228. McCabe SE, Cranford JA, Boyd CJ, Teter CJ. Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. *Addict Behav*. 2007;32(3):562-575.

229. Arria AM, Wilcox HC, Caldeira KM, Vincent KB, Garnier-Dykstra LM, O'Grady KE. Dispelling the myth of "smart drugs": Cannabis and alcohol use problems predict nonmedical use of prescription stimulants for studying. *Addict Behav*. 2013;38(3):1643-1650.

230. Bachman JG, Johnson LD, O'Malley PM. Explaining recent increases in students' marijuana use: impacts of perceived risks and disapproval, 1976 through 1996. *Am J Public Health*. 1998;88(6):887-892.

231. Sheeran P, Trafimow D, Finlay KA, Norman P. Evidence that the type of person affects the strength of the perceived behavioural control-intention relationship. *Br J Soc Psychol*. 2002;41(2):253-270.

232. Scheier LM, Botvin GJ, Diaz T, Griffin KW. Social skills, competence, and drug refusal efficacy as predictors of adolescent alcohol use. *J Drug Educ*. 1999;29(3):251-278.

233. LEEPER C. ASHP statement on the pharmacist's role in substance abuse prevention, education, and assistance. *Am J Health Syst Pharm*. 2014;71(3):243-246.

234. Conner M, Warren R, Close S, Sparks P. Alcohol consumption and the theory of planned behavior: An examination of the cognitive mediation of past behaviorid. *J Appl Soc Psychol*. 1999;29(8):1676-1704.

235. Norman P, Conner M. The theory of planned behaviour and binge drinking: Assessing the moderating role of past behaviour within the theory of planned behaviour. *Br J Health Psychol*. 2006;11(1):55-70.

236. Norman P, Armitage CJ, Quigley C. The theory of planned behavior and binge drinking: Assessing the impact of binge drinker prototypes. *Addict Behav*. 2007;32(9):1753-1768.

237. Cooke R, French DP. How well do the theory of reasoned action and theory of planned behaviour predict intentions and attendance at screening programmes? A meta-analysis. *Psychol Health*. 2008;23(7):745-765. doi:10.1080/08870440701544437.

238. Bagozzi RP. Attitudes, intentions, and behavior: A test of some key hypotheses. *J Pers Soc Psychol*. 1981;41(4):607.

239. Kreuter MW, Wray RJ. Tailored and targeted health communication: strategies for enhancing information relevance. *Am J Health Behav*. 2003;27(1):S227-S232.

240. Grogan SC, Bell R, Conner M. Eating sweet snacks: gender differences in attitudes and behaviour. *Appetite*. 1997;28(1):19-31. doi:10.1006/appe.1996.0067.

241. Yankelevitz RL, Mitchell SH, Zhang Y. Gender Differences in Factors Associated with Alcohol Drinking: Delay Discounting and Perception of Others' Drinking. *Drug Alcohol Depend*. 2012;123(0):273-276. doi:10.1016/j.drugalcdep.2011.11.012.

242. Badiani A, Belin D, Epstein D, Calu D, Shaham Y. Opiate versus psychostimulant addiction: the differences do matter. *Nat Rev Neurosci*. 2011;12(11):685-700.

243. Arria AM, DuPont RL. Nonmedical Prescription Stimulant Use Among College Students: Why We Need to Do Something and What We Need to Do. *J Addict Dis*. 2010;29(4):417-426. doi:10.1080/10550887.2010.509273.

244. Phillips J. Prescription drug abuse: Problem, policies, and implications. *Nurs Outlook*. 2013;61(2):78-84.

245. Sussman S, Pentz MA, Spruijt-Metz D, Miller T. Abuse of "study drugs": Prevalence, consequences, and implications for therapeutic prescription and policy. *Subst Abuse Treat Prev Policy*. 2006;1.

246. Generation Rx | Safe Medication Practices for Life. http://www.generationrx.org/. Accessed March 20, 2016.

247. Fleming ML, Barner JC, Brown CM, Shepherd MD, Strassels S, Novak S. Using the theory of planned behavior to examine pharmacists' intention to utilize a prescription drug monitoring program database. *Res Soc Adm Pharm*. 2014;10(2):285-296.

248. Reifler LM, Droz D, Bailey JE, et al. Do prescription monitoring programs impact state trends in opioid abuse/misuse? *Pain Med*. 2012;13(3):434-442.

249. Paulozzi LJ, Stier DD. Prescription drug laws, drug overdoses, and drug sales in New York and Pennsylvania. *J Public Health Policy*. 2010;31(4):422-432.

250. Green TC, Mann MR, Bowman SE, et al. How does use of a prescription monitoring program change medical practice? *Pain Med*. 2012;13(10):1314-1323.

251. DEA Office of Diversion Control - About Us. http://www.deadiversion.usdoj.gov/Inside.html. Accessed March 20, 2016.

252. Commissioner O of the. Testimony - FDA's Role in Preventing Prescription Drug Abuse. http://www.fda.gov/NewsEvents/Testimony/ucm112718.htm. Accessed March 20, 2016.

253. The Science of Attention: How To Capture And Hold The Attention of Easily Distracted Students. InformED. http://www.opencolleges.edu.au/informed/features/30-tricks-for-capturing-students-attention/. Published June 28, 2014. Accessed February 5, 2016.

254. Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: A meta-analytic review. *Br J Soc Psychol*. 2001;40(4):471-499.

255. Kok G, Schaalma H, Ruiter RAC, Empelen PV, Brug J. Intervention Mapping: Protocol for Applying Health Psychology Theory to Prevention Programmes. *J Health Psychol*. 2004;9(1):85-98. doi:10.1177/1359105304038379.

256. Microsoft Word - ASIPP Fact Sheet - FINAL 10.11.11.doc - ASIPPFactSheet101111.pdf. https://www.asipp.org/documents/ASIPPFactSheet101111.pdf. Accessed March 31, 2016.

257. Dowdall GW, Wechsler H. Studying college alcohol use: widening the lens, sharpening the focus. *J Stud Alcohol Suppl*. 2002;(14):14-22.

APPENDIX A: IRB Approval Letter

UNM HEALTH SCIENCES CENTER

Human Research Review Committee
Human Research Protections Office

December 1, 2015

Dennis Raisch, PhD, MS, R.Ph
1 University of New Mexico
Albuquerque, NM 87131
5052722130
draisch@salud.unm.edu

Dear Dr. Raisch:

On 11/30/2015, the HRRC reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	The Impact of a Theory-Based Web Intervention on the Intention To Use Prescription Drugs for Non-Medical Purposes Among College Students: A Randomized Controlled Trial
Investigator:	Dennis Raisch, PhD, MS, R.Ph
Study ID:	15-526
Submission ID:	15-526
IND, IDE, or HDE:	None
Submission Summary:	Initial Study
Documents Approved:	• NMUPD_HRP-503__PROTOCOL_10_13_2015 • Consent_form v10/14/2015 • Survey_Only_10_13_2015 • Recruitment email submitted 10/2/2015
Review Category:	EXEMPTION: Categories (2) Tests, surveys, interviews, or observation.
Determinations/Waivers:	Students / Employees Documentation of Consent not required. HIPAA Authorization Addendum Not Applicable.
Submission Approval Date:	11/30/2015
Approval End Date:	None
Effective Date:	11/30/2015

The HRRC approved the study from 11/30/2015 to inclusive. If modifications were required to secure approval, the effective date will be later than the approval date. The "Effective Date" 11/30/2015 is the date the HRRC approved your modifications and, in all cases, represents the date study activities may begin.

Because it has been granted exemption, this research is not subject to continuing review.

Please use the consent documents that were approved and stamped by the HRRC. The stamped and approved consents are available for your retrieval in the "Documents" tab of the parent study.

This determination applies only to the activities described in this submission and does not apply should you make any changes to these documents. If changes are being considered and there are questions about whether HRRC review is needed, please submit a study modification to the HRRC for a determination. A change in the research may disqualify this research from the current review category. You can create a modification by clicking Create Modification / CR within the study.

In conducting this study, you are required to follow the Investigator Manual dated April 1, 2015 (HRP-103), which can be found by navigating to the IRB Library.

Sincerely,

S.Lu

Stephen Lu, MD
HRRC Chair

APPENDIX B: Recruitment Email (Intervention Group)

Dear UNM student,

You are receiving this email because you have been selected by chance from a list of all students at UNM. The purpose of our study is to find out why students might choose to use (or not use) prescription drugs for nonmedical purposes. The study usually takes 20 to 30 minutes to complete.

Your involvement in the study is voluntary, and you may choose not to participate. Your responses will be held strictly confidential. No names or identifying information are collected in this study. None of your responses to the survey can be linked to you. The study involves viewing a website and then responding to a survey. You will be randomly assigned to view one of two websites, if you agree to participate.

If you agree to participate, please view this website: http://www.rxoutofcontext.org/ and after viewing the website, please respond to this survey: https://esurvey.unm.edu/opinio/s?s=49455. If you decide not to participate, please use the X at the upper right corner to close the window and disconnect.

When you complete the study and survey, you will have a separate opportunity to **register to get $20 in gift cards**. Twenty students will receive gift cards. Registration for the gift cards is separate and will never be linked to the survey. Information on how to register for the gift cards will be given at the last page of the survey.

If you do not want to receive any more emails for this study, reply to this email with “Not interested” in the subject line.

If you have any questions please contact Rasha Arabyat at rarabyat@salud.unm.edu .

Thank you,

Sincerely,

Rasha Arabyat, MPH, PhD Candidate
College of Pharmacy
The University of New Mexico.

And,
Dennis W. Rasich, PhD
Professor
College of Pharmacy
The University of New Mexico

APPENDIX C: Recruitment Email (Control Group)

Dear UNM student,

You are receiving this email because you have been selected by chance from a list of all students at UNM. The purpose of our study is to find out why students might choose to use (or not use) prescription drugs for nonmedical purposes. The study usually takes 20 to 30 minutes to complete.

Your involvement in the study is voluntary, and you may choose not to participate. Your responses will be held strictly confidential. No names or identifying information are collected in this study. None of your responses to the survey can be linked to you. The study involves viewing a website and then responding to a survey. You will be randomly assigned to view one of two websites, if you agree to participate.

If you agree to participate, please view this website (http://www.cdc.gov/family/college/) and after viewing the website, please respond to this survey: https://esurvey.unm.edu/opinio/s?s=49457. If you decide not to participate, please use the X at the upper right corner to close the window and disconnect.

When you complete the study and survey, you will have a separate opportunity to **register to get $20 in gift cards**. Twenty students will receive gift cards. Registration for the gift cards is separate and will never be linked to the survey. Information on how to register for the gift cards will be given at the last page of the survey.

If you do not want to receive any more emails for this study, reply to this email with “Not interested” in the subject line.

If you have any questions please contact Rasha Arabyat at rarabyat@salud.unm.edu .

Thank you,

Sincerely,

Rasha Arabyat, MPH, PhD Candidate
College of Pharmacy
The University of New Mexico.

And,
Dennis W. Rasich, PhD
Professor
College of Pharmacy
The University of New Mexico.

APPENDIX D: The Survey

Using prescription drugs for nonmedical purposes is increasing among college students. The present survey is to investigate some of the reasons that students choose to use (or not use) prescription drugs for nonmedical purposes. Please read each of the following questions carefully, and respond to the best of your ability. There are no correct or incorrect answers; we are merely interested in your personal point of view. The survey will take approximately 10 to 15 minutes to be filled out. Thank you for your time and participation in this study.

*The first 6 questions are related to your previous use of prescription drugs for nonmedical reasons. Please choose the option that you think is appropriate.

Note: *Nonmedical use of prescription drugs is defined as using* ***medications without a prescription, or for purposes other than prescribed by doctors such as to get high, to relief stress or to increase concentration. These include painkillers (e.g. Codeine &Oxycodone), stimulants (e.g. Adderall & Ritalin), and depressants (e.g. Valium & Xanax)***

1. Have you **ever** used a prescription drug for nonmedical purposes? (If no, please skip questions 2 to 6).
-------------(1) Yes
-------------(2) No

2. How old were you the first time you used a prescription drug for nonmedical purposes? ………..

3. Have you used a prescription drug for nonmedical purposes **in the past 12 months**?
-------------(1) Yes
-------------(2) No

4. How many times in the past year have you used a prescription drug for

nonmedical reasons? ………..

5. Which of the following prescription drugs have you used for nonmedical purposes? **Choose all that apply.**
------------(1) Painkillers (e.g. Codeine, Darvon, Demerol, Hydrocodone, Lortab, Oxycodone)
------------(2) Prescription Stimulants (e.g. Adderall, Concerta, Methylphenidate, Ritalin)
------------(3) Depressants (e.g. Ativan, Halcion, Librium, Nembutal, Valium, Xanax)

6. What were your reasons for using a prescription drug for nonmedical purposes? **Choose all that apply**
-------------(1) For self-medication (e.g. for pain or anxiety)
-------------(2) To study for an exam

-------------(3) To lose weight
-------------(4) To party with friends
-------------(5) Other reasons (please specify………..)

*Now we are interested in learning more about you and your educational experience in order to better evaluate your responses. Please answer the following questions.

7. What is your gender?
-------------(1) Male
-------------(2) Female

8. What is your age? ……..

9. Which of the following best describes your UNM degree program?
------------(1) Undergraduate
------------(2) Graduate
------------(3) Professional degree (law, medical, physical therapy, nursing practice, and pharmacy)

10. How many years have you been at UNM?..............

11. Are you a student within any of the UNM Health Sciences Center's colleges?
-------------(1) Yes
-------------(2) No

12. Are you a member of a social fraternity/sorority group?
-------------(1) Yes
-------------(2) No

13. How would you best describe your ethnic/racial background?
----------(1) Non-Hispanic/White
----------(2) Non-Hispanic/African American
----------(3) Hispanic
----------(4) Native American/American Indian
----------(5) Asian
----------(6) Others

14. Do you live on-campus?
-------------(1) Yes
-------------(2) No

15. Regarding tobacco use, which of the following categories fit you the best?
-------------(1) Non-tobacco user
-------------(2) Former tobacco user
-------------(3) Current tobacco user

16. Regarding alcohol consumption, which of the following categories fit you the best?

-------------(1) Non-drinker
-------------(2) Former drinker
-------------(3) Occasional drinker (e.g. weekends only)
-------------(4) Frequent drinker (e.g. more than 3 times a week)

17. Regarding marijuana use, which of the following categories fit you the best?

------------(1) Non-marijuana user
------------(2) Former marijuana user
------------(3) Occasional marijuana user (e.g. weekends only)
------------(4) Frequent marijuana user (e.g. more than 3 times a week)

*Now we are interested in determining your beliefs regarding student's use of prescription drugs for nonmedical reasons. Please circle the number that corresponds to your choice using the following scale.

18. Using prescription drugs for nonmedical purposes will:	**Strongly Disagree**			**Neither disagree nor agree**			**Strongly agree**
Help me stay focused and improve my grades	1	2	3	4	5	6	7
Cause me physical health problems	1	2	3	4	5	6	7
Cause me mental health problems	1	2	3	4	5	6	7
Cause me to be addicted	1	2	3	4	5	6	7
Get me arrested	1	2	3	4	5	6	7
Help me lose weight	1	2	3	4	5	6	7
Help me get high and party	1	2	3	4	5	6	7
Make me feel more socially accepted by my group	1	2	3	4	5	6	7

Note: the following question may look similar to the previous one, but they measure different things.

19. Generally speaking, <u>how good or bad</u> do you feel about the following outcomes?	**Extremely bad**			**Neutral**			**Extremely good**
Stay focused and improve my grades	1	2	3	4	5	6	7
Have physical health problems	1	2	3	4	5	6	7
Have mental health issues	1	2	3	4	5	6	7
Develop addiction	1	2	3	4	5	6	7
Get arrested	1	2	3	4	5	6	7
Lose weight	1	2	3	4	5	6	7
Get high and enhance my partying experience	1	2	3	4	5	6	7
Feel more socially accepted by my group	1	2	3	4	5	6	7

*Next, we are interested in knowing how you feel about using prescription drugs for nonmedical reasons. (Note: it is **not** necessarily that you have used prescription drugs for nonmedical reasons previously to answer this question)

20. I consider the use of prescription drugs for nonmedical purposes to be:								
Irritating	-3	-2	-1	0	1	2	3	Relaxing
Unpleasant	-3	-2	-1	0	1	2	3	Pleasant
Unenjoyable	-3	-2	-1	0	1	2	3	Enjoyable
Bad	-3	-2	-1	0	1	2	3	Good
Harmful	-3	-2	-1	0	1	2	3	Not harmful
Irresponsible	-3	-2	-1	0	1	2	3	Responsible

*Now we would like to ask few questions about your intention to use prescription drugs for nonmedical purposes in the future.

20. Please circle the number that closely matches your level of agreement/disagreement with the following statements.	**Strongly Disagree**			**Neither disagree nor agree**			**Strongly agree**
I intend to **AVOID** using prescription drugs for nonmedical purposes over the next 3 months.	-3	-2	-1	0	1	2	3
I am **NOT** willing to use prescription drugs for nonmedical purposes over the next 3 months.	-3	-2	-1	0	1	2	3
I plan to **NOT** use prescription drugs for nonmedical purposes over the next 3 months.	-3	-2	-1	0	1	2	3

*Now, we are interested in knowing which individuals/group of individuals influence your decision regarding using prescription medications for nonmedical reasons. Please use the following scale to circle the number the matches your choice.

21. How likely would each of the following individuals <u>disapprove your use</u> of prescription drugs for nonmedical purposes?	**Extremely unlikely**			**Neutral**			**Extremely likely**
Your partner (spouse, girlfriend, or boyfriend)	1	2	3	4	5	6	7
Your close friends	1	2	3	4	5	6	7
Your doctor, nurse or pharmacist	1	2	3	4	5	6	7
Your family members	1	2	3	4	5	6	7

Note: the following question may look similar to the previous one, but they measure different things.

22. When it comes to matters of health, how likely are you to do what the following individuals recommend?	**Extremely unlikely**			**Neutral**			**Extremely likely**
Your partner (spouse, girlfriend, or boyfriend)	1	2	3	4	5	6	7
Your close friends	1	2	3	4	5	6	7
Your doctor, nurse or pharmacist	1	2	3	4	5	6	7
Your family members	1	2	3	4	5	6	7

23. Most people who are important to me think I should **NOT** use medications for nonmedical purposes:

Strongly Disagree	-3	-2	-1	0	1	2	3	Strongly agree

24. Most people whose opinions I value would **NOT** approve my using of medications for nonmedical purposes:

Strongly Disagree	-3	-2	-1	0	1	2	3	Strongly agree

25. Most people whom I respect and admire **DO NOT** use medications for nonmedical purposes:

Strongly Disagree	-3	-2	-1	0	1	2	3	Strongly agree

26. Most people, like me, **DO NOT** use medications for nonmedical purposes:

Strongly Disagree	-3	-2	-1	0	1	2	3	Strongly agree

27. How do you think the following factors make using medications for nonmedical purposes easy or difficult?	**Extremely difficult**			**Neither easy nor difficult**			**Extremely easy**
Having a legitimate prescription for the medication	1	2	3	4	5	6	7
Having a friend with a prescription for the medication	1	2	3	4	5	6	7
Having easy access to the medication	1	2	3	4	5	6	7
Being offered a medication by a friend or a family member	1	2	3	4	5	6	7
Having a health insurance	1	2	3	4	5	6	7
Getting behind in school work	1	2	3	4	5	6	7
Facing a stressful personal situation	1	2	3	4	5	6	7
Being a member of social fraternity/ sorority group	1	2	3	4	5	6	7

Note: the following question may look similar to the previous one, but they measure different things.

28. How much control do you feel you have over the following factors	**No control**			**Neither no control nor complete control**			**Complete control**
Having a legitimate prescription for the medication	1	2	3	4	5	6	7
Having a friend with a prescription for the medication	1	2	3	4	5	6	7
Having easy access to prescription medications	1	2	3	4	5	6	7
Being offered a prescription medication by a friend or a family member	1	2	3	4	5	6	7
Having a health insurance	1	2	3	4	5	6	7
Getting behind in school work	1	2	3	4	5	6	7
Facing a stressful personal situation	1	2	3	4	5	6	7
Being a member of social fraternity/ sorority group	1	2	3	4	5	6	7

29. It is completely up to me whether or not I use medications for nonmedical purposes:

Strongly Disagree	-3	-2	-1	0	1	2	3	Strongly agree

30. For me, using medications for nonmedical purposes is under my control:

Strongly Disagree	-3	-2	-1	0	1	2	3	Strongly agree

Thank you for your participation

APPENDIX E: Tracking the Utilization of the Survey

Figure 7 Tracking the utilization of the website(source: Google Analytics)