

This Is Your Brain On Drugs: Effects of a Biological Explanation on Attitudes

Toward Heroin Users and Responses to Heroin Addiction

Honors in Psychology Project and Honors Program Capstone

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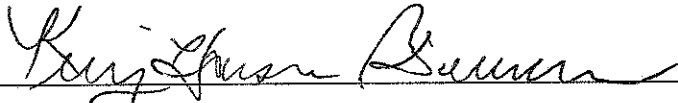
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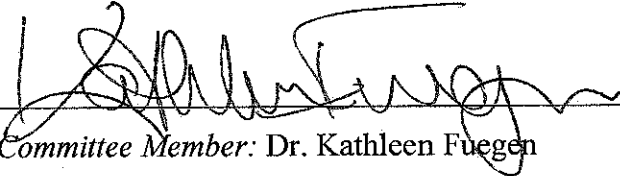
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**Abstract**

Northern Kentucky is experiencing a heroin epidemic, and while opposition remains widespread, activists are advocating for harm reduction programs. This experiment tested the possibility that biological explanation of heroin addiction would change attitudes toward heroin users and harm reduction programs. This study included 87 undergraduates and 32 participants from a quasi-control group. Subjects were randomly assigned to one of two groups: an experimental group, who received information on the biology of addiction and information on harm reduction practices, and a control group who only received the latter. A quasi-experimental control group received no information. All participants then answered 75 items measuring perceived controllability of addiction, stigma toward heroin users, support for harm reduction practices, and levels of anger and disgust. Overall, there were few significant effects of the information manipulation. However, regression analyses supported Weiner's (1995) attribution theory that belief in a biological cause of addiction is linked to reduced perceptions of control and less stigmatization of people who use heroin.

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Heroin use is a growing epidemic in our country today. From 2010 to 2012, death rates from heroin overdose doubled in America (Centers for Disease Control, 2014). From 2000 to 2012, there was a 366% increase in overdose deaths in Ohio. Three years ago, 1,272 Ohioans died of opioid overdose, with 680 of those deaths being specifically due to heroin (Violence and Injury, 2012). Kentucky ranks third in the nation for heroin overdose deaths (Levy, Segal, & Miller, 2013) and the region has been called “ground zero” in the heroin epidemic (DeMio, 2013). There were 72 heroin overdose deaths in northern Kentucky alone in 2013 (Kentucky Office of Drug Control Policy, 2014).

Aside from the threat of overdose death, heroin use also carries the risk of the spread of infectious diseases, including Hepatitis C and AIDS, caused by unsafe injecting procedures. Hepatitis C can lead to liver failure, cancer, and death. The estimated lifetime treatment costs of Hepatitis C range as high as \$600,000 (with liver transplant; C. Everett Koop Institute, 2014), and rates of acute Hepatitis C in northern Kentucky are reported to be 24 times the national rate (DeMio, 2014). Other diseases, such as HIV/AIDS and endocarditis, are comparably expensive to treat, as well as potentially fatal, and are also linked to unsafe heroin injecting procedures (Wodak & Cooney, 2006).

Currently, northern Kentucky only meets approximately 25% of the demand for any treatment, and waiting lists for treatment range from one week to nine months. Unfortunately, much of the available treatment lacks a strong evidence base (Leadership Team of Northern Kentucky Heroin Impact Response, 2014). The long wait times and lack of effective treatment are likely to be contributing to the surge in heroin overdose deaths. However, there are ways to

combat this public health crisis. Three forms of harm reduction that are supported by substantial scientific evidence include the distribution of naloxone, medication-assisted treatment, and syringe services programs (SSPs).

### **Evidence-Based Harm Reduction Services**

First, and most importantly, there is medication created to keep heroin users alive. Naloxone (also known by its brand name, Narcan®; Beletsky, Burris, & Kral, 2009), is an opioid antagonist medication that reverses the respiratory depression that causes heroin overdose fatalities. Naloxone now comes in an intranasal spray that can be administered by lay people with minimal training. Naloxone is not a narcotic and causes no harmful side effects; when administered in a timely manner, it saves lives. Since 2001, the expansion of access to naloxone kits across 17 states and the District of Columbia has led to over 10,000 overdose reversals (Centers for Disease Control, 2012). However, myths about naloxone and beliefs that this drug encourages heroin users to continue using drugs contribute to the stigma associated with helping heroin users (Castillo, 2014).

Second, there are medication-assisted treatment (MAT) options for heroin users (Center for Substance Abuse Treatment, 2012). A large body of research suggests that MAT, combined with behavioral therapy, is the most effective treatment for heroin addiction (Volkow, Frieden, Hyde, & Cha, 2014). There are currently three types of medications used for MAT available in America today: Vivitrol®, Suboxone®, and methadone.

Vivitrol is a long-acting opioid antagonist that can be injected once monthly (Krupitsky et al., 2011). Vivitrol reduces cravings for heroin and blocks the effects of heroin (the “high”) if heroin or other opioids are used. Vivitrol is not a controlled substance, so one does not become dependent upon the medication, and Vivitrol can be prescribed by any medical professional

licensed to prescribe medication. However, Vivitrol is less effective for people who have extensive histories of heroin use.

Suboxone is made up of buprenorphine, which is a partial opioid agonist, and naloxone, which is a full antagonist (Center for Substance Abuse Treatment, 2004). When taken daily, Suboxone relieves the painful withdrawal symptoms associated with heroin and helps to control cravings. This medication, designed to dissolve under the tongue, is a controlled substance and has modest abuse potential; however, the naloxone component of Suboxone helps to prevent misuse of the medication by triggering immediate withdrawal symptoms if injected. Suboxone is effective in combination with behavioral therapy for people with shorter heroin use histories and lower amounts of daily heroin use.

Methadone maintenance therapy (methadone combined with behavioral therapy) is the most effective treatment for heroin addiction (Center for Substance Abuse Treatment, 2012). Methadone is a synthetic opioid full agonist. Taken orally, once daily, and regularly, methadone does not produce intoxication. This medication blocks the effects of heroin, relieves heroin craving, and prevents withdrawal symptoms. Methadone treatment is heavily regulated in the U.S., and most methadone maintenance is administered in specially designed Opioid Treatment Programs commonly known as methadone clinics.

Last, syringe services programs (SSPs, also known as needle exchange programs) prevent blood-borne infections such as Hepatitis C, HIV/AIDS, and endocarditis (AmFAR, 2013). All of these infections can be caused by unsafe injecting practices. SSPs effectively reduce such infections by providing low-cost or free sterile syringes; on-site testing, counseling, and resources for blood-borne infections; safe disposal of used syringes; and overdose prevention kits and training. The cost of providing syringe services is much lower than that of treating blood-

borne infections. SSPs promote public safety and provide a bridge to treatment for heroin users. It is important to note that dozens of studies have demonstrated that SSPs do not lead to increased drug use (Ritter & Cameron, 2006), and that SSP clients are as much as five times more likely to enter drug treatment programs than drug users who do not have access to SSPs (Hagan et al., 2000).

Unfortunately, stigma appears to play a major role in limiting the availability of these effective harm reduction options in our area.

### **Addiction-Related Stigma**

Stigmas are physical attributes or behaviors that deviate from the norm and denote negative outcomes or unwanted effects (Weiner, Perry, & Magnusson, 1988). Health-related stigma is a social process characterized by exclusion, rejection, blame or devaluation, perception or reasonable anticipation of an adverse social judgment about a person or group on the basis of a socially discredited health condition, such as drug addiction or AIDS (Weiss, Ramakrishna, & Somma, 2006). In turn, stigma influences the opportunities and outcomes of people with psychiatric disorders, such as addiction (Corrigan, Kuwabara, & O'Shaughnessy, 2009).

Population surveys have consistently shown that drug addiction is more heavily stigmatized than other mental or physical illnesses. Corrigan et al. (2009) revealed that people facing addiction were viewed as being more blameworthy and dangerous than those with other mental illnesses. In a survey conducted in 2003 (Crisp, Gelder, Goddard, & Meltzer, 2005), participants were asked various opinion questions regarding seven mental illnesses, one of which was addiction. Across the board, the greatest percentage of negative opinions was in relation to drug addiction, especially opinions about dangerousness, predictability, and blameworthiness. Likewise, in a study regarding the stigma associated with alcohol dependence in comparison to

substance-unrelated mental disorders, researchers found that alcohol dependent persons were less frequently regarded as mentally ill, were held more responsible for their condition, provoked more negative emotion and social rejection, and were therefore at risk of medical discrimination (Schomerus et al., 2010).

Stigma associated with drug use may dissuade people from initially becoming drug users (Boekhaut van Solinge, 1999); however, once addiction has taken hold, stigmatization is likely to play a harmful role in multiple ways (Livingston, Milne, Fang, & Amari, 2012). Stigma toward drug addiction can be broken down into three types: social stigma, structural stigma, and self-stigma.

Social stigma describes “the phenomenon of large groups endorsing stereotypes about and acting against a stigmatized group” (Livingston et al., 2012, p. 39). Cunningham, Sobell, Freedman, and Sobell (1994) found that museum attendees who considered cocaine abuse to be an example of wrongdoing, as opposed to considering it a disease, were significantly less likely to express humanitarian attitudes supportive of helping drug users. In a 2013 survey of a representative sample of American adults, Barry, McGinty, Pescosolido, and Goldman (2014) compared attitudes toward people with drug addiction versus mental illness; the researchers found consistent evidence that drug addiction was more stigmatized than mental illness. Respondents were significantly less willing to work closely with addicted persons or have them marry into their family; they were also more unconvinced of the effectiveness of treatment for addiction and more opposed to policies aimed at helping people with addiction, such as increased government spending on treatment, housing, or job support. Many landlords choose not to rent to substance users (Corrigan, Druss, & Perlick, 2014) due to beliefs that people with addiction are dangerous, incompetent, and unpredictable. Likewise, many employers are reluctant or



simply refuse to employ anyone with an addiction problem or history.

Structural stigma (also known as institutional stigma) refers to “the rules, policies, and procedures of private and public entities in positions of power that restrict the rights and opportunities of people with mental illness” (Livingston et al., 2012, p. 40). Substance use disorders are often treated as moral and criminal issues, rather than as health issues, and negative attitudes by policy makers may result in reduced treatment availability and variety (Livingston et al., 2012). For instance, Luty, Kumar, and Stagias (2010) found that pharmacy managers in England with more negative attitudes toward people who use heroin were less likely to offer methadone dispensing, thus constraining the options for methadone patients in their communities. People receiving methadone maintenance treatment in Canada routinely visit their neighborhood pharmacy to consume their methadone (Anstice, Strike, & Brands, 2009). In the U.S., however, strict government regulations require that clients go each day to a methadone clinic, rarely located in their own neighborhood, for supervised consumption (Center for Substance Abuse Treatment, 2012). Healthcare providers may hold negative beliefs and stigma toward substance abusers, believing that they misuse and abuse the system, causing poor provision of care (Weiss et al., 2006). Stigma may also lead physicians to refuse to offer certain services, such as providing syringe exchange or prescribing needed medications for treatment for other illnesses, to heroin users (Shah & Diwan, 2010). Therefore, many heroin users conceal their use to avoid stigma, in turn avoiding needed care (e.g. prenatal care; Ahern et al., 2007). Indeed, negative attitudes toward medication-assisted treatment, such as the inaccurate assumption that MAT simply replaces one addiction with another, among physicians, hospitals, and drug treatment facility staff members are partially responsible for the fact that MAT is available in fewer than half of American treatment programs (Volkow et al., 2014).

Self-stigma (also known as internalized stigma) can be described as “a subjective process that is characterized by negative feelings about one’s self, maladaptive behavior, identity transformation or stereotype endorsement resulting from an individual’s experiences, perceptions, or anticipation of negative social reactions on the basis of a stigmatized social status or health condition” (Livingston & Boyd, 2010, p. 2151). Self-stigma occurs when people internalize the pressure of prejudice that is bestowed on them from the community (Corrigan, Druss, & Perlick, 2014). Discrimination toward drug users has been shown to be a significant source of stress and an obstacle to appropriate care, as heroin users internalize their communities’ negative attitudes toward themselves and their condition (Ahern, Stuber, & Galea, 2006). Many heroin users feel shame and are reluctant to reach out for help from mental health providers and clinics in an attempt to avoid further community discrimination (Corrigan, Druss, & Perlick, 2014).

### **Perceived Controllability and Stigma**

Conditions that are considered to be mental illness, rather than physical illness, carry greater stigma due to the belief in their greater controllability (Weiner, 1995). Health conditions such as obesity and drug addiction, which are perceived to be within the affected individual’s control, are more strongly stigmatized than other conditions (Vartanian, 2010). Schomerus and colleagues (2010) reviewed population studies comparing stigma associated with a variety of disorders and found that people with drug addiction or alcoholism were more likely to be blamed for their disorder than people with other mental illnesses. Decety, Echols, and Correll (2009) found that people who blamed AIDS victims for acquiring their disease through drug injecting showed less empathy for the victims’ pain, as measured via fMRI, than for the pain of healthy controls or AIDS victims who became ill through infected blood transfusions. Another study

(Crisp et al., 2005) found that, in a representative sample of the British public, people with drug addiction were held more personally responsible for their disorders than people with alcoholism, schizophrenia, eating disorders, depression, dementia, or panic disorder.

### **Stigma and Attributions of Responsibility**

Some conditions carry similar stigmatization to drug addiction. Obesity, like drug addiction, is believed (inaccurately) to be controllable (Blaine & Dibiassi, 2002). Overweight individuals are seen as having a moral flaw and less willpower to stay fit and are therefore stigmatized due to their weight. However, when perceptions of weight controllability have been experimentally reduced by providing persuasive information about the role of genetics in determining one's metabolism (Crandall, 1994), stigma was reduced. A study conducted by Puhl, Schwartz, and Brownell (2005) suggested that negative attitudes about people struggling with obesity can be manipulated by presenting participants with information about scientifically based biological factors that influence the condition.

Crandall and Martinez (1996) found that in the U.S., people have negative attitudes about obesity based on social ideology, which stems in part from the belief that individuals are responsible for their own life outcomes. It is logical, then, to think that people addicted to heroin, like those suffering from obesity, are more likely to be viewed as having control over what they put into their bodies and therefore are more likely to be held responsible and blameworthy for their affliction (Corrigan, Kerr, & Knudson, 2005). According to Weiner (1995), this perceived controllability provokes anger for those on the outside, toward the user.

It is important to note, however, that judgments of responsibility assume that the cause of a particular condition can be willfully changed (Weiner, 1995). Therefore, to reduce the stigma associated with heroin addiction, an emphasis on genetic or biological causes that are not

voluntarily modifiable needs to be presented. When uncontrollability due to biological factors is communicated, the recipients of the message may begin to understand that responsibility cannot be assumed for the negative condition (Graham, 1984, 1991).

To alleviate stigma associated with heroin addiction, the biological influences of the disorder need to be presented and understood by policy makers, health care providers, and the general public. Simply referring to heroin addiction as a brain disease may be part of the solution. As discussed by Reinarman (2005), the disease concept of alcoholism was a deliberate construction coined in the 1940s by Jellinek and Mann to persuade both the public and medical profession that alcoholics were not responsible for their drinking and its consequences and therefore were deserving of treatment. Cunningham et al. (1984) found that members of the general public who viewed alcohol abuse as a disease were more sympathetic and supportive of publicly funded treatment. Public awareness of the disease concept of addiction has increased in many industrialized countries since its inception; for example, a population survey of Australians (Meurk et al., 2014) found that 53% believed heroin addiction is a disease (although only 33% agreed that it is a brain disease). Viewing heroin addiction as a disease may lead to less incarceration, more treatment, and less stigmatization (Hall, Carter, & Morley, 2003).

When it was originally formulated, the disease concept of addiction was not based on science (Reinarman, 2005); however, as technology has improved over time, research is now beginning to unravel the science behind addiction and what actually occurs in the addicted brain. In this study, I plan to educate the participants in the experimental condition about the neurological roots of addiction by explaining the critical roles of the brain's reward and executive control systems in the development and maintenance of heroin addiction (Baler & Volkow, 2006; Feil et al., 2010; Volkow, Fowler, & Wang, 2004; Weiss, 2005). I hypothesize that

presenting a biological explanation of addiction will reduce perceived controllability and therefore reduce stigma toward people who use heroin.

In addition to reducing stigmatizing attitudes toward individuals, changing the perceived controllability of disorders by emphasizing their biological causes may also increase support for progressive policies aimed toward those disorders. For example, when museum attendees considered substance use to be a disease (rather than a sin or bad habit), they were more likely to endorse humanitarian efforts to help such disease sufferers (Cunningham et al., 1994). Weiner et al. (1988) found that stigmatizing conditions viewed as less controllable (e.g., paraplegia, blindness) elicited much higher support for personal assistance and charitable contributions than did conditions viewed as more controllable (e.g., drug addiction, obesity). Likewise, when Weiner and colleagues (1988) manipulated the perceived controllability of a person's disorder (e.g., becoming addicted through medical treatment of post-injury pain versus through recreational experimentation), willingness to provide assistance increased significantly in the uncontrollable (low responsibility) condition but not in the controllable (high responsibility) condition. Thus, I hypothesize that reducing the perceived controllability of heroin addiction via a biological explanation will lead to increased support for expanded overdose prevention, medication-assisted treatment availability, and syringe services programs.

### **Anger and Disgust in Response to Heroin Use**

In an early study of attribution, emotion, and response tendencies, Weiner (1980) showed that participants who read a scenario about a person who falls down in public felt disgust when told the person was drunk, as opposed to ill. Weiner hypothesized that the drunk was viewed as responsible for his plight, and helping intentions were not elicited. Later studies from Weiner's lab (Weiner et al., 1988; Weiner, 1995) demonstrated that anger was typically elicited when

participants judged stigmatized individuals to be responsible for their condition.

More recent studies have focused on the overlapping but distinct roles played by anger and disgust in moral judgments, particularly in cases where moral codes involving the body are violated (e.g., MacCoun, 2013; Salerno & Peter-Hagene, 2013). Salerno and Peter-Hagene (2013), for instance, found that both anger and disgust had important influences on mock jurors' confidence in their guilty verdict in a simulated murder trial involving graphic photographs of bloody knife injuries. However, the influence of disgust was significant at all levels of anger, whereas anger influenced judgment confidence only when disgust levels were at least moderate. In a comprehensive review, Russell and Giner-Sorolla (2013) demonstrated that in cases of bodily violations, such as sexual taboos, both anger and disgust are often evoked but respond differently to mitigating information. The researchers asserted that, in contrast to anger, bodily moral disgust is not strongly linked to attributions of fault or justification, but is instead more associative in nature ("...certain objects are just disgusting," p. 328). Park, Faulkner, and Schaller (2003) hypothesized that bodily disgust is an overly inclusive vestige of an evolved process of disease avoidance; they found, for example, that disgust responses were triggered by people with missing limbs resulting from accidents that were not their fault. In a study using fMRI techniques, Harris and Fiske (2006) found that pictures of drug addicts elicited activity in subcortical brain regions associated with processing of disgust and fear, but not regions associated with the prefrontal cortex necessary for higher order social cognition.

As noted by MacCoun (1998), heroin injecting is a clear example of violation of the body; in his own research (MacCoun, 2013), he found that heroin injecting was associated with higher levels of anger and disgust than alcoholism, air pollution, teen sex, or illegal immigration among a representative random sample of California residents. In a previous study of Northern

Kentucky University students, Gilbert (2012) discovered that ongoing heroin use was associated with high levels of disgust, but anger was not measured. Weiner et al. (1988) demonstrated that anger toward drug addicts was reduced if the addiction resulted from medical treatment rather than recreational experimentation; however, the researchers did not assess disgust. To the best of my knowledge, the simultaneous impact of controllability attributions in heroin addiction and anger and disgust has not been examined. Therefore, I propose to measure both anger and disgust after participants have been exposed to either a biological explanation for heroin addiction or a control scenario. Given the evidence that anger is amenable to mitigating factors but disgust is not, I predict that participants exposed to the biological explanation for heroin addiction will show lower levels of anger but equivalent levels of disgust, relative to participants in the control condition.

To summarize, I plan to have undergraduate research participants watch a brief video explaining three harm reduction practices (overdose prevention via naloxone, medication-assisted treatment, and syringe services programs). Prior to watching this harm reduction video, half of the participants (the experimental group) will be randomly assigned to watch an additional brief video explaining the biological roots of heroin addiction, with particular focus on the roles of the reward circuits of the limbic system and the executive inhibitory functions of the prefrontal cortex. The control group will receive no explanation of the causes of heroin addiction. After watching the videos, all participants will respond to items measuring their perceptions of the controllability of heroin use, their attributions of heroin users' responsibility for their addiction, their attitudes toward heroin use and heroin users, and their approval of each of the heroin-related harm reduction practices. Participants will also indicate how much anger and disgust they feel about heroin users. To control for the influence of the information provided

about heroin and related harm reduction practices to experimental and control participants in my study, I will also include a quasi-experimental control group (chosen from participants in another study conducted this semester; see **Participants** below) whose members will respond to several of the attitude measures but who will not receive any information about heroin and harm reduction. The hypotheses are as follows:

Hypothesis 1: Relative to participants in the control and quasi-control groups, participants exposed to a biological explanation for heroin addiction (the experimental group) will believe that heroin users have less control over their addiction and are less responsible for their plight. They will also have less stigmatizing attitudes toward heroin users.

Hypothesis 2: Relative to participants in the control and quasi-control groups, participants in the experimental group will indicate greater support for heroin-related harm reduction practices.

Hypothesis 3: Compared to the control and quasi-control groups, the experimental group will show lower levels of anger toward heroin users, but levels of disgust will be equivalent in the three groups.

## **Method**

### **Participants**

Undergraduate students at Northern Kentucky University were recruited through Sona, Northern Kentucky University's online research participant management system, and received course credit or extra credit for their participation in the "Opinions about Heroin" study. A total of 156 students participated in this study, and 10 were deleted from the analyses due to extensive missing data. Of the remaining 146 participants, 26% were male, 73% were female, 62% were freshmen, and 86% were White, Non-Hispanic.



Unfortunately, it became apparent that a large number of participants had not spent sufficient time to read the “What is Heroin?” description (Appendix 2), watch the videos (30 minutes for the Experimental Group; 16 for the Control), and answer all of the survey questions. In order to identify those participants who made conscientious attempts to follow the study’s directions, I first attempted to split the sample into two groups based on what I considered sufficient time (15 minutes for the Control group, 20 minutes for Experimental group) versus insufficient time (fewer than 15 minutes for Control, 20 minutes for Experimental). Based on this selection criterion, the Control Group spent a mean of 22.14 minutes ( $SD = 14.92$ ) on the study, and the Experimental Group spent a mean of 27.66 minutes ( $SD = 20.02$ ). However, this selection criterion resulted in the inclusion of a substantial number of participants who scored below 60% on the manipulation check (see Appendix 7).

Ultimately, given that both conditions included the harm reduction video, I settled on the number of harm reduction practice items from the Manipulation Check that each participant answered correctly as my selection criterion. Participants who scored a passing grade of at least 64% (7 out of 11) were kept for analysis. Not surprisingly, these participants spent more time on the study than the unselected participant sample, with the passing score group mean of 29.69 minutes ( $SD = 17.17$ ) and the low scoring group mean of 16.27 minutes ( $SD = 14.08$ ). An independent-samples  $t$  test revealed a significant difference in the mean time spent on the study per group,  $t(137) = -4.76, p < .001$ . An additional  $t$  test revealed no significant differences in mean age between the selected and rejected participants, and a chi-square test revealed no significant differences in the gender distribution across the two groups. Therefore, I chose to use a passing score on the Harm Reduction Knowledge Test (Manipulation Check; see Appendix 7) to distinguish between included and excluded participants. This selection criterion yielded a control

group who averaged 26.67 minutes on task ( $SD = 15.30$ ) and an experimental group who averaged 34.64 minutes on task ( $SD = 19.1$ )

As a result of this selection process, 87 participants were kept for data analysis, 54 from the Control Group and 33 from the Experimental Group. Of these participants, 31% were male and 69% were female. Subjects ranged in age from 18 to 77, with a mean age of 22.05 ( $SD = 7.70$ ). Regarding race, 89% were White, Non-Hispanic, and 8% were African American, Non-Hispanic. The majority (55%) were freshmen.

A second study (“Measuring Heroin Related Attitudes”) was run simultaneously through Sona, gathering data from a different sample but from the same pool of undergraduate students and using many of the same measures. This study’s participants were given no information on heroin, harm reduction practices, or biological influences of addiction. I used this sample’s data, collected from the Heroin and Harm Reduction Attitudes Scale-Revised (HHRAS-R; see Appendix 5), as a quasi-experimental control group. Participants in this group were specifically asked if they had participated in the “Opinions about Heroin” study, and any who had done so were omitted from the analysis reported here. A total of 32 participants was included in data analyses; they ranged in age from 17 to 33, with a mean age of 19.78 ( $SD = 3.29$ ). Of the participants, 21% were male and 78% were female. Regarding race, 84% were White, Non-Hispanic and 12% were African American, Non-Hispanic. The majority (72%) were freshmen.

**Materials and Measures**

Participants in my study (“Opinions about Heroin”) were first asked to read a consent form and indicate their willingness to participate (see Appendix 1). Participants were then randomly assigned via a question about their birth month to the experimental group (odd numbered months) or the control group (even numbered months). All participants read a short

explanation of what heroin is, where it comes from, and what its effects are (see Appendix 2). Participants assigned to the experimental group were then prompted to watch a 14-minute embedded video that accurately described the biological changes in the brain that lead to heroin addiction (see Appendix 3). The control group did not receive any information regarding the biological roots of heroin addiction. Both groups were then prompted to watch a 16-minute video describing three types of heroin-related harm reduction practices: preventing overdose deaths with naloxone, expanding access to medication-assisted treatment, and providing access to syringe service programs (SSPs; see Appendix 4).

The first set of items (Heroin and Harm Reduction Attitudes Scale-Revised; see Appendix 5) is a modified version of an attitude scale developed by Goddard, Sharpe, and Holt (2014) for research on NKU students. In this part of the survey, participants indicated their attitudes toward the heroin-related harm reduction practices described in the video that all participants watched. Questions included items such as “People seeking help for heroin addiction should be able to get medication-assisted treatment with drugs like Suboxone or methadone” and “People who use heroin should suffer the consequences if they overdose.”

From these items, four individual scales were created: Attitudes toward Heroin Users, Overdose Prevention Attitudes, Medication-Assisted Treatment Attitudes, and Syringe Services Programs Attitudes. The full scale, as well as each scale derived from it, including each scale’s individual items and internal consistency (Cronbach’s  $\alpha$ ) can be found in Appendix 5.

Next, participants responded to two questions taken from MacCoun (2013). These items measure anger and disgust toward people who use heroin and can be found in Appendix 5.

Appendix 6 comprises items designed to assess several variables derived from Weiner’s (1995) attribution theory of controllability and stigma, including participants’ beliefs about the

(a) biological basis of addiction, (b) controllability of heroin use, and (c) responsibility and blameworthiness of heroin users. Ultimately, I determined that there was too much overlap among many of the Appendix 6 items to construct scales of responsibility and blameworthiness that would be independent of the controllability scale items. Therefore, I opted to limit the scales to two constructs: beliefs about the biological basis of addiction (Biological Cause Scale; Cronbach's  $\alpha = .735$ ) and perceived control over heroin use and addiction (Perceived Control Scale; Cronbach's  $\alpha = .857$ ); see Appendix 6 for specific items. I used the Attitudes toward Heroin Users scale (see Appendix 5) as the measure of stigma toward heroin users.

Participants were then asked to complete a manipulation check designed to assess their understanding of the information presented in the videos; this scale was adapted from the manipulation check employed by Goddard et al. (2014; see Appendix 7). The manipulation check consisted of 20 questions, 9 based on information provided in the biological explanations video and 11 regarding harm reduction practices and information from the "What Is Heroin?" paragraphs preceding the video links. These latter items were relevant to both the experimental and control conditions and were therefore used to determine the inclusion criterion for the study's analyses (see **Participants**, above). The 20 items included in the manipulation check were measured on 5-point Likert scales with response options ranging from 1 (*Sure this is NOT true*) to 5 (*Sure this IS true*). For true items, responses of 4 and 5 were coded as correct; false items were recoded; all other responses were considered incorrect.

At the conclusion of the experiment, participants were asked to respond to demographic items including their age, gender, race, classification, and political identity (see Appendix 8).

## **Procedure**

This study was posted online via the Sona research participant management system and

linked to SurveyMonkey.com for survey completion and data collection. Northern Kentucky University undergraduate students were invited via Sona to participate in the study for course credit or extra credit. Participants first saw a detailed consent form and were prompted for their consent. Next, they were randomly assigned to one of the two conditions. The video detailing the biological causes of heroin addiction was presented to the experimental group; the control group received no information about the causes of heroin addiction. Participants in both conditions were then prompted to watch a video about harm reduction practices for people who use heroin. All participants were then asked to respond to the items described above. At the completion of the survey, all participants were debriefed (see Appendix 9).

### Results

To confirm that the Experimental Group paid attention to the video on the biology of addiction, an independent-samples *t* test was conducted to see if the Experimental Group scored higher on the Biology of Addiction Knowledge test in comparison to the Control Group. The results were significant,  $t(85) = -4.81, p < .001$ ; out of a maximum of 9 correct answers, the Experimental Group averaged 7.15 ( $SD = 1.40$ ) and the Control Group averaged 5.44 ( $SD = 1.72$ ).

To test Hypothesis 1 (that relative to participants in the Control Group and Quasi-Control Group, participants exposed to a biological explanation for heroin addiction will believe that heroin users have less control over their addiction and are less responsible for their plight, and will also have less stigma toward heroin users), a one-way analysis of variance (ANOVA) was conducted to compare the means of each group in regard to the belief that heroin addiction has a biological cause, the perceived controllability of addiction, and attitudes toward heroin users. There were no significant differences among the three groups on the Biological Cause or

Perceived Control scales. There was, however, a significant difference in attitudes toward heroin users,  $F(2, 123) = 3.58, p = .031$ . A Tukey HSD post hoc test showed that the significant difference was between the Control Group, which showed more positive, less stigmatized attitudes ( $M = 3.68, SD = .65$ ) than the Quasi-Control Group ( $M = 3.28, SD = .61$ ),  $p = .027$ .

To test Hypothesis 2 (that relative to participants in the Control Group and Quasi-Control Group, participants in the Experimental Group will indicate greater support for heroin-related harm reduction practices), a one-way ANOVA was conducted to compare the groups on the acceptability of the three harm reduction practices discussed in this study: overdose prevention, medication-assisted treatment (MAT), and syringe services programs (SSPs), as measured by the scales described in Appendix 6. The test revealed that there was a significant difference among the group means for MAT,  $F(2, 123) = 6.39, p = .002$ . A Tukey HSD post hoc test revealed that at the .05 level, there was a significant difference between the Control Group mean ( $M = 3.71, SD = .57$ ) and the Quasi-Control Group mean ( $M = 3.19, SD = .60$ ), as well as between the Experimental Group mean ( $M = 3.70, SD = .95$ ) and the Quasi-Control Group, but no significant difference between the Control Group and the Experimental Group. Based on the group means, the Control Group and the Experimental Group had significantly higher support for MAT than the Quasi-Control Group.

There were no significant differences in group means on the Overdose Prevention Support or SSP Support scales, although it is worth noting that at the .05 level, the one-way ANOVA on Overdose Prevention Support approached significance,  $F(2, 123) = 2.99, p = .054$ , with a significant difference between the means of the Control ( $M = 3.83, SD = .82$ ) and Quasi-Control ( $M = 3.38, SD = .82$ ) groups; Tukey HSD post hoc test,  $p = .046$ .

There was no evidence to support Hypothesis 3. A one-way ANOVA revealed no

differences among the three groups in levels of anger or disgust.

### **Regression Analyses**

To further explore the predictions derived from Weiner's (1995) attribution theory, I conducted a series of regression analyses to determine the extent to which hypothesized variables were interrelated. These analyses were limited to the experimental and control groups; the quasi-control group was omitted.

Although there was no evidence that exposure to the biology of addiction video significantly impacted participants' beliefs about the controllability of heroin addiction, results of regression analyses were consistent with Weiner's theory that a belief in a biological cause for addiction is associated with observers' perceptions of addiction's controllability and less stigmatized judgments of people who use heroin (see Table 1). Together, beliefs that heroin addiction has a biological cause of addiction and is not fully under users' control significantly predicted less stigmatizing attitudes toward heroin users,  $R^2 = .49$ ,  $F(2, 84) = 39.49$ ,  $p < .001$ , and both beliefs were significant predictors,  $ps < .008$ .

A similar pattern of results was found when biological causal beliefs and perceived control were used to predict support for heroin-related harm reduction (i.e., overdose prevention, medication-assisted treatment, and syringe services programs; see Table 1). In each case, both biological causal beliefs and perceptions of less control over heroin use independently predicted support for each harm reduction practice. Thus, regression analyses provided support for Hypotheses 1 and 2 derived from Weiner's (1995) attribution theory, despite the fact that the experimental manipulation of beliefs in a biological cause for addiction did not.

An additional regression analysis was conducted to try to identify variables associated with belief in a biological cause for addiction. Age, political identity, and gender (dummy coded)

were entered as predictors. However, the overall regression equation was nonsignificant,  $R^2 = .02$ ,  $F(2, 84) = .69$ ,  $p = .563$ . The combination of the same predictor variables was significant when the criterion was perceived control,  $R^2 = .15$ ,  $F(2, 84) = 4.71$ ,  $p = .004$ . Political identity was a significant individual predictor,  $B = -.16$ ,  $p = .002$ ; more conservative political identity was associated with greater perceived control over heroin use.

Regression analyses were also used to address Hypothesis 3 (that reducing perceived control over heroin use would reduce anger but not disgust toward heroin users). When they were the only predictors, the combination of anger and disgust significantly predicted less stigmatizing attitudes toward heroin users,  $R^2 = .21$ ,  $F(2, 84) = 10.90$ ,  $p < .001$ ; disgust was the only significant individual predictor,  $p < .001$ . However, when belief in a biological basis for addiction and perceived control were added to the regression equation, disgust was no longer a significant predictor (see Table 1). This same pattern of results was obtained when criterion variables were the three types of heroin-related harm reduction examined in this study: anger and disgust together significantly predicted each criterion variable, disgust but not anger was a significant individual predictor, and neither variable remained significant when biological beliefs and perceived control were added to the regression equation. Thus, anger showed no significant relationship with attitudes toward heroin users or harm reduction, and disgust was a significant predictor only when beliefs in biological causes and perceived control were not included.

### Discussion

In the context of this study, contrary to the hypotheses, exposing participants to a biological explanation for heroin addiction did not lead them to believe that heroin users have less control over their addiction, nor did it prompt participants to stigmatize heroin users less or support heroin-related harm reduction more. In fact, the only measurable impact of the video



about the biological basis of addiction was to increase participants' knowledge of biological factors in addiction. The manipulation of the independent variable had no effect on participants' ideas about or responses to heroin addiction. Thus, I found no direct support for any of the hypotheses.

Nevertheless, regression analyses provided support for several aspects of the attribution process posited by Weiner (1995). Specifically, beliefs in a biological basis for addiction and perceptions that heroin use is not entirely under individuals' volitional control robustly predicted reduced stigma toward heroin users and enhanced support for heroin-related helping (i.e., harm reduction practices). Thus, it appears that the links between biological attributions, perceived control, stigma, and helping are consistent with Weiner's predictions but are not affected by the information presented in this study.

Less support was found for hypothesized relationships between attributions, anger and disgust, and responses to heroin users or heroin-related helping. Contrary to Weiner's theory, there was no evidence that anger played a significant role; contrary to predictions from other researchers (e.g., MacCoun, 2013; Russell & Giner-Sorolla, 2013), the contributions of disgust to the explanation of attitudes toward people who use heroin and related harm-reduction policies were not significant when beliefs in biological causation and perceptions of controllability were included in the prediction.

Although exposure to the biological explanation of addiction had no significant impact on support for harm reduction practices, the Control Group's exposure to the video about harm reduction was associated with less stigmatized attitudes toward people who use heroin, relative to the Quasi-Control Group. The Control Group also showed more support for overdose prevention than the Quasi-Control Group, and both the Experimental and Control Groups were

significantly more in favor of medication-assisted treatment than the Quasi-Control Group was. Thus, exposure to the video about heroin-related harm reduction was associated with support for two of the harm reduction practices targeted in the video. The apparent greater impact of the harm reduction video on the Control Group than the Experimental Group may be due to the possibility that the Control Group participants paid more attention to that video (unlike the Experimental Group, the harm reduction was the first and only video viewed by the Control Group).

It is perhaps not surprising that manipulating participants' beliefs about the controllability of heroin addiction was unsuccessful. In previous studies, attempts to persuade participants that stigmatized conditions are due to biological factors have had mixed results. For example, Hansson and Rasmussen (2014) reported that in six interventions designed to reduce negative attitudes toward obesity by focusing on uncontrollable (medical and genetic) factors, four trials produced positive but minor effects, and two trials produced no effects at all. Puhl et al. (2005) conducted three experiments where the controllability of the cause of obesity was manipulated and yielded statistically significant but weak results. Crandall and Martinez (1996) emphasized that it is difficult to persuade others (via lectures, seminars, etc.) that obesity is not under individuals' complete control. Obesity can be compared to drug addiction in that there are strong biological factors associated both with obesity and addiction, as well as stigma toward people who struggle with these conditions. Finally, Corrigan et al. (2009) found that efforts to use education to reduce the stigma associated with drug addiction and mental illness leads to modest but only temporary reductions.

Although the current study did not yield significant results with regard to the manipulated impact of biological explanations for addiction, it does show that beliefs in biological causation

are strongly associated with reduced stigma toward heroin users. One possibility is that many participants already believed that addiction is rooted in biology, so there was little room for the manipulation to have an impact. Unfortunately, I was unable to identify predictors of biological attributions; future studies should assess participants' prior exposure to information about the biology of addiction. However, conservative political identity predicted the belief that heroin use is under the user's control; this finding is consistent with Crandall and Martinez (1996), who showed that Americans' beliefs that obesity is controllable were part of an ideological constellation that included political conservatism and beliefs in a just world.

It is also possible that stigma toward heroin users is not actually as high as I had initially predicted. Indeed, the mean score on the measure of attitudes toward heroin users was above the scale midpoint for all three groups, indicating slightly positive attitudes. Moreover, while I had hypothesized that biological information would raise support for harm reduction practices, it turned out that educating people on harm reduction practices increased support for medication-assisted treatment, with or without the biological factors.

There are several limitations to this study. To start, the conscientiousness of the sample was low, as many participants did not spend enough time on the study's website to read the description of heroin's effects, watch their assigned videos, and then thoughtfully respond to all items. The majority of the sample was made up of NKU freshmen, who are neither representative of the student body nor of the general population. A larger, more representative sample may have yielded different results. Another limitation of this study was the inability to control the information about heroin addiction and harm reduction practices that is currently circulating in our region. During the time data were being collected for this study, northern Kentucky was struggling with policy change in regard to the opioid epidemic. News reports

about heroin addiction and possible solutions occurred frequently throughout the data collection phase of the study. It is possible, then, that subjects from all groups were exposed to the experimental condition of this study in some form.

In summary, my study failed to show the hypothesized impact of giving participants a biological explanation for heroin addiction. However, regression analyses demonstrated that beliefs in the biological cause of addiction and views about the relative uncontrollability of heroin addiction are associated with reduced stigma toward heroin users. Although providing biological information did not affect support for heroin-related harm reduction practices, simply educating people on harm reduction may increase support, particularly for medication-assisted treatment and overdose prevention. This is important, as harm reduction practices are urgently needed at this time.

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Table 1.

*Multiple regression analyses (N = 86) conducted to predict attitudes toward heroin users and support for overdose prevention, medication-assisted treatment, and syringe services programs.*

<b>Variable</b>	<b>B</b>	<b>SE B</b>	<b><math>\beta</math></b>	<b>t</b>	<b>p</b>
<b><i>Criterion: Attitudes toward Heroin Users</i></b>					
Biological Cause Scale	.22	.08	.25	2.75	<b>.007</b>
Perceived Control Scale	.47	.08	.54	5.89	<b>&lt;.001</b>
<b><i>Criterion: Attitudes toward Heroin Users</i></b>					
Anger at Heroin Use	.04	.09	.06	.46	.649
Disgust at Heroin Use	-.32	.08	-.49	-3.92	<b>&lt;.001</b>
<b><i>Criterion: Attitudes toward Heroin Users</i></b>					
Biological Cause Scale	.23	.08	.25	2.80	<b>.006</b>
Perceived Control Scale	.40	.09	.46	4.40	<b>&lt;.001</b>
Anger at Heroin Use	.00	.07	-.01	-.05	.961
Disgust at Heroin Use	-.09	.08	-.14	-1.26	.213
<b><i>Criterion: Attitudes toward Overdose Prevention</i></b>					
Biological Cause Scale	.29	.10	.26	2.77	<b>.007</b>
Perceived Control Scale	.54	.10	.50	.539	<b>&lt;.001</b>
<b><i>Criterion: Attitudes toward Overdose Prevention</i></b>					
Anger at Heroin Use	.04	.12	.04	.30	.762
Disgust at Heroin Use	-.33	.10	-.40	-.312	<b>.002</b>
<b><i>Criterion: Attitudes toward Overdose Prevention</i></b>					
Biological Cause Scale	.29	.10	.26	2.77	<b>.007</b>
Perceived Control Scale	.51	.12	.47	4.37	<b>&lt;.001</b>
Anger at Heroin Use	-.02	.09	-.03	-.24	.815
Disgust at Heroin Use	-.04	.10	-.05	-.39	.697
<b><i>Criterion: Attitudes toward Medication-Assisted Treatment</i></b>					
Biological Cause Scale	.22	.09	.25	2.41	<b>.018</b>
Perceived Control Scale	.38	.09	.43	4.26	<b>&lt;.001</b>

<b>Variable (Table 1 continued)</b>	<b>B</b>	<b>SE B</b>	<b><math>\beta</math></b>	<b>t</b>	<b>p</b>
<b>Criterion: Attitudes toward Medication-Assisted Treatment</b>					
Anger at Heroin Use	.06	.10	.08	.58	.566
Disgust at Heroin Use	-.27	.09	-.40	-3.11	<b>.003</b>
<b>Criterion: Attitudes toward Medication-Assisted Treatment</b>					
Biological Cause Scale	.22	.09	.25	2.40	<b>.019</b>
Perceived Control Scale	.34	.10	.38	3.27	<b>.002</b>
Anger at Heroin Use	.02	.08	.02	.18	.860
Disgust at Heroin Use	-.07	.09	-.10	-.81	.420
<b>Criterion: Attitudes toward Syringe Services Programs</b>					
Biological Cause Scale	.32	.10	.31	3.25	<b>.002</b>
Perceived Control Scale	.45	.10	.44	4.60	<b>&lt;.001</b>
<b>Criterion: Attitudes toward Syringe Services Programs</b>					
Anger at Heroin Use	.00	.11	.00	.02	.983
Disgust at Heroin Use	-.29	.10	-.37	-2.89	<b>.005</b>
<b>Criterion: Attitudes toward Syringe Services Programs</b>					
Biological Cause Scale	.33	.10	.32	3.28	<b>.002</b>
Perceived Control Scale	.40	.11	.40	3.61	<b>.001</b>
Anger at Heroin Use	-.50	.09	-.06	-.56	.576
Disgust at Heroin Use	-.03	.09	-.04	-.37	.714

Table 1.

Notes:

Criterion: Attitudes toward Heroin UsersPredictors: Biological Cause Scale (BCS), Perceived Control Scale (PCS),  $R^2 = .49$ ,  $p < .001$ Predictors: Anger, Disgust,  $R^2 = .21$ ,  $p < .001$ Predictors: BCS, PCS, Anger, Disgust,  $R^2 = .50$ ,  $p < .001$ Criterion: Attitudes toward Overdose PreventionPredictors: Biological Cause Scale (BCS), Perceived Control Scale (PCS),  $R^2 = .45$ ,  $p < .001$ Predictors: Anger, Disgust,  $R^2 = .14$ ,  $p = .001$ Predictors: BCS, PCS, Anger, Disgust,  $R^2 = .46$ ,  $p < .001$ Criterion: Attitudes toward Medication-Assisted TreatmentPredictors: Biological Cause Scale (BCS), Perceived Control Scale (PCS),  $R^2 = .36$ ,  $p < .001$ Predictors: Anger, Disgust,  $R^2 = .13$ ,  $p = .003$ Predictors: BCS, PCS, Anger, Disgust,  $R^2 = .36$ ,  $p < .001$

Criterion: Attitudes toward Syringe Services Programs

Predictors: Biological Cause Scale (BCS), Perceived Control Scale (PCS),  $R^2 = .43, p < .001$

Predictors: Anger, Disgust,  $R^2 = .14, p = .002$

Predictors: BCS, PCS, Anger, Disgust,  $R^2 = .44, p < .001$



**Appendix 1: Research Participation Informed Consent**

Principal Investigator: Sara Sharpe ([sharpes1@nku.edu](mailto:sharpes1@nku.edu))

Co-Principal Investigator: Perilou Goddard, Ph.D. ([goddard@nku.edu](mailto:goddard@nku.edu)), 859-572-5463

Department: Psychological Science

Title of Project: Opinions about Heroin

This research study is designed to assess attitudes toward a variety of topics related to our region's heroin epidemic and proposed policy responses. The researchers are interested in factors that may affect individuals' attitudes toward these topics. A full description of the research will be provided at the completion of the study. If you agree to participate in this study, you will read some information, get some additional information by video, and complete several questionnaires. The expected length of time to participate is 30 minutes or less.

We do not anticipate that there are any serious risks associated with your participation. Your responses are ANONYMOUS. It is possible that you may experience some emotional distress when thinking about heroin use and its consequences, but you will not read any graphic descriptions nor view any graphic depictions. We expect that if you experience any distress, it will be temporary and mild. Again, we emphasize that the responses you provide are absolutely ANONYMOUS and cannot be traced to you by anyone, not even the researchers themselves. Demographic questions (e.g., age, gender, race/ethnicity) cannot be used to identify you as an individual. Only aggregate (group) data will be used; no individual responses of any kind will ever be used in presentations or publications of this research. We recommend that you complete the questionnaires in a private setting so other people will not see your responses.

You will earn 2 Sona research credits for participating.

This study is ANONYMOUS and no one (not even the researchers themselves) can match your responses with your name. The data will exist only in electronic form and will be stored securely on a password-protected server.

Your participation is voluntary, refusing to participate involves no penalty, and you may stop participating at any time without penalty or loss of benefits.

If you have any questions, comments, or concerns regarding this project, feel free to contact the co-principal investigator, Dr. Perilou Goddard (contact information above). If you have questions about your rights as a research participant, please contact the chair of the Institutional Review Board (Philip J. Moberg, Ph.D., 859-572-1913, [mobergp1@nku.edu](mailto:mobergp1@nku.edu)).

Thank you for your participation.

Please choose one of the following options:

- a. I consent to participate.
- b. I do not consent to participate.

## Appendix 2: What Is Heroin?

In a few moments, you will see some video information about heroin and responses to the current epidemic in our community. First, though, we figured you need to know what heroin is.

Heroin is a drug made from a flower called the opium poppy. Most of the heroin found in the U.S. comes from Mexico. Heroin is a member of a category of drugs called opioids. Heroin binds to specific brain receptors, called opioid receptors. When it reaches the brain, heroin causes an intense feeling of well-being (the “high”), and like all the opioids, it also reduces pain. Heroin is usually injected, although if it is pure enough, it can be snorted or smoked. It often produces tolerance; this means that if people use heroin regularly, it will take more and more heroin over time to produce the same effects. Heroin also has a short half-life; that means it wears off quickly, within a few hours. If a person is a frequent heroin user and suddenly stops, he or she is likely to experience painful withdrawal symptoms, which include intense nausea, diarrhea, and painful aches. Heroin withdrawal is said to feel like having a case of “Super Flu.”

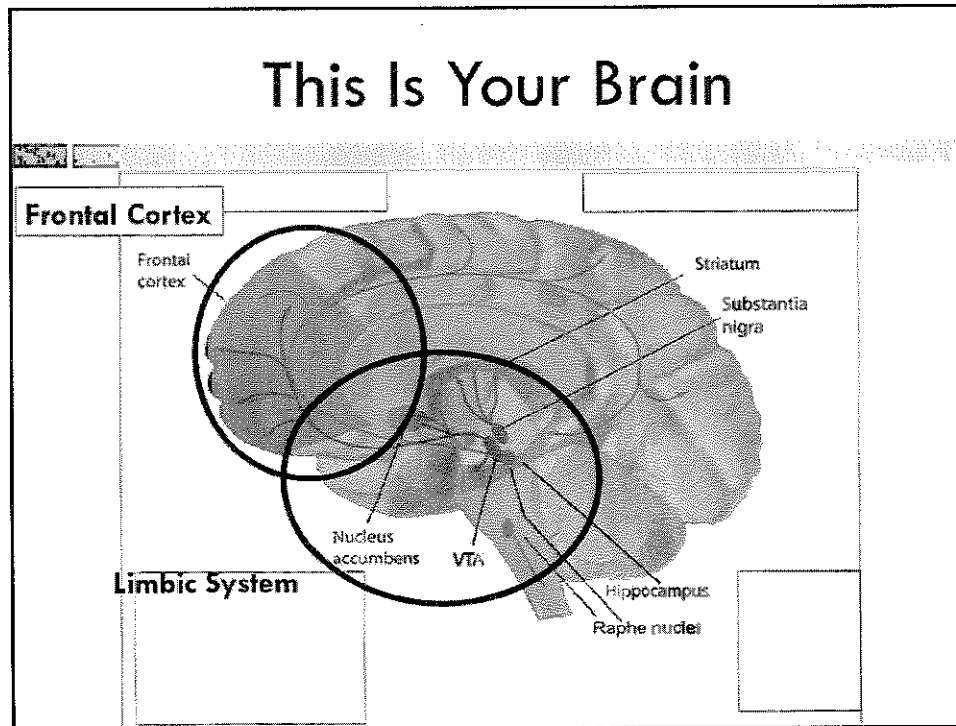
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At this point, half of the participants (those in the experimental condition, assigned at random), will be directed to a link to a short video describing the biological causes of heroin addiction, based on a section of the Six@Six presentation “Heroin Hits Home” given by Perilou Goddard in 2014. The PowerPoint slides for this portion of the presentation are presented in **Appendix 3** (see separate attachment).

Also at this point, participants in the control condition will be directed to a link to a video describing three harm reduction practices (prevention of overdose, expansion of medication-assisted treatment, and provision of syringe services programs) identified by community leaders as response priorities (**Appendix 4**; see separate attachment). Participants in the experimental group will be directed to this video at the end of the previous video.

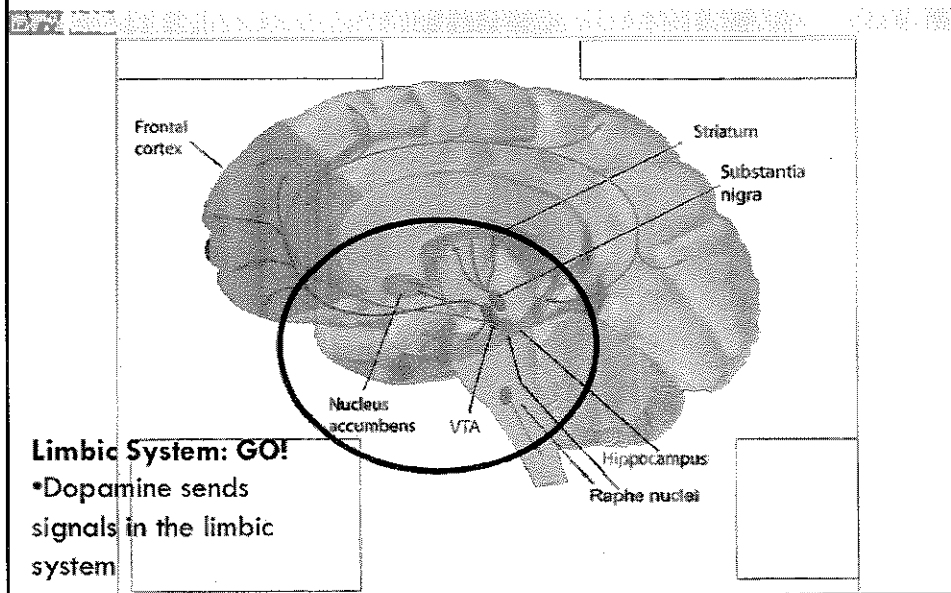
After all participants have watched the video describing response priorities, they will be asked to respond to the attitude items below (**Appendices 5 and 6**), followed by the manipulation check items (to determine whether participants read the material carefully; **Appendix 7**), the demographic questions (**Appendix 8**), and the debriefing (**Appendix 9**).

## Appendix 3



Let's take a look at how heroin affects the brain. There are two areas to pay particular attention to: the limbic system and the frontal cortex.

# This Is Your Brain

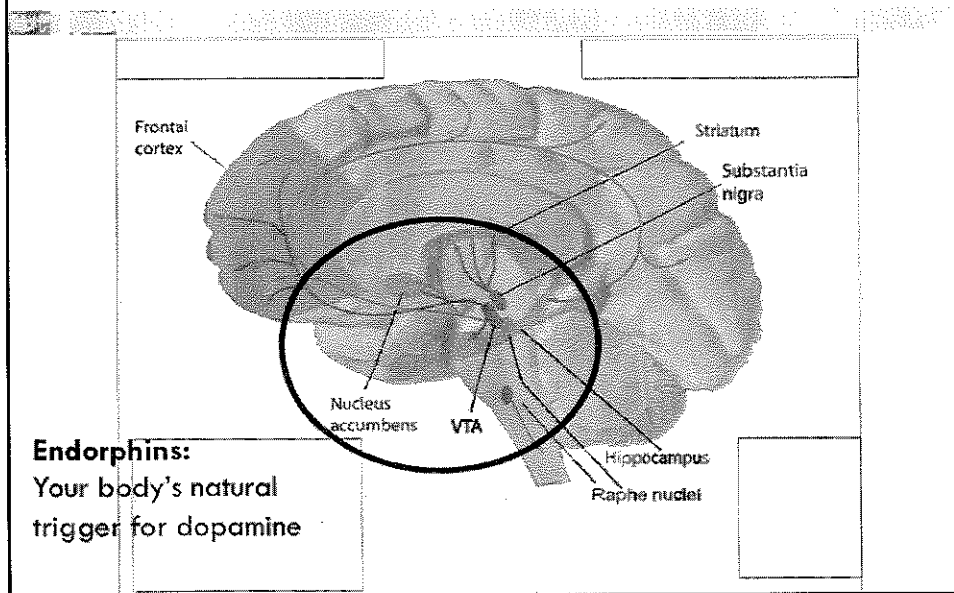


We have evolved to repeat behaviors that feel good, like eating or having sex. These behaviors are necessary for our survival as a species.

The limbic system is the primitive part of the brain that is responsible for the reward circuits.

When we do something that feels good, the limbic system responds with a chemical called dopamine. We all have dopamine, and the activity of dopamine in the limbic system makes us feel pleasure and motivates us to repeat activities that feel good. This is why dessert is so hard to pass up!

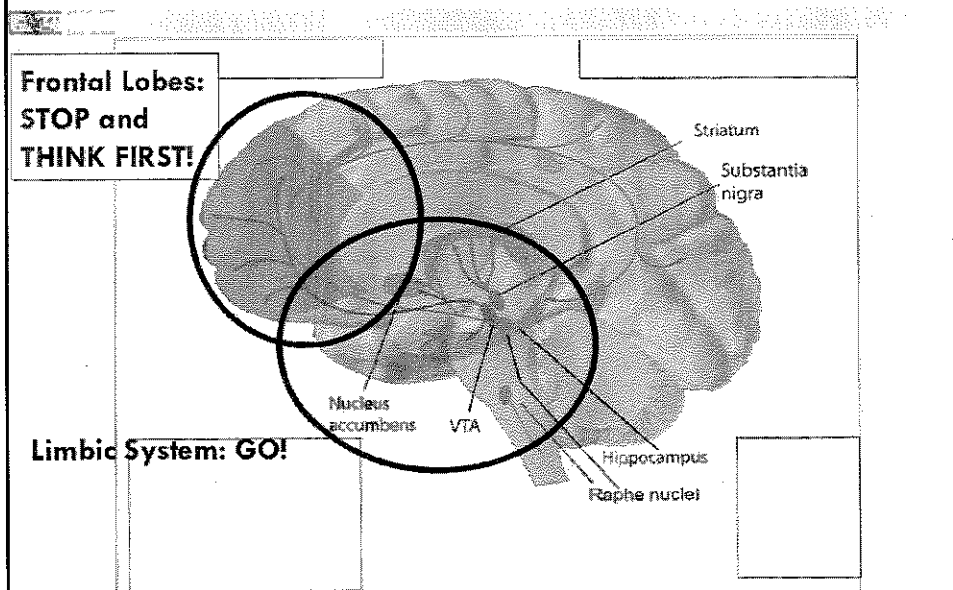
# This Is Your Brain



We even have naturally produced chemicals in our brains called **ENDORPHINS**, which cause dopamine to be released in the limbic system and help us cope with stress and pain (Ever heard of the runner's high? It's thought to be due to the actions of endorphins).

So our brain's reward system gets triggered by activities that help us survive.

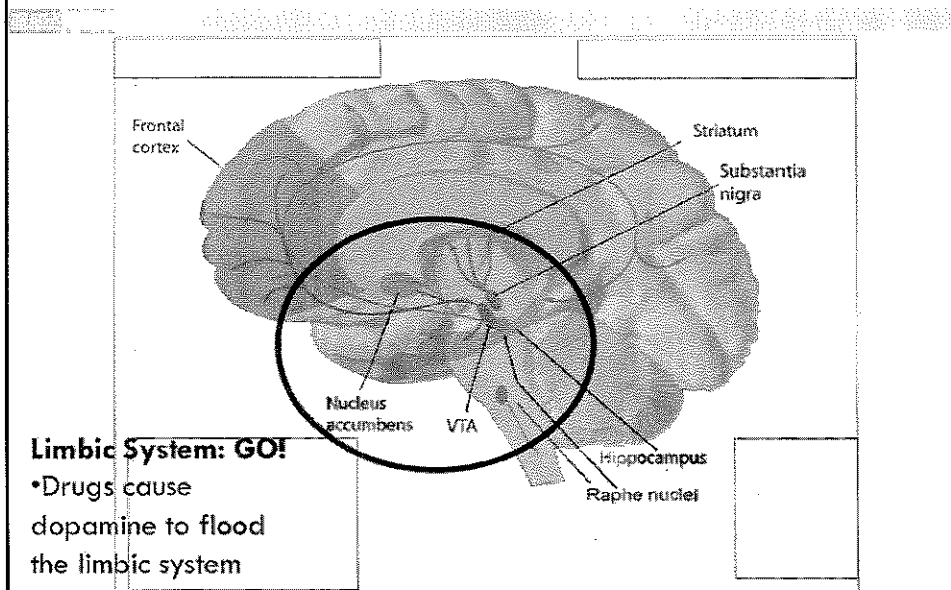
# This Is Your Brain



As we mature, the frontal lobes become better at putting the brakes on the limbic system.  
So we learn to save some of the food for later, or wait to have sex until an appropriate time.

Frontal lobes aren't fully mature until mid-20s.  
This helps explain why teenagers and young adults often make decisions that seem so risky to older people.  
This is also why teens and young adults are at particular risk for drug problems.

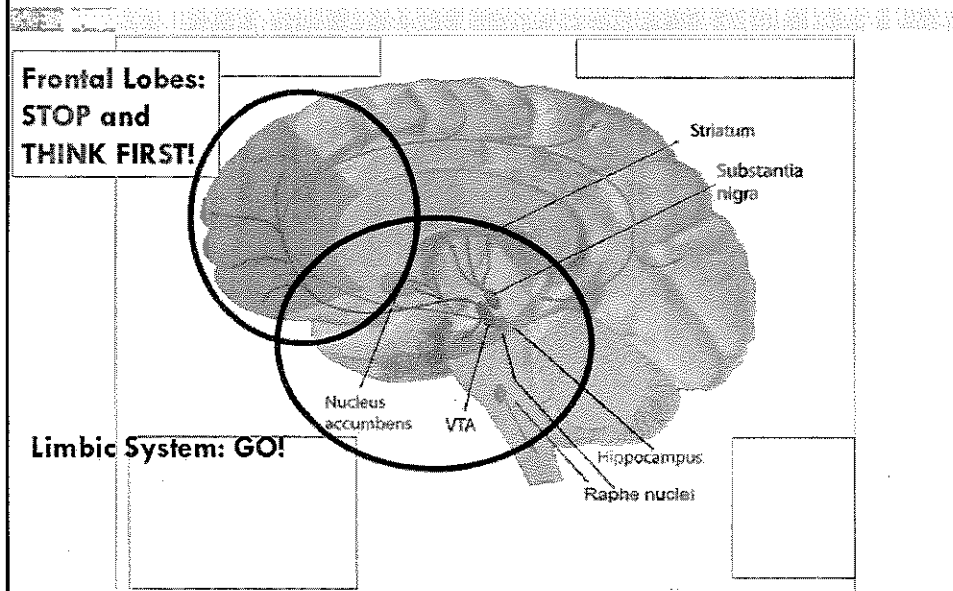
# This Is Your Brain on **Drugs**



Drugs like heroin travel directly to the brain, where they cause a flood of dopamine.

Heroin and other opioid drugs fit into the same receptor sites as endorphins, but their effects are MUCH more powerful. Drugs like heroin are basically teaching our brains to keep using them, by giving us a much larger burst of dopamine than we can ever get naturally.

## This Is Your Brain on Drugs

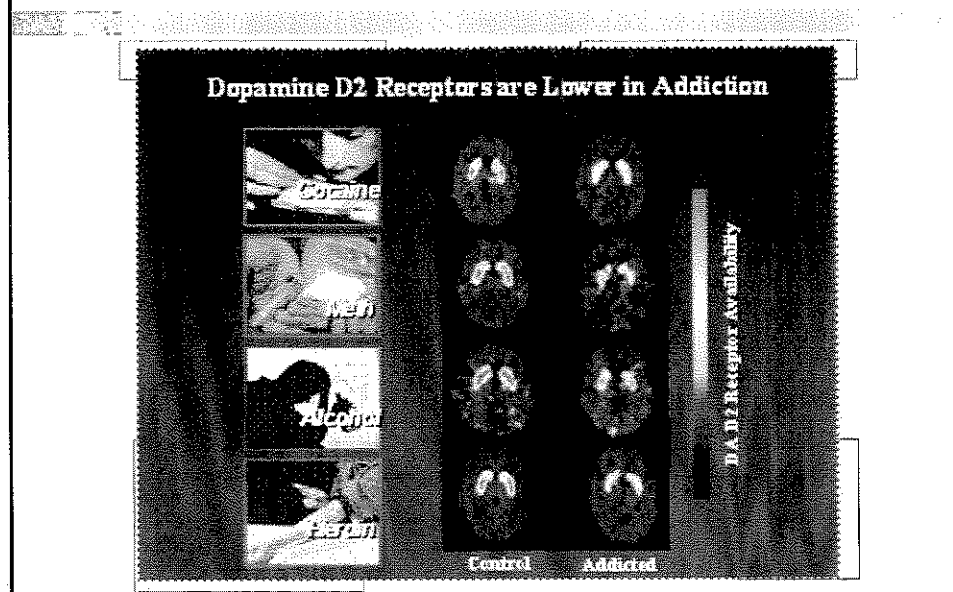


With increasing use of heroin or other drugs of abuse, it becomes harder and harder for the frontal lobes to “apply the brakes.” The flood of dopamine in the limbic system is like a car with a stuck accelerator pedal. You know you’re going too fast, but you can’t seem to slow down and the brakes don’t work. Thus, it becomes harder to SAY NO to drugs.

This problem of impaired frontal lobe inhibition is especially acute in teens and young adults, whose frontal lobes aren’t fully mature in the first place.



# This Is Your Brain on Drugs



With repeated use of heroin or other drugs of abuse, the brain also becomes less responsive to dopamine, as shown in this picture. It's analogous to turning down a radio that is too loud—your brain adjusts to the overwhelming surges of dopamine by becoming less responsive.

Thus, over time, people who use heroin, especially in large amounts, often lose the ability to feel pleasure. They may ultimately be unable to feel joy, or even ordinary happiness, if they are not using heroin.

Okay, so we've seen how heroin works in the brain and how, with repeated, frequent use, it may cause major changes in how the brain itself works.

## The Bottom Line: Addiction Is a Chronic Brain Disease

- Genetics, environment, and individual behavior all play a role in the initial development
- Once it develops, permanent physical changes have often already taken place
  - ▣ lifestyle modification is often not enough
  - ▣ medication is usually necessary
- It's a chronic disorder so it's never "cured," but treatment makes it manageable, leads to functional recovery

With brain wiring like this, why doesn't everyone become addicted?

We scientists think there are multiple factors that put people at risk or help protect us from addiction.

Multiple risk or protective factors

Genetic differences

We don't all feel the same pleasure from drug effects

Some of us are born with better "brakes"

Environmental factors

Adverse childhood events, other disorders, greater availability of drugs are risk factors

Other sources of pleasure are protective

Interaction of genes and environment

Notice that the combination of genetic and environmental risk factors are similar to the combinations of risk factors that we see in diseases like Type 2 diabetes or hypertension. In type 2 diabetes, for example, genes definitely play a role in who does and does not develop the disorder, and so does environment (like eating less healthy food or not getting regular exercise).

## Next video, Please!

Now please click on the link to the next short video, which describes three priorities for dealing with our community's heroin epidemic. Thank you.

## Appendix 4

### So What Can We Do? Northern Kentucky's Response

Northern Kentucky's  
Collective Response  
To the Heroin  
Epidemic



Our Plan for Recovery

Released November 14, 2013

- A team of community leaders identified a set of key issues to address
- The following slides describe 3 of the top priorities

## Priority #1: Prevent Overdose Deaths

- ❑ Overdose is one of the most serious risks associated with heroin use
- ❑ You don't even have to be addicted to heroin to die of an overdose
- ❑ People are most likely to overdose after periods of sustained abstinence

Overdose is one of the most serious risks associated with heroin use

You don't even have to be addicted to heroin to die of an overdose

You can OD the first time you use heroin, or the 1000<sup>th</sup> time

One of the saddest issues with heroin overdose is that people are most vulnerable after

sustained periods of abstinence

For example, after incarceration or unmedicated abstinence

Fortunately, there is one really good way to help when someone is overdosing.

## Priority #1: Prevent Overdose Deaths

### ☐ Naloxone (or Narcan)

- ▣ available as injection or intranasal spray
- ▣ safe and effective, with no adverse effects, can't be abused
- ▣ Rapidly replaces heroin or other opioids in brain receptors, restoring breathing and triggering immediate withdrawal



Naloxone (or Narcan) is available as injection or intranasal spray

Safe and effective, with no adverse effects

Sometimes called the Lazarus drug

Rapidly replaces heroin or other opioids in brain receptors,  
restoring breathing and triggering immediate withdrawal

Expanded access in DC and 17 states has led to over 10,000 overdose  
reversals since 2001

## Priority #1: Prevent Overdose Deaths

### Myths about Naloxone

- Myth 1: Giving out naloxone will keep drug users from seeking treatment
- Myth 2: If you give an overdose antidote to drug users, they will abuse more drugs.

Source: Top Seven Crazy Myths about Drug Overdose Antidote, Naloxone. Tessie Castillo, Huffington Post Healthy Living. Posted 3/31/14.

Myth 1: Giving out naloxone will keep drug users from seeking treatment

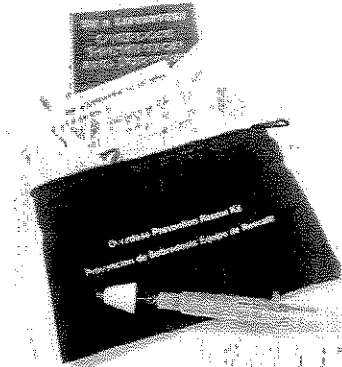
Reality: Death keeps people from seeking treatment. Naloxone gives people another chance to get help if they choose. Having a near-death experience and being saved with naloxone propels many people to get into treatment.

Myth 2: If you give an overdose antidote to drug users, they will abuse more drugs.

Reality: There is no evidence that naloxone leads to more drug use. Naloxone produces painful withdrawal symptoms, so it doesn't feel good. You also can't administer it to yourself.

## Priority #1: Prevent Overdose Deaths

- We've made made substantial progress on this priority
  - A local grassroots organization overdose kit training and distribution events frequently
  - At least 6 lives saved in Northern KY already (about 40 in the greater Cincinnati area)



Substantial progress has already been made on this priority

Naloxone Harm Reduction Center is currently operating in Falmouth

NKy PAR conducts overdose kit training and distribution events frequently



Priority #2:  
Provide More Evidence-Based Treatment

- Northern Kentucky currently meets only 25% of the demand for any treatment (not necessarily the most effective treatment)
  - Wait times for most services range from 1 week to 9 months
  - Some recent improvements (e.g., \$2.8 million in funding for adolescent residential treatment)
- Treatment gap is still huge

Northern Kentucky currently meets only 25% of the demand for any treatment (not necessarily the most effective treatment)

Wait times for most services range from 1 week to 9 months

Some recent improvements (e.g., \$2.8 million in funding for adolescent residential treatment)

Treatment gap is still huge

## Priority #2: Provide More Evidence-Based Treatment

- Research consistently shows that the most effective treatment for heroin addiction is the combination of medications and behavioral therapy
- This treatment should be tailored to each individual's needs
- Three medications are currently available to treat heroin addiction
  - Vivitrol
  - Suboxone
  - Methadone

Research evidence consistently shows that the most effective treatment for heroin dependence is the combination of medications and behavioral therapy

This treatment should be tailored to each individual's needs

One size does NOT fit all!

Behavioral therapy may involve

Enhancing the motivation to change

Providing incentives to stop using heroin

Building skills to resist heroin cravings

Learning to replace heroin use with other sources of reinforcement

Improving problem-solving skills

Building better interpersonal relationships

Three medications are currently available to treat heroin addiction

Vivitrol

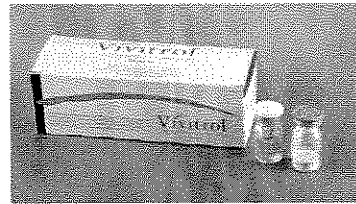
Suboxone

Methadone

None of these are likely to be effective without behavioral therapy and social services

## Priority #2: Medication-Assisted Treatment: Vivitrol

- Long-acting injectable form of opioid antagonist naltrexone
- Given as an injection once a month
- Blocks the effects of opioid drugs, so the “high” is reduced or eliminated if heroin is used
- Reduces cravings for heroin, making it easier to benefit from behavioral therapy
- Can be prescribed by anyone licensed to prescribe meds (physicians, physician’s assistants, nurse practitioners)



Long-acting injectable form of opioid antagonist naltrexone

Not a controlled substance, has no abuse potential

Approved for opioid addiction in 2010

Given as an injection once a month

Blocks the effects of opioid drugs, so the “high” is reduced or eliminated if heroin is used

Reduces cravings for heroin, making it easier to benefit from behavioral therapy

Can be prescribed by anyone licensed to prescribe meds (physicians, physician’s assistants, nurse practitioners)

## Priority #2: Medication-Assisted Treatment: Vivitrol

- ❑ Very expensive (up to \$1500/injection)
- ❑ Must detox from heroin and other opioids for 7-10 days prior to getting Vivitrol
- ❑ Thought to work best with highly motivated patients or those with shorter opioid use histories



Very expensive (up to \$1500/injection)

Often not fully covered by insurance

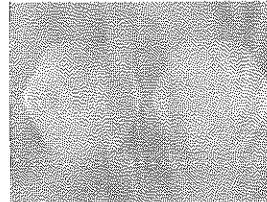
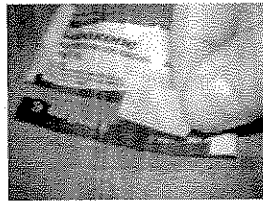
Reduces opioid tolerance, so risk of overdose is increased if Vivitrol treatment is stopped (similar to risk with extended abstinence)

Must detox from heroin and other opioids for 7-10 days prior to getting Vivitrol

Thought to work best with highly motivated patients or those with shorter opioid use histories

## Priority #2: Medication-Assisted Treatment: Suboxone

- Combination of buprenorphine (an opioid partial agonist) and naloxone (an opioid antagonist)
- Buprenorphine helps people stop using heroin without causing them to have withdrawal symptoms
- Naloxone does nothing when Suboxone is used as directed but causes painful withdrawal symptoms if it is injected



Combination of buprenorphine (a partial opioid agonist) and naloxone (an opioid antagonist)

Taken as sublingual dissolving film or tablets

Buprenorphine helps people stop using heroin without causing them to have withdrawal symptoms

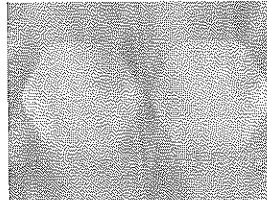
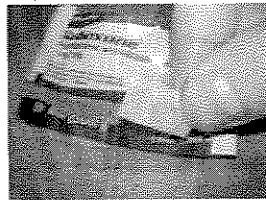
Taken once a day

Ceiling effect (increasing doses have limited effects)

Naloxone does nothing when Suboxone is used as directed but causes painful withdrawal symptoms if it is injected

## Priority #2: Medication-Assisted Treatment: Suboxone

- ❑ Over 20 years of research show Suboxone's main ingredient is an effective treatment for heroin addiction
- ❑ Can be prescribed by physicians in an office setting
- ❑ Needs to be combined with psychosocial services



Over 20 years of research show Suboxone's main ingredient is an effective treatment for heroin addiction

Because Suboxone is an opioid partial agonist (rather than a full agonist like methadone), it is

- less likely to work for people who use large amounts of heroin or who have a more extensive history of heroin use, and

- less likely to be abused

Can be prescribed by physicians in an office setting

Needs to be combined with psychosocial services

Relatively low overdose risk except when combined with benzodiazepines

## Priority #2: Medication-Assisted Treatment: Methadone

- ❑ Over 40 years of research shows that methadone maintenance therapy is the most effective treatment for heroin addiction
- ❑ Methadone is an opioid full agonist taken once a day
  - ❑ with stable dosing, doesn't produce a "high" or intoxication
  - ❑ blocks the "high" from heroin
  - ❑ relieves heroin craving
  - ❑ prevents withdrawal symptoms



Over 40 years of research shows that methadone maintenance therapy (methadone combined with evidence-based psychosocial treatment) is the most effective treatment for heroin addiction

Methadone is an opioid full agonist taken once a day

- with stable dosing, doesn't produce a "high" or intoxication
- blocks the "high" from heroin
- relieves heroin craving
- prevents withdrawal symptoms

## Priority #2: Medication-Assisted Treatment: Methadone

- Benefits of methadone maintenance include
  - ▣ significant reductions in heroin use, injecting drug use, overdose, blood-borne diseases, criminal activity, and mortality
  - ▣ significant improvements in family stability and employment
  - ▣ big economic benefits (\$4-5 return on investment for every \$1 invested)
- Effectiveness depends on
  - ▣ adequate dosing
  - ▣ length of treatment (minimum of one year)
  - ▣ tailoring treatment to individual patients' needs



Benefits of methadone maintenance include

significant reductions in heroin use, injecting drug use, overdose, blood-borne diseases, criminal activity, and mortality

significant improvements in family stability and employment

big economic benefits (\$4-5 return on investment for every \$1 invested)

Improvement depends on

adequate dosing

length of treatment (minimum of one year)

tailoring treatment to individual patients' needs

Methadone programs are much more heavily regulated than other drug treatments

In U.S., most methadone maintenance is done in specially designated Opioid Treatment Programs (OTPs, a.k.a. methadone clinics)

Opposition to them is widespread

Not In My Backyard!



## Priority #2: Medication-Assisted Treatment

- ❑ Opposition to medication-assisted treatment assumes that total abstinence without the use of medication is the only acceptable outcome
- ❑ Suboxone or methadone treatment are seen as substituting one addiction for another
- ❑ These beliefs miss the point that addiction is a **CHRONIC DISEASE** caused by changes in brain chemistry and function

Opposition to medication-assisted treatment often focuses the assumption that total abstinence without the use of medication is the only acceptable outcome for people who use heroin

Suboxone or methadone treatment is seen as substituting one addiction for another

These beliefs miss the point that addiction is a **MEDICAL DISORDER** caused by changes in brain chemistry and function

Think about the disease of Type 2 diabetes

It's caused by a combination of genetic vulnerability, environment, and individual behavior

Once it develops, some people can beat the disease through diet and exercise alone

Most others need medication, even when they've tried their hardest to change their lifestyle

Many will eventually need insulin long-term

Would you deny treatment to diabetics who need insulin? Should we blame them for being weak-willed? Should we stigmatize them for having diabetes?

Now think about the disease of heroin addiction

Like type 2 diabetes, it's caused by a combination of genetic vulnerability, environment, and individual behavior

Once it develops, a few people can beat the disease without using medication

But most others need medication, even when they've tried their hardest to change their lifestyle

Many will eventually need medication long-term

Would you deny treatment to heroin users who need medication? Should we blame them for being weak-willed? Should we stigmatize them for having a disease?

### Priority #3: Prevent Blood-Borne Infections

- Estimated cost to treat
  - HIV/AIDS: \$385,000 to \$619,000 (lifetime)
  - Hepatitis C: \$350,000 to \$600,000 (lifetime)
  - Endocarditis: \$120,000 (per episode)
- Major risk factor: Sharing of injecting equipment, including needles and syringes
  - Needle-stick injuries are another risk factor

#### Estimated cost to treat

HIV/AIDS: \$385,000 to \$619,000 (lifetime)

Hepatitis C: \$350,000 to \$600,000 (lifetime)

Hepatitis C rate in N KY is twice the state rate and 24 times the national rate

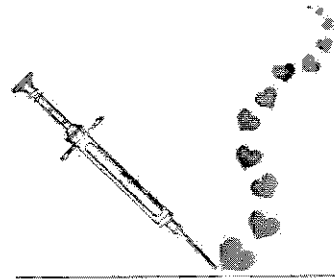
Endocarditis: \$120,000 (per episode)

Sharing of injecting equipment, including needles and syringes,  
is a major risk factor for each of these infections

Needle-stick injuries are another risk factor

### Priority #3: Prevent Blood-Borne Infections

- Syringe services programs can make a big difference
- They provide:
  - ▣ Sterile injecting equipment
  - ▣ SAFE DISPOSAL of used syringes
  - ▣ On-site testing and counseling for HIV, Hep C, and STIs
  - ▣ Overdose prevention training, kits
  - ▣ Referrals to drug treatment and other medical and social services



#### Why do heroin users share needles?

Sterile syringes are difficult or impossible to get without a prescription

Sharing drugs is a common practice

Stigma makes “sticking together” even more necessary

Most heroin isn’t pure enough to smoke or snort

Injecting gives a bigger bang for the buck

Syringe services (a.k.a. needle exchange) programs are not new

First “official” programs started in the Netherlands in the mid-1980s

They are ubiquitous in virtually all other industrialized countries and endorsed by the World Health Organization

#### What syringe services programs provide:

Sterile injecting equipment (syringes, filters, alcohol swabs, heating dish)

SAFE DISPOSAL of used syringes

On-site testing and counseling for HIV, Hep C, and STIs

Overdose prevention training, kits

### Priority #3: Prevent Blood-Borne Infections

- ❑ Syringe services programs also
  - ❑ Save public resources
  - ❑ Serve as vital bridges to treatment services
  - ❑ Promote public safety by taking contaminated syringes off the streets
  - ❑ Promote the safety of police officers by reducing needle stick injuries
- ❑ In studies across the globe, there is NO EVIDENCE that syringe services programs lead to more injecting drug use

#### Syringe services programs also

Save public resources (much cheaper to provide syringe services than treat blood-borne infections)

Serve as vital bridges to treatment services

Research shows that people who use needle exchanges are 5 times more likely to enter treatment

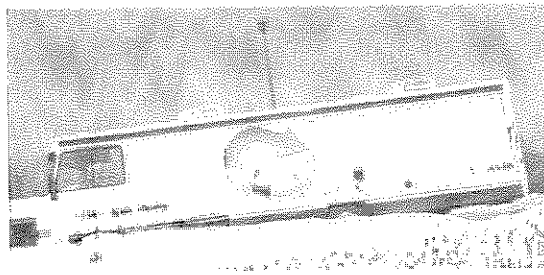
Promote public safety by taking contaminated syringes off the streets

Promote the safety of police officers by reducing needle stick injuries

In studies across the globe, there is NO EVIDENCE that syringe services programs lead to more injecting drug use

## Priority #3: Prevent Blood-Borne Infections

- Cincinnati ExChange Program
  - needle exchange, rapid HIV/Hep C testing, referral to treatment, naloxone education and kit distribution
  - operates a few hours a week in Mount Auburn and Northside
- Desperately needed in Northern Kentucky



### Cincinnati ExChange Program

needle exchange, rapid HIV/Hep C testing, referral to treatment, naloxone education and kit distribution

Operates a few hours a week in Mount Auburn; plans for additional hours in Northside

Desperately needed in Northern Kentucky

## Recap of Recommendations

- ☐ Priority #1: Prevent overdose deaths
- ☐ Priority #2: Provide more evidence-based treatment, especially medication-assisted treatment
- ☐ Priority #3: Prevent blood-borne infections
- ☐ All of these priorities are examples of Harm Reduction
- ☐ Key principle: ANY step that reduces drug-related harm is a step in the right direction

Priority #1: Prevent overdose deaths

Priority #2: Provide more evidence-based treatment, especially medication-assisted treatment

Priority #3: Prevent blood-borne infections

All of these priorities are examples of Harm Reduction

Key principle of harm reduction: ANY step that reduces drug-related harm is a step in the right direction

Harm reduction is the first step in the continuum of care that extends to abstinence

But harm reduction recognizes that it is unethical to ignore other means of reducing human suffering, even if they don't lead to immediate abstinence

### Appendix 5: Heroin and Harm Reduction Attitudes Scale-Revised (HHRAS-R), including Anger and Disgust Items

For each of the following statements, choose the number that corresponds to your personal attitude or opinion:

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

1. People seeking help for heroin addiction should be able to get medication-assisted treatment with drugs like Suboxone or methadone.
2. I wouldn't want a drug treatment clinic in my community.
3. Overdose prevention kits should be available to friends and family members of people who use heroin.
4. Syringe services programs send a message that it's acceptable to use heroin.
5. Heroin use is immoral.
6. If people who are addicted to heroin receive medication-assisted treatment, they will commit fewer crimes.
7. Abstinence (being completely drug free) is the only acceptable treatment option for people who are addicted to heroin.
8. People who use heroin should suffer the consequences if they overdose.
9. People have a moral right to use heroin if they choose to do so.
10. Syringe services programs should be available to heroin injectors.
11. Medication-assisted treatment is just trading one addiction for another.
- \*12. Medication-assisted treatment is acceptable only if it eventually leads to a drug-free lifestyle.
13. If people who are addicted to heroin have access to overdose prevention kits, they won't be motivated to quit using heroin.
14. The costs of medication-assisted treatment (MAT) outweigh the benefits.
15. If people are addicted to heroin, they deserve the bad things that happen to them.
16. I approve of using overdose kits to save the lives of people who use heroin.
17. Heroin addiction should be treated as a public health or medical issue, rather than as a criminal issue.
18. Having a syringe services program in my community would lead to more heroin users and drug dealers hanging out in my neighborhood.
19. Medication-assisted treatment (MAT) should be widely available for people addicted to heroin.
20. Having a syringe services program in a community will not harm local businesses.
21. If people who use heroin get HIV/AIDS or Hepatitis C as a result of injecting drugs, that's the price that they have to pay.
22. If someone using an overdose prevention kit saves the life of a heroin user, the heroin user may ultimately stop using heroin.

For each of the following statements, choose the number that corresponds to your personal attitude or opinion:

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

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<sup>a</sup>23. Heroin use makes me feel angry.

<sup>a</sup>24. Heroin use makes me feel disgusted.

<sup>b</sup>25. Heroin use is harmful for the user.

<sup>b</sup>26. People who inject heroin should stop.

27. As far as I know, none of my friends, relatives, or neighbors have ever used heroin.

<sup>b</sup>28. Heroin use harms other people.

29. People who use heroin are just like other people.

\*Ambiguous item, omitted from subscale analyses.

<sup>a</sup> Item derived from MacCoun's (2013) moral outrage scale.

<sup>b</sup> Item derived from MacCoun's (2013) risk management scale.

### **Internal Consistency Analyses on HHRAS-R (Goddard et al., 2014)**

Cronbach's alpha for Attitudes toward Heroin Users items (1, 2R, 3, 6, 8R, 9, 13R, 15R, 16, 18R, 19, 21R, 22, 29) = .907

Cronbach's alpha for Overdose Prevention Attitude items (3, 8R, 13R, 16, 22) = .873

Cronbach's alpha for Medication-Assisted Treatment Attitude items (1, 6, 7R, 11R, 14R, 19) = .816

Cronbach's alpha for Syringe Services Programs Attitude items (4R, 10, 18R, 20, 21R) = .766

Anger single item = 23

Disgust single item = 24



## Appendix 6: Assessment of Attributions of Controllability, Responsibility, and Blame

For each of the following statements, choose the number that corresponds to your personal attitude or opinion:

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

1. People who are addicted to heroin are responsible for their condition. [Weiner et al., 1988]
2. People who are addicted to heroin should receive help. [Weiner et al., 1988]
3. Heroin addiction is caused by biological changes in the brain. [Meurk et al., 2014]
4. Recovery from heroin addiction depends entirely on using willpower to say "No" to drugs. [Olsen & Sharfstein, 2014]
5. Genetic/inherited factors cause heroin addiction. [Meurk et al., 2014]
6. With treatment, most people who are addicted to heroin recover and return to productive lives. [Barry et al., 2014]
7. If people become addicted to heroin, it's their own fault. [Crandall, 1994]
8. People who are addicted to heroin should be punished. [Weiner et al., 1988]
9. People who are addicted to heroin can just quit using the drug if they really want to. [Crandall, 1994]
10. People who are addicted to heroin are to not blame for their addiction. [Weiner et al., 1988]
11. Heroin addiction is a disease. [Meurk et al., 2014]
12. Being addicted to heroin is under the individual's control. [Vartanian, 2010]
13. I feel sympathy for people who are addicted to heroin. [Corrigan et al., 2003]
14. People who are addicted to heroin are dangerous. [Ahern et al., 2007]
15. People who are addicted to heroin have only themselves to blame. [Crisp et al., 2005]
16. Heroin addiction is a brain disease. [Meurk et al., 2014]
17. Heroin addiction is a moral weakness. [Dean & Rud, 1984]
18. To recover from heroin addiction, people just need to pull themselves together. [Crisp et al., 2005]
19. Heroin addiction is a biological disorder. [Allison et al., 1991; BAOP scale]

### Internal Consistency Analyses on Biological Causality and Perceived Control Scales

Cronbach's alpha for Perceived Control Scale (1R, 7R, 9R, 10, 12R, 15R, 17R, 18R) = .857

Note: Alpha is the same with or without Item 10 (Blame item).

Cronbach's alpha for Biological Cause Scale (3, 11, 16, 19) = .735

**Appendix 7: Manipulation Check**

For each of the following items, choose the number that corresponds to your belief about the statement:

- | 1                        | 2 | 3                                       | 4 | 5                    |
|--------------------------|---|---|---|----------------------|
| Sure this is<br>NOT true |   | Not sure whether this<br>is true or not |   | Sure this IS<br>true |
- 
1. In medication-assisted treatment (MAT), people who use heroin are given medications to prevent painful withdrawal symptoms.
  2. People who use a lot of heroin often lose the ability to feel pleasure from ordinary activities.
  3. Overdose prevention kits may be given to friends or family members of current heroin users.
  4. If you break your arm, your brain will release a natural substance that will help reduce your pain.
  5. Syringe services programs help keep heroin users from getting infections like HIV/AIDS and Hepatitis C.
  6. When people use heroin frequently, their frontal lobes get better at inhibiting (or “putting the brakes on”) the limbic system.
  7. The medication in overdose prevention kits helps heroin users start breathing again if they have stopped.
  8. Syringe services programs are common in Canada, Australia, and most European countries.
  9. The frontal lobes “put the brakes” on the activity of the limbic system, so that we learn to do pleasurable things in moderation or at appropriate times.
  10. The medications in the term “medication-assisted treatment” are drugs like Vicodin or Oxy-Contin.
  11. People who use heroin usually stick to their original dose and don’t increase the amount they use over time.
  12. Medication-assisted treatment does not have much scientific research support.
  13. The main part of your brain that responds when you do something that feels good is called the limbic system.
  14. Overdoses are rare among heroin users.
  15. Heroin is made from opium poppies.
  16. When we do something that feels good (like eating a delicious dessert), our brains respond by releasing a chemical called dopamine.
  17. The frontal lobes are mature by the time we reach age 16.
  18. For people who are addicted heroin, one dose of heroin usually lasts all day.
  19. Drugs like heroin trigger the release of much more dopamine than would be released after normal pleasurable activities (like sex or eating).
  20. Unlike people with Type 2 diabetes who need medication to manage their disease, most people who become addicted to heroin do not need medication to manage their symptoms.

**Manipulation Check Scale Items (False Items were recoded prior to scoring)**

Biology of Addiction Knowledge Test (total correct across Items 2, 4, 6R, 9, 13, 16, 17R, 19, 20R)

Harm Reduction Knowledge Test (total correct across Items 1, 3, 5, 7, 8, 15, 10R, 11R, 12R, 14R, 18R)

**Appendix 8: Demographic Questions**

1. Age \_\_\_\_\_
2. Gender \_\_\_\_\_ Male \_\_\_\_\_ Female
3. Classification  
\_\_\_\_\_ Freshman  
\_\_\_\_\_ Sophomore  
\_\_\_\_\_ Junior  
\_\_\_\_\_ Senior  
\_\_\_\_\_ Non-degree seeking  
\_\_\_\_\_ Post-baccalaureate
4. Race  
\_\_\_\_\_ African American, Non-Hispanic  
\_\_\_\_\_ Hispanic/Latino  
\_\_\_\_\_ White, Non-Hispanic  
\_\_\_\_\_ Asian/Pacific Islander  
\_\_\_\_\_ American Indian/Native Alaskan  
\_\_\_\_\_ Other (Please specify: \_\_\_\_\_)
5. Which of the following best describes your political identity?  
\_\_\_\_\_ Strongly liberal  
\_\_\_\_\_ Moderately liberal  
\_\_\_\_\_ Slightly liberal  
\_\_\_\_\_ Neutral (moderate)  
\_\_\_\_\_ Slightly conservative  
\_\_\_\_\_ Moderately conservative  
\_\_\_\_\_ Strongly conservative
6. Do you remember participating in a study that was similar to this one and filling out the same online survey last year?  
\_\_\_\_\_ Yes  
\_\_\_\_\_ No
7. Have you ever taken (or are you currently taking) Dr. Goddard's Drug Policy course?  
\_\_\_\_\_ Yes  
\_\_\_\_\_ No

**Appendix 9: Debriefing****"Opinions about Heroin" Study**

Thank you for participating in the "Opinions about Heroin" research study, designed by NKU psychology major Sara Sharpe and Dr. Perilou Goddard. The study was an experiment; we are investigating the possibility that learning about the biological basis for heroin addiction will affect participants' attitudes toward heroin users and specific policy responses (e.g., medication-assisted treatment, overdose prevention, and needle exchange). Our hypothesis is that participants who saw the video about the biological basis for heroin addiction will be (a) more likely to believe that people addicted to heroin are not solely responsible for their addiction; (b) less likely to blame heroin users for their addiction, and (c) more likely to support the policies to help people who use heroin.

All questionnaire responses are completely anonymous—we have no way to connect any responses with any identifying information about you.

If participating in this study raised any concerns for you about drug use or other problems, please consider contacting the NKU Office of Health, Counseling, and Student Wellness, 859-572-5650. They provide help to NKU students and can also refer you to community agencies that may provide help, too. You can also find many community resources by visiting the website for NKY Hates Heroin: <http://nkyhatesheroin.com/>

If you'd like to find out the study's results when they become available, or if you have any questions or concerns about your participation, please feel free to contact Dr. Perilou Goddard (goddard@nku.edu).

Thank you very much for your help with this study. We sincerely appreciate your time and effort.