CHAPTER 1

Introduction to Substance Abuse Across the Lifespan

CHAPTER OPENER

What is the most valuable commodity (i.e., product, good, or service) in the world? While indispensable necessities like water, food, medicine, and gasoline might come to mind, I would argue that perhaps the most valuable commodity is information. Consider industries showing the greatest potential for growth. Are they not directly related to the exchange of information? Reflect on how indispensable the internet and mobile phones have become in just the last few years. How long could you function without a mobile phone or the Internet? Of course, while you obviously could function without these items, why would you want to?

Some people laugh at stories of college roommates who use instant messenger, email, or text to communicate while sitting in the same dorm room. I have to admit that my wife and I have called each other from different rooms in our house just because we didn't feel like yelling or actually having to get up to talk with each other. (It is not like we have a large house, either.) Sadly, I even called my wife's mobile phone once, knowing that it was right next to me. I figured she would have to come into the room in order to answer the phone, which, at the time, seemed a lot easier than me having to get up and find her (it seems much funnier now than it did then, especially when she realized who was calling her).

Information, and whoever possesses it, becomes increasingly important in times of crises. For example, who would visit you if you were sick? Where would you take your car if it broke down before an important trip? Lastly, who would you call first if you were arrested? While the answer to these questions is obvious—a physician if you were sick, a mechanic if your car wasn't working, and an attorney if you had legal troubles—the reasoning behind these answers is not so obvious. We seek out highly trained people for specific problems because they possess the right information and experience. Experience is really just another way of saying information. For this reason, taking your car to the neighborhood mechanic is generally cheaper than taking it to a transmission specialist. Similarly, seeing a family physician is less expensive than seeing a neurologist. There is often a direct relationship between the cost of a professional's services, his or her training, and the relative scarcity of the information and experiences he or she has. Of course, that is great if you happen to be the one with the information that is in high demand.

There is an axiom which states "knowledge is power." While you may still doubt the ultimate utility of information, consider what you would pay if you could get information about the future?

Society generally rewards those who have information and use their skills and/or experience to produce a better quality of life, or at least a better income. Ultimately, if you are a student, isn't this one of the reasons why you are taking this class? Similarly, aren't you taking

this class to satisfy a requirement while trying to earn a college degree? While I am sure that there are students who take classes for the sheer joy of learning, most are considerably more practical. College students who earn a degree usually earn more money during their lifetime when compared to those individuals who do not attend college. We equate information with earning potential; hence, the more information you have, the greater the earning potential. This helps to explain why we have associates, bachelors, masters, and doctoral degrees. It sounds so easy. "If I just earn a degree, then I will make more money." However, earning that degree, or learning for that matter, is not so easy.

What is the most challenging aspect of a college course? Is it the difficulty of acquiring countless concepts? Or is it simply memorizing the innumerable terms inherent to advanced areas of study? Perhaps you can empathize with me since one of my greatest frustrations in college was studying. I would study for several hours each day, for several straight days; and yet while I was pleased with myself for being disciplined, I couldn't even remember the three most important points of what I was studying—or even recall the title of the chapter I was reading. I wondered, "Was all that effort for nothing?" Or was some information able to sneak into my head? I really do mean sneak, since there was no evidence of its existence inside my head. Sadly, most of my studies did not immediately increase my clarity or lead to an epiphany. Instead, I simply realized I had a great deal more work to do. Learning is often hard; and while there are not any "shortcuts," there are proven strategies to facilitate more effective and efficient learning.

As a scientist and psychologist, a professor and educator, I realize that one of the most important aspects of learning is engagement. As student engagement increases, so does learning. Furthermore, engagement is often directly related to the practical value of the learning experience. Students tend to earn better grades in courses that they believe provide them with practical knowledge and tangible skills. To this end, this book was designed to be informative and rich in content, but it is primarily focused on providing true-to-life examples, up-to-date information, and relevant applications—all centered around one of our nation's most pressing problems, substance abuse.

THE BIG QUESTIONS

Even though the universe is extraordinarily complex, interwoven with excruciating precision, do you ever stare towards the heavens and wonder if there are any questions left unanswered; that is, will science ultimately answer all of our questions? Can science continue to transform mysteries into facts? Isn't it rather amazing that we have detailed maps of distant planets and even know the content of their atmospheric gases? Robots are currently driving across Mars, taking pictures, and sending them to Earth. Further away, distant galaxies have been identified, some ten thousand and counting, and the number of stars currently visible exceeds seventy sextillion (7 followed by 22 zeros). Even now, plans are underway to develop interplanetary travel, a feat that is in the process of occurring during your lifetime. In many ways, what we used to call science fiction just a few years back is now a historical note or scientific fact.

While some scientists gaze across the universe, others have recently delved deep into the human body unlocking one of its greatest mysteries, the human genome. For the first time, the complete genetic blueprint for building a human being is available. The human genome is made of forty-six chromosomes, between twenty thousand and twenty-five thousand genes, and over three billion DNA base pairs. In fact, it took a multinational effort over thirteen years to sequence it. Knowledge of the very building blocks that provide structure, organization, and function to our bodies offers enormous potential for not just treating, but curing disease. Understanding DNA allowed scientists to clone a sheep known as "Dolly."

Despite enormous controversy, people continue to consider human cloning. Perhaps in the not so distant future, such advances will even provide the background knowledge necessary to make improvements to our very nature; that is, if science has the capability to genetically engineer crops, then why not people? Honestly, who wouldn't like to be just a little more intelligent, athletic, and/or attractive? From the universe that carries us to the molecules that bind us,

advances within every scientific discipline continue to accelerate at astonishing, unprecedented rates. The moral and ethical dilemmas extending from these advancements develop just as quickly. Just because it can be done, doesn't mean it should be done.

As each new mystery is solved, do you ever feel increasingly indistinct, irrelevant, and insecure? While science does not set out to diminish our significance, it often seems to do just that. Is there a natural progression that, as our scientific knowledge increases, our inherent self-worth decreases? Does the objective search for facts interfere with our subjective sense of meaning? I, as well as many others, would argue that the greatest scientific mystery, across all of time and space, is yet to be solved. That mystery resides in you. So, while there may be times when you feel unimportant, especially in comparison to the near infinite expanse of the universe, one of the most significant questions of all time deals with the nature of your very own perceptions and conscious experiences. Therefore, this makes you and your very thoughts and perceptions exceedingly important, especially as an area of scientific study. Thus, while attempting to unravel the details of the universe, incredibly important advances like the human genome will eventually pale in comparison to comprehending the final frontier of consciousness.

The very nature of consciousness, the mind, is an area of study that encompasses all others. Since psychology and neuroscience deal with how we perceive and understand the universe, I would argue that these scientific disciplines bring all the other disciplines together. Ultimately, all scientific advancements and all human achievements are housed in the mind. Where else could they be located? Consciousness is fundamental to the psychological study of perception. Studying perception means studying how we construct and extract meaning from simple, isolated, physical stimuli. Drugs are a type of stimuli and people ingest drugs for all sorts of reasons. However, nearly all of these reasons involve alterations of consciousness.

Neuroscience is the study of brain-behavior relationships. Advancements in this field have furthered our understanding of how we perceive, remember, and respond to the world around us and within us. Considering how far our understanding of neuroscience has developed in the last 25 years, it begs the following question: How far will neuroscience take us, and do we really want to take that journey?

Consider trying to explain the sophisticated mechanisms that make a computer, the Internet, or mobile phones work to a person who lived 300 years ago? Can you imagine how absurd those ideas or explanations would sound to someone who had never even heard the word "computer," "Internet," or "phone" before? Likewise, consider where humanity will be 300 years from now. More specifically, try imagining how far science will advance in its understanding of the neural mechanisms underlying our every perception, memory, response, and, ultimately, our most sacred beliefs like our understanding of "self."

Imagine that our understanding of the brain advances so much that we can program the brain as readily as we can program a computer. While this idea might seem ridiculous, again, consider how the idea of a mobile phone would have sounded 300 years ago, scientists have already implanted electrodes in a pigeon's brain to control its flight. The implants activate specific areas of the pigeon's brain using electrical signals. These signals are sent by the scientists via computer, mimicking the natural signals generated by the brain. Even now, scientists are making enormous strides in understanding and replacing natural organs with artificial ones. For example, those who have lost their hearing can be fitted with an artificial cochlea. Those that have lost their sight can have an artificial retina implanted in their eye. People who have lost an arm or a leg can have a new, bionic one fitted to their body. While these devices are relatively crude at this point in time, in the near future, they may even surpass our body's natural abilities.

While much of our knowledge of brain-behavior relationships can be used to improve the human condition (e.g., the point of this textbook), this knowledge can also detract from it. Advances in neuroscience and chemistry have enabled humankind to further develop and refine the chemicals used to alter consciousness—often with terrible consequences. These consequences can include crime, violence, addiction, health problems, economic burdens, family breakdowns, job loss, and death. Overall, the individual and societal costs to getting "high" get higher every day. Even small declines in the number of people using abused substances could provide enormous benefits for society—and for you. While we often view complex problems in collective terms, the very best prevention strategies always center around a single fundamental issue—one individual making a decision to make the world a little bit better. As spoken by Mahatma Gandhi, "Be the change you want to see in the world."

Upon successful completion of this course, the student should be able to do the following:

1. Demonstrate their understanding of the fundamental concepts of chemical dependency.
   - Convey an understanding of the historical context, the biological context, and the impact of substances
   - Explain dependency and describe how abused chemicals fit into this description
   - Differentiate between biological, psychological, and sociological factors that influence the developmental of substance abuse disorders
   - Define misuse, abuse, dependence, and addiction
   - Understand the neuropsychological consequences of drug use
   - Explain how humanity's understanding of chemical dependency has changed across time; note how differing models, perspectives, and frameworks have impacted our understanding of chemical dependency
2. Understand the enormous contribution of pharmacokinetics (i.e., bioavailability: absorption, distribution, metabolism, and elimination) and of pharmacodynamics (i.e., mechanism and site of action) in the initiation, development, and maintenance of abused chemicals
   - Describe how drugs move through our bodies and explain why this is relevant to substance abuse
   - Describe the different routes of administration and drug distribution in the cycle of substance abuse
   - Explain how the processes of metabolism and elimination impact drug self-administration
   - Describe how a combination of pharmacokinetics and conditioning contribute to drug abuse problems
   - Compare the three broad categories of abused chemicals, depressants, stimulants, and hallucinogens, and understand their limitations
   - Identify the defining characteristics of abused drugs
3. Demonstrate competency in their understanding of the fundamental types of addictive substances and their particular effects
   - Describe the basic pharmacology of inhalants, alcohol, benzodiazepines, and barbiturates, including their routes of administration, metabolism, intoxication, tolerance, withdrawal, and mechanism of action
   - Describe the basic pharmacology of cocaine, amphetamines, ecstasy, and other psychomotor stimulants, including their routes of administration, metabolism, intoxication, tolerance, withdrawal, and mechanism of action
   - Describe the basic pharmacology of marijuana, LSD, PCP, and other hallucinogens, including their routes of administration, metabolism, intoxication, tolerance, withdrawal, and mechanism of action
   - Describe the basic pharmacology of nicotine-containing products, including their routes of administration, metabolism, intoxication, tolerance, withdrawal, and mechanism of action
   - Describe the basic pharmacology of opioid-acting agents such as heroin, morphine, codeine, OxyContin, and Demerol, including their routes of administration, metabolism, intoxication, tolerance, withdrawal, and mechanism of action
   - Describe the harmful impact that abused chemicals can have on various organ systems and the developing fetus
4. Understand that the various substances have implications for treatment planning, models of treatment, and intervention
   - Explain the diagnostic criteria for substance abuse disorders

- Describe individual patient characteristics that are important for substance abuse treatment plans
- Explain comorbidity and the "self-medication hypothesis" as they pertain to treatment planning
- Describe the family and community role in the treatment of substance abuse problems
- Compare the various treatment models for substance abuse disorders, focusing on biological, psychological, and sociological approaches

5. Gain an introductory level of understanding about diversity, ethnic, social economic status, developmental age, and gender issues and how they affect addiction assessment and treatment
   - Define epidemiology and explain its significance in substance abuse research; define and explain commonly used epidemiological terms such as population, incidence, prevalence, lifetime use, morbidity, and mortality
   - Identify and explain the strengths and weaknesses of important data gathering approaches in substance abuse research, including ethnographic research, focus groups, interviews, double-blind designs, and quasi-experiments
   - Identify and examine the typical pattern of use and relevant demographic information such as age, ethnic group, sex, and social economic status for commonly abused substances
   - Identify and examine essential issues and problems in the treatment of special populations of chemically dependent persons

These key points, noted above, will be covered in the following chapters:

- **Chapter 1** will review a brief history of substance abuse and addiction and discuss general principles of substance abuse disorders. It will also explain the differences between use, abuse, dependence, and addiction.
- **Chapter 2** will focus on the neurobiological basis of why drugs are abused. Abused drugs will be discussed in terms of their impact on neurophysiological and neuroanatomical systems.
- **Chapter 3** will examine the pharmacology of abused drugs including a focus on pharmacokinetics and pharmacodynamics.
- **Chapter 4** will review the impact of abused drugs during pregnancy, including a focus on fetal and postnatal effects. Additionally, it will explore the impact of abused drugs during early through late adolescent development. We will also consider drug abuse issues unique to the elderly.
- **Chapter 5** will explore how drugs can serve as perceptual stimuli. Also, we will review how environmental contingencies serve to reinforce compulsive drug use—a focus on classical and operant conditioning.
- **Chapter 6** will review the pharmacological effects of drugs known to depress brain function, such as inhalants, alcohol, benzodiazepines, and barbiturates and explore how these substances affect neurocognitive functioning.
- **Chapter 7** will review the pharmacological effects of drugs known to stimulate brain functions, such as cocaine, methamphetamine, prescription stimulants, and nicotine and determine how these substances affect neurocognitive functioning.
- **Chapter 8** will review the pharmacological effects of marijuana, painkillers, and hallucinogens and how these substance affects neurocognitive functioning.
- **Chapter 9** will discuss the etiology, diagnosis, and treatment of substance abuse disorders. It will also explain how to use this information to make informed decisions about patient treatment plans.

- **Chapter 10** will explore the relationship between drug using individuals, their families, and their communities—a public heath perspective on substance abuse. We will conclude with an examination of substance abuse prevention strategies

TEXT OVERVIEW

Welcome to Biopsychosocial Effects of Substances: A Lifespan Approach

Substance abuse is a very complex, multifaceted, dynamic problem that cannot be explained by any single factor. That is, people do not become addicted to drugs due to their genetics or because of their mental health problems. Nor do people become addicted to drugs because of peer pressure or a bad environment. While each of the above factors can certainly contribute to substance abuse problems, no one factor alone necessarily causes addiction. In response to the realization that a loved one or friend has an addictive disorder, many people almost reflexively blame the problem on some simple correlational factor. Often this oversimplification interferes with the recovery process both for the person suffering from the addiction and for the people who care for them.

For the purposes of making a comparison, first consider what factors make someone successful at academics, sports, music, or theater. It would be difficult to argue that for basketball players, simply being tall and strong would provide all of the necessary prerequisite attributes for success—if that were the case, all tall, strong people would be making millions of dollars playing basketball. That is to say, biology (i.e., genetics) alone does not make one an athlete. Certainly, opportunity, coordination, endurance, motivation, training/coaching, and equipment would be necessary for competitive play. On the other hand, no amount of coaching or training would by itself make someone a professional basketball player. In fact, I think it would be rather easy to make predictions about what high school youth are unlikely to ever be competitive at basketball or ice hockey. Such predictions would likely extend mostly from specific biological attributes but also based on location and/or availability. Someone in Miami, Florida, regardless of skill or desire, would have a much higher probability of playing basketball than ice hockey simply because one is considerably more available than the other. Similarly, in St. Paul, Minnesota, regardless of skill or desire, one would receive a lot more support for ice-hockey than basketball. However, even the very, very best basketball players often make for poor cross country runners, gymnasts, ice-hockey players, or wrestlers. So, being good at sports is not a universal phenomenon; that is, being good at one sport does not often translate into being good at all sports. This also holds true for other complex activities like music; that is, having excellent hand-eye coordination and/or a good ear for pitch does not alone create a world class violinist, pianist, or singer. Similarly, there are many very smart people who end up doing very poorly in school, so just looking at intelligence, as defined by an IQ test, is not a meaningful way to examine academic aptitude.

Complex behaviors almost always have a biological component and thus tend to fall along a "bell-curve" with few people on the extremes and a large number of people showing intermediate or average ability. So, while there is considerable variation in biology, motivation, and environment, often all three have to act on someone to decrease or increase the likelihood of a certain behavior—like athletic ability or musical talent. Hence, there are very, very few exceptional basketball players, a lot of just average players, and, again, very few who just can't play at all.

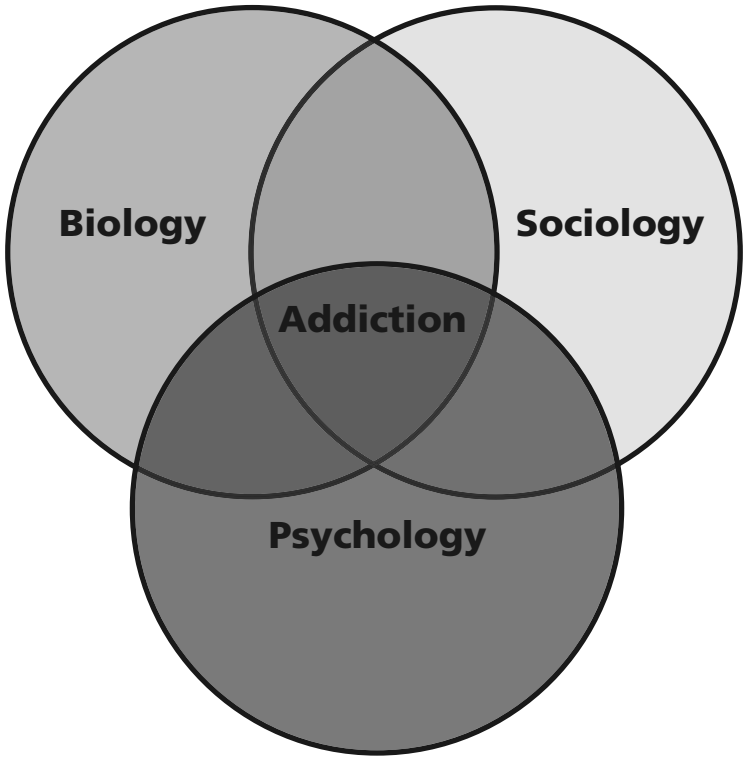
So, putting this together, if someone is naturally inclined towards sports, what sport is he or she most likely to play and excel at? If someone loves music, what instrument or type of music will he or she most likely play? In academics, what major or area of study is one most likely to pick? The answer to all of these questions is the one that is most rewarding or advances the easiest. However, there also has to be availability of that specific activity and, over the long run, there has to be a certain degree of social support (e.g., family, coaching, peers, etc.).

Translating this back to substance abuse, what drug is someone most likely to abuse, becoming dependent or addicted? The answer is not universal; instead, the answer is the readily available drug that is the most rewarding to that particular person at that particular time. Both of

these factors are significantly enhanced by biology but equally so by environment and social support. To be succinct, **the most dangerous abused substance is the one *you* find most rewarding**. The behaviors that lead up to substance use, abuse, and dependence include a wide variety of biological, psychological, and sociological factors—just like any other complex behavior like engaging successfully in academics, sports, music, or theater. Nearly all human behavior has biological, psychological, and sociological factors driving it. So, to fully understand what drives people to do just about anything, one must employ a form of analysis that includes all relevant factors.

The biopsychosocial effect of substances is an area of scientific study that examines the immediate and long-term impact of abused chemicals on biological, psychological, and sociological systems.

1. Biological systems include molecular biology, biochemistry, physiology, anatomy, and systems biology.
2. Psychological systems include learning, emotions, cognition, perception, development, and personality.
3. Sociological systems include families, peers, colleagues, communities, governments, ethnic groups, and religious affiliation.



Case Study: Heather

Heather entered college an exceedingly bright and motivated student. Although she engaged in infrequent experimental and recreational use of alcohol, prescription medication, and marijuana during high school, she was able to maintain A/B honor roll status. After going away to college, her infrequent use quickly accelerated to both use and abuse. Her continued use of a variety of abusive substances began to negatively impact every aspect of her life. Despite acknowledging that her substance use was interfering with school, upsetting friends, and disqualifying her from the equestrian team, she continued

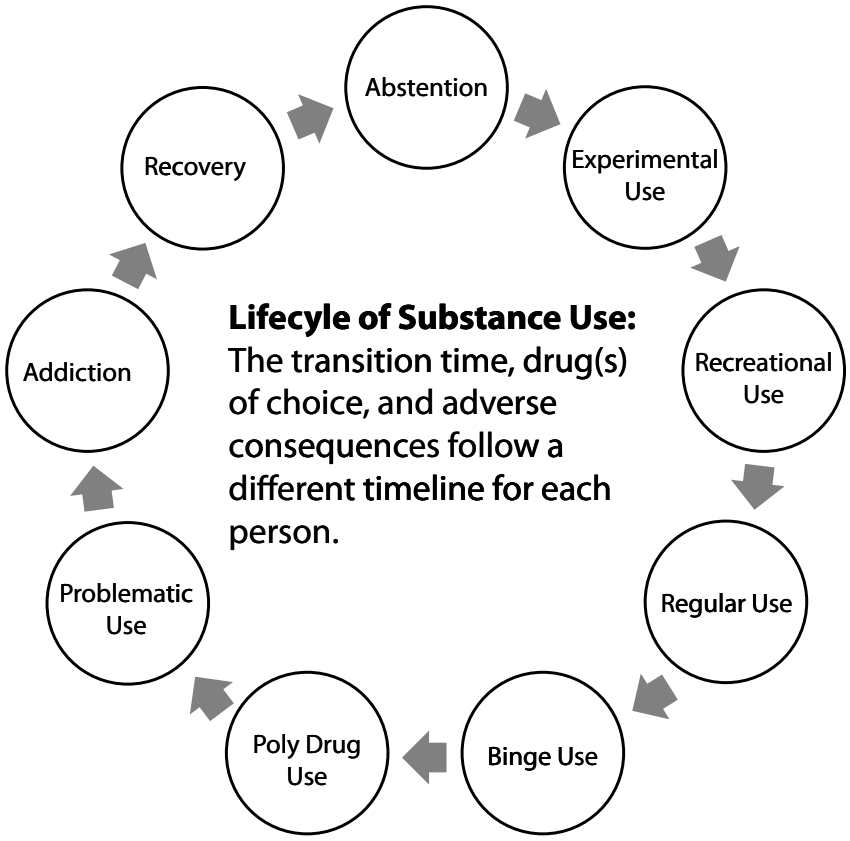
her drug use with the naïve assumption that she could stop and get her life back on track at any time.

After completing her first year of school, she was placed on academic probation. Instead of going back to her parent's home for the summer, she decided to work at a nearby equestrian center and live with some friends. She spent time that summer with her friends only to further exacerbate her substance abuse problem. By the end of the summer, she had become addicted to methamphetamine. She dealt with the adverse effects of that drug by using and abusing a combination of other drugs like alcohol, marijuana, and prescription painkillers. Because drug use is an expensive behavior to maintain, she ended up making a variety of bad decisions in order to support her "drug habit"—having sex with men in exchange for drugs, stealing from friends, and lying to her family. She returned to school in the fall fully expecting to leave her poor choices behind her; however, within the first week of starting school, she was rushed to the local hospital for alcohol poisoning. Upon further examination, it was determined that she had multiple drugs in her system. In addition, she was diagnosed with a sexually transmitted disease and malnourishment. Her family was called to pick her up. They were surprised and upset to discover the variety of serious health problems, including drug dependency.

The parents discussed the issue of their daughter's addiction with me noting they had both read drug addiction was a neurobiological diseases caused by genetics. Their scientific review of the problem lead them to the clear conclusion that Heather's problem was entirely medical and all she needed was an appropriate medical intervention in order to get better, like treating a broken arm, diabetes, or an allergic reaction. The discussion of the situation revealed they were both completely disconnected from the reality and seriousness of their daughter's problem. I was quick to point out that substance abuse is a complex, multifaceted problem that involves all aspects of someone's life. I further explained that substance abuse specifically includes their social relationships, psychological vulnerabilities, and biological/genetic make-up—but certainly not one of those factors alone is causally connected to substance abuse. Despite a lengthy and involved conversation, it seemed I hadn't convinced them because as they left my office they reiterated their intention to make sure their daughter was prescribed the right drug to fix her problem.

This particular case study is not unusual; it is our natural tendency to simplify complex issues during times of crises and especially when it is personal and difficult. However, the most successful education, prevention, and treatment programs are those that include a focus on the entire spectrum of factors related to why someone starts, continues, and ultimately becomes dependent upon dangerous chemicals. Thus, people use and abuse drugs due to biological, psychological, and sociological factors.

The recreational use and subsequent abuse of chemicals is not new to humankind. Throughout history, people used chemicals to achieve euphoria as well as altered states of consciousness. Frequently, substance use gets out of control, and it gets out of control much faster than anticipated. The substance user is often the "last to know" of the terrible consequences of his or her use and behavior. For example, ask a daily smoker when they switched from infrequent use to daily use? Ask an alcoholic when exactly their use became compulsive. I doubt he or she will have any conscious knowledge of when this transition happened. It is a lot like gaining weight. You don't know the small incremental changes taking place over months or years; you just realize one day that you have gained weight. While individuals have varied reasons for trying and maintaining substance use, there tends to be a predictable pattern. As noted in the diagram below, the lifecycle of use and abuse follows a cyclical pattern starting with no use then transitioning to escalating use, eventually to compulsive use, and, hopefully at this point, through to recovery. Sadly, many people with substance abuse problems struggle for years or even their entire lives and are always within this cycle at one point or another. It is for this reason, among others, that substance abuse should be viewed as a chronic disease. This is not to say that once an addict always and addict, but the consequences of substance use often change the brain's function to place that person at increased risk for substance abuse programs indefinitely.



Despite their allure, chemicals used to alter our reality have adverse consequences. The impact of drug abuse is both personal and public. It destroys not only the mind and body but also families and communities. The economic realities of drug abuse are equally disheartening. The cost of "getting high" becomes higher every day; in other words, people and the society pay a big price for substance abuse problems. Learning about substance abuse from various perspectives is a good investment in education because it is the first step in prevention.

CHAPTER ONE OVERVIEW

Addiction: A Brief History and Current Trends

Substance abuse, dependence, and addiction have always been a problem for individuals as well as society. Throughout recorded history there is evidence of substance use, abuse, and addiction. While addiction and substance abuse are complementary to each other, addiction refers to out-of-control, compulsive drug use, and substance abuse refers to any inappropriate use of a drug or another substance (Bell, 1996). An example of addiction would be an adult stealing money from his employer in order to purchase drugs and subsequently using those drugs in the bathroom at work instead of going to an important meeting. An example of substance abuse would be a teenager inhaling glue in order to elevate the mood or produce euphoria. Part of the difference between abuse and addiction is the personal consequences associated with use. The term addiction has become cliché in our culture and communication; we say that we are addicted to pizza, video games, driving fast, Pinterest, Facebook, or tanning, but what does the term "addiction" really imply? **Addiction** generally refers to out of control use of a chemical to the extent that such use supplants all other activities like work, relationships, and hobbies or interests. Over time the substance user finds him or herself engaged in a more narrow range of behaviors ultimately, and often limited, to just three behaviors: getting drugs, using drugs, recovering from drugs. As the cycle repeats itself, the addict tends to get more and more desperate resulting in riskier and riskier behaviors to access, use, and recover from use.

There is one experience concerning addiction that has remained fixed in my memory. One particularly nice afternoon, while working at an academic medical center, I decided to enjoy my lunch on a bench outside the hospital's main entrance. I recall an older gentleman pushing his friend in a wheelchair—he pushed him right out of the hospital's busy main entrance. It caught my attention because the man in the wheelchair was quite ill and connected to all sorts of tubes and monitoring devices. More dramatically, the man had bandages from his neck/throat to his nose. Upon more careful examination, I saw he had his lower jaw removed along with his larynx—his face was very deformed due to the operation. He was breathing through a trachea tube, located at the base of his neck. It was windy that day and all he was wearing was the standard hospital gown, so suffice it to say, I saw a lot more than I anticipated. His friend wheeled him to the edge of the hospital campus and locked the break on the wheelchair. Thereafter, the man pushing the wheelchair lit a cigarette and took a couple of puffs and placed the cigarette in the trachea tube in his wheelchair-bound friend's throat and helped him smoke for the next several minutes. The trachea tube was like a little chimney, focusing all of the smoke into a stream. The man coughed, hacked, and gagged while smoking. The smoking was clearly causing pain but he continued to smoke two cigarettes. For me, this provided the quintessential example of addiction. The man had lost much because of smoking, including part of his face and much of his dignity, but even when smoking caused physical pain, he continued to do so. I figured out at that moment that if he was willing to work that hard for a couple of minutes smoking, what would an otherwise healthy person do once captured by addiction? The answer—almost anything.

As the world becomes increasingly complex, the stress and demands people experience increase as well. Similarly, as a result, the problem of substance abuse has become more complex. Currently, an estimated 22 million Americans suffer from dependency and addictions and many more are on the verge of becoming drug abusers (Fleming, Potter, and Kelyle, 1996; US DHHS, 2006). Substance use and abuse is a public health epidemic impacting our families, friends, neighbors, schools, communities, counties, states, and collectively our nation (National Institute on Drug Abuse, 2013). Although the costs of cancer and diabetes are at record-breaking numbers, $157 billion dollars and $131.7 billion dollars respectively, the cost of substance abuse far surpasses both diseases combined at about $600 billion dollars annually (NIDA, 2013). Substance abuse also accounts for over 30% of the homeless individuals in America (Office of National Drug Control Policy, 2000) and approximately 66% of the Federal prison inmates suffer from a substance use disorder (National Center on Addiction and Substance Abuse at Columbia University, 2010). In 2011, over 3 million individuals 12 and over used an illicit drug for the first time within the past 12 months, at a rate of approximately 8,000 new users a day (Substance Abuse and Mental Health Services Administration, 2010, 2013). Drug abuse problems are not limited to just the US. An estimated 210 million people globally use drugs each year and about 200,000 die from such use. The United Nations Office on Drugs and Crime and the World Health Organization report that illicit drug use is one of the top 20 health risk factors globally—keep in mind that many people across the globe have limited access to clean drinking water, nutritious food, employment, or any kind of healthcare. Substance or chemical use disorders are associated with an increased risk of HIV/AIDS, cancer, accidental injury, hepatitis, tuberculosis, suicide, overdose deaths, and cardiovascular diseases. Injecting drug use—a primary route for transmission of HIV and other infections—is reported by 151 countries. According to the 2011 United Nations Office on Drugs and Crime World Drug Report, nearly one-fifth (17.9%) of the world's injection drug users have HIV; more than half (50.3%) have hepatitis C; and nearly one-quarter (22%) have hepatitis B. Outside of sub-Saharan Africa, 30% of global HIV infections are due to injecting drug use.

The United Nations Office on Drugs and Crime also notes that drug abuse is very expensive. In some countries and regions, the value of the illicit drug trade "far exceeds" the size of the legitimate economy and, on a smaller level, ends up overwhelming people's personal finances, leaving many individuals and families in devastating and dangerous conditions. In addition to substance-related health problems, accompanying crime and social problems also add to the economic cost of substance abuse, which the United Nations Office on Drugs and Crime and World Health Organization estimate can approach 2% of the gross domestic product in some countries—translating into billions and billions of dollars.

Of the world's nearly 4.5 billion people aged 15 to 64 in 2009, the United Nations Office on Drugs and Crime estimated that between 149 million and 272 million (3.3% to 6.1%) used drugs at least once in the past 12 months. Between 15 million and 39 million people (0.3% to 0.9%)

were problem drug users, and between 11 million and 21.2 million people (0.25% to 0.5%) injected drugs. The World Drug Report 2011 found marijuana (i.e., cannabis) remained the most widely used drug in all regions, accounting for more than 202 million people worldwide. Amphetamines and ecstasy were used most frequently in Asia; more than 56 million people used amphetamines, with about 28 million people using ecstasy. Some 34 million people used opioids, which were used most frequently in the Americas. Heroin consumption stabilized in Europe following years of rapid growth. Around 20 million people used cocaine, mostly in the Americas, where declines in North America were offset by increased consumption in South America. Cocaine use doubled in Europe during the past decade. The misuse of prescription drugs is a significant problem in North America, but is dramatically increasing worldwide. Both the United Nations Office on Drugs and Crime and the European Monitoring Centre for Drugs and Drug Dependence report the emerging trend of synthetic substance abuse, noting with particular concern the increasing prevalence of the stimulant substitute **mephedrone** (i.e., bath salts) and the synthetic marijuana/cannabinoid known as "**Spice**."

Different areas of the world and even different states and localities across the US have varying laws and regulations about drugs: sales, taxes, and distribution. In addition to a drug's legal status, we collectively refer to drugs broadly based on anticipated or perceived effects. Abused drugs are generally classified by their legal status, chemical class, or behavioral effects, thus, making a general discussion about drugs challenging; however, such labels add value by making it easier to talk about and explain drug effects that are inherently complex.

The reasons for drug abuse are many. People use drugs to elevate the mood, decrease anxiety, reduce pain, increase energy, focus attention, or produce delusions. However, the primary purpose of substance use was and continues to be associated with alterations in consciousness. These alterations can be produced by a variety of drugs, each capable of exerting a unique profile of effects (Hopkins, 1998). While there are many different abused chemicals, they tend to fall into about eight major categories and these categories are based, in part, on the drug's mechanism of action. That is, drugs in each of the categories below tend to influence similar brain chemicals and structures.

1. Psychostimulants—cocaine, amphetamine, methylphenidate
2. Tobacco products/nicotine—cigarettes, chewing tobacco, cigars
3. Opioids—heroin, Oxytocin, Percocet, morphine
4. Depressants—alcohol, benzodiazepines, barbiturates
5. Inhalants—nitrous oxide, ethyl ether, toluene
6. Cannabinoids—marijuana
7. Psychedelics—LSD, mescaline, psilocybin
8. Dissociative agents (Arylcyclohexylamines)—PCP, ketamine, dextromethorphan

Of course, the human desire to get high never ceases, and the lengths individuals will go in order to produce an altered state of consciousness never cease to amaze, that is why the list of abused chemicals continues to expand. For example, just in the last several years, young people have been harmed using a variety of legal chemicals, a few of which include the following:

"Spice" or "K2"

Four Loko, Joose, or Moonshot

Nutmeg

Ayahuasca

Bath Salts

Dextromethorphan (DXM)

Ephedrine

The 2C family of synthetic drugs

Bromo-Dragonfly

Alcohol Whipped Cream

Pocket Shots

Lazy Cakes

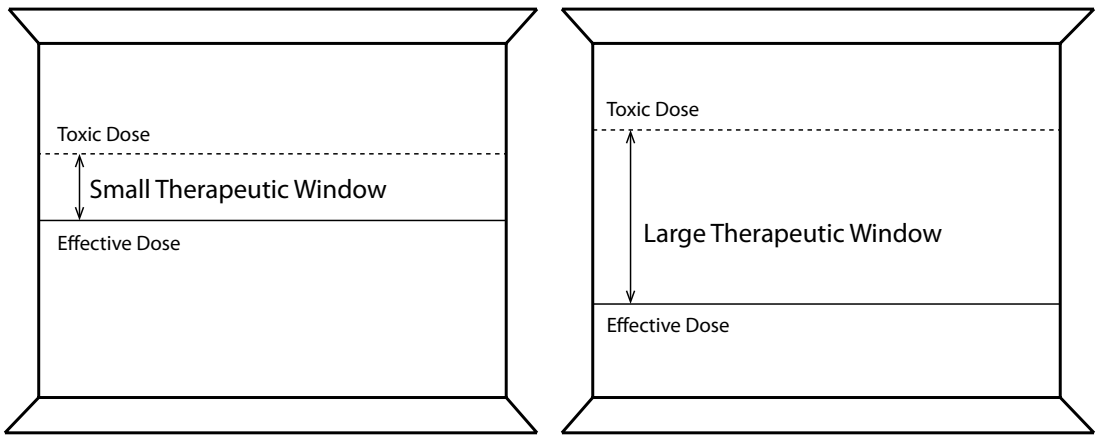
Kratom

Hookahs

Because of the harm caused by these substances, most governing authorities around the world have imposed sanctions against the use of such chemicals. America is no different. We have multiple agencies at every level of government as well as many grassroots organizations working to reduce the harm caused by abused substances.

Drug Enforcement Agency Drug Schedules

Perhaps you have seen one of many recent commercials or print advertisements in which paid celebrities or every day consumers advocate for a particular drug because it has changed their lives for the better. Thanks to the drug, you see a mom playing with her child, a grandparent taking a child for a bike ride, a child more effectively studying, or the always awkward relationship enhancing scenario played out. These relatively new direct-to-consumer advertisements provide a strong pitch for the drug's life changing potential. However, once the sales pitch is over and scientific information is provided on the potential adverse effects of these drugs, enthusiasm can quickly diminish. The adverse effects (i.e., side effects) are quite exhaustive and in some cases include disability or death. If a drug can produce such potentially devastating outcomes, then why take them at all? I hear this sort of argument all of the time from folks who want to legalize all drugs—"look how dangerous cancer drugs are and they are legal." Well, if you have cancer, cardiovascular (i.e., heart) or pulmonary (i.e., lungs) disease, there is a good chance you are already moving towards disability and death, so in those cases the beneficial effects of the drug far outweigh the adverse effects. Furthermore, drugs are very complex molecules and they are being put in an even more complex biological system, so their potential effects often vary from person to person or across the same person over time. While every drug has adverse effects, not every drug has a clinical benefit—at least from a medical standpoint. Therefore, every drug falls along two continuums, one for risk and the other for benefit. The safety of a given drug is based on the relationship between potential risk and potential benefit. It gets a little more complicated in that some drugs may have a strong benefit along with moderate risk at one dose, and, with just a small increase in dose, the risk can increase dramatically. The relationship between the safe dose of the drug and a potentially dangerous dose is referred to as its **therapeutic window**. As noted below, you can see the "window" on the left represents a drug with a small therapeutic window because the distance between a safe and dangerous dose is quite small. On the other hand, the "window" on the right represents a drug that has a larger safety profile.



Interestingly, alcohol is a drug with a relatively small therapeutic window, which is why it is often greatly diluted when used recreationally. Beer, for example, contains only about 4-5% alcohol by volume, making the other 95-96% of the ingredients just water and flavors. If you were to consume a 12 oz. can of pure alcohol, it would almost certainly kill you. Caffeine is an example of a drug with a larger therapeutic window. You can drink a cup of coffee containing about 100 mg of caffeine and experience a rather robust change in arousal. While not in any way recommended, you could consume 5 cups of coffee and have little potential for life altering problems.

Some abused substances also have a significant clinical function, like prescription pain killers. However, other substances with high abuse potential may have no clinical function, such as marijuana, bath salts, and PCP (i.e., phencyclidine). To simplify a complex matter, drugs with no clinical benefit are deemed illegal and drugs with some clinical benefit but also the potential for abuse are controlled by several layers of highly trained experts like drug manufacturers, physicians, nurses, and pharmacists for the purpose of consumer protection. There are multiple local, state, and federal agencies that help control the flow of drugs. And, while there is much debate about what to do regarding drug use penalties as well as legalizing drugs, we do know, as prevention specialists, that one of the single most influential factors in drug use is availability. Any time a drug becomes more readily available, its use goes up. In contrast, any time a drug becomes less available, its use goes down. For these reasons, there will likely always be some degree of control or restriction of substances that have potential for abuse and dependence.

While there are many ways to categorize drugs, as noted previously, the Drug Enforcement Agency—a branch of the United States Department of Justice—categorizes drugs based on their potential for abuse, addictive nature, and proven medical benefit. Drugs with abuse potential are placed in five categories, called schedules. Drugs with high abuse potential and no known medical use are considered the most dangerous and are referred to as Schedule I compounds. Schedule II compounds have high potential for abuse but have a proven medical purpose. Schedule III include compounds that have a modest potential for abuse and are a part of proven medical treatments. Schedule IV and V includes drugs that have some potential for abuse but have proven medical use.

"The Drug Enforcement Administration was created by President Richard Nixon through an Executive Order in July 1973 in order to establish a single unified command to combat "an all-out global war on the drug menace." At its outset, the DEA had 1,470 special agents and a budget of less than $75 million. Today, the DEA has nearly 5,000 special agents and a budget of $2.02 billion. "The mission of the Drug Enforcement Administration (DEA) is to enforce the controlled substances laws and regulations of the United States and bring to the criminal and civil justice system of the United States, or any other competent jurisdiction, those organizations and principal members of organizations, involved in the growing, manufacture, or distribution of controlled substances appearing in or destined for illicit traffic in the United States; and to recommend and support non-enforcement programs aimed at reducing the availability of illicit controlled substances on the domestic and international markets."

From: http://www.justice.gov/dea/history.htm;

http://www.justice.gov/dea/agency/mission.htm

Schedule I

- The drug or other substance has a high potential for abuse.
- The drug or other substance has no currently accepted medical use in treatment in the United States.
- There is a lack of accepted safety for use of the drug or other substance under medical supervision.
- Examples of Schedule I substances include heroin, gamma hydroxybutyric acid (GHB), lysergic acid diethylamide (LSD), marijuana, and methaqualone.

Schedule II

- The drug or other substance has a high potential for abuse.
- The drug or other substance has a currently accepted medical use in treatment in the United States or a currently accepted medical use with severe restrictions.
- Abuse of the drug or other substance may lead to severe psychological or physical dependence.
- Examples of Schedule II substances include morphine, phencyclidine (PCP), cocaine, methadone, hydrocodone, fentanyl, and methamphetamine.

Schedule III

- The drug or other substance has less potential for abuse than drugs or other substances in Schedules I and II.
- The drug or other substance has a currently accepted medical use in treatment in the United States.
- Abuse of the drug or other substance may lead to moderate or low physical dependence or high psychological dependence.
- Anabolic steroids, codeine and hydrocodone products with aspirin or Tylenol®, and some barbiturates are examples of Schedule III substances.

Schedule IV

- The drug or other substance has a low potential for abuse relative to the drugs or other substances in Schedule III.
- The drug or other substance has a currently accepted medical use in treatment in the United States.
- Abuse of the drug or other substance may lead to limited physical dependence or psychological dependence relative to the drugs or other substances in Schedule III.
- Examples of drugs included in Schedule IV are alprazolam, clonazepam, and diazepam.

Schedule V

- The drug or other substance has a low potential for abuse relative to the drugs or other substances in Schedule IV.
- The drug or other substance has a currently accepted medical use in treatment in the United States.
- Abuse of the drug or other substances may lead to limited physical dependence or psychological dependence relative to the drugs or other substances in Schedule IV.
- Cough medicines with codeine are examples of this Schedule.

From http://www.justice.gov/dea/pubs/drugs_of_abuse.pdf

The DEA uses these schedules not only to categorize drugs with potential for abuse but also to help determine federal drug trafficking penalties with more addictive drugs carrying greater penalties than less addictive drugs. Sentencing is based on not only the drug's schedule but also the amount that one has in their possession. Each year the DEA makes many thousands of arrests which result in the seizure of a number of illicit drugs.

DEA DRUG SEIZURES

Calendar Year	Cocaine kgs	Heroin kgs	Marijuana kgs	Methamphetamine kgs	Hallucinogens dosage units
2009	49,339	642	666,120	1,703	2,954,251
2008	49,823.3	598.6	660,969.2	1,540.4	9,199,693
2007	96,713	625	356,472	1,086	5,636,305
2000	58,674	546	331,964	1,771	29,307,427
1990	57,031	535	127,792	272	2,826,966

From: http://www.justice.gov/dea/statistics.html

EXPERT COMMENTARY

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"Addiction is not merely the chronic use of a drug. Addiction involves the compulsion to use drugs, a loss of control over the time and amount of drug use, and continued drug use despite negative consequences." Mim J. Landry (1964). Understanding Drugs of Abuse: The Processes of Addiction, Treatment and Recovery. *American Psychiatric Press,* p.7.

This quote succinctly captures the adverse effects of drug use. Not infrequently, the "loss of control" includes engagement in some sort of criminal activity. At that point in time, if the criminal justice system intercedes, the process of reaching a determination on criminal charges begins—taking into account the manner in which the addict's behavior was affected by drug use at the time of the criminal act or the residual effects of drug use that predated the criminal act. In order to understand how drug use can affect behavior, mental health experts, including psychiatrists and neuropsychologists, are frequently asked to educate the courts regarding the effects of drug use so that triers of fact, such as the judge and/or a jury, can make a well-informed decision.

In a criminal case, the defendant (the accused), generally enters one of a few potential pleas (answers) to the accusation—not guilty, guilty, guilty by reason of insanity, or some derivative or variant of these. The charge is generally based on different factors, including, but not limited to, the severity of the act (e.g., murder versus manslaughter), societal or political considerations (e.g., marijuana use versus marijuana cultivation), historical considerations (e.g., the right to defend one's property even at the expense of another life), sociological considerations (e.g., punishment for minors versus punishment for adults), potential punishment, and so forth. One important factor is related to the mental element of the crime: (mens rea) versus the act or action of the crime (actus reus).

General intent does not require intent to violate the law. When a person intentionally does that which the law declares to be a crime, [that person] is acting with general criminal intent, even though [that person] may not know that [their] act or conduct is unlawful. Additionally, there must exist a union or joint operation of act or conduct and this general criminal intent [1]. The term, "joint operation," which is essential to this definition, means that the mental element was present at the same time that the act occurred.

Mens rea means a culpable mental state, generally one involving intent or knowledge and forming an element of the criminal offense. With regard to such offenses, there must exist a union or joint operation of act or conduct and a certain specific intent in the mind of

the perpetrator. Unless this specific intent exists as to the charges as required, the crime [as it is charged] is not committed. It is noteworthy that because specific intent crimes generally involve crimes in which the actor is deemed to be more culpable, the penalties imposed for specific intent crimes tend to be more severe than those involving only general intent or only the doing of an act. For example, an individual convicted of a premeditated murder is likely to receive a more severe penalty than an individual who negligently, but inadvertently, killed a pedestrian while operating a motor vehicle.

In a criminal case, the prosecution must prove each and every element (part or subpart) of the crime or prohibited conduct charged beyond a reasonable doubt. If the defense successfully negates one of those elements or creates a reasonable doubt in the minds of the trier of fact that the prosecution beyond a reasonable doubt has not established an element or set of elements, the crime is not proved. In order to negate or raise a reasonable doubt as to a specific intent crime, mental health practitioners may be called to help determine whether the defendant was suffering from a mental disease or mental defect at the time of the commission of the crime. The mental disease or defect, which also is known as a mitigating factor, can potentially cause an individual to act impulsively or "act without thinking." If successful, this approach might result in an acquittal on the charge or cause the degree (severity) of the charge to be reduced; however, it is important to note that in many jurisdictions, voluntary intoxication does not provide a defense or diminishment of the charges.

The information provided by the mental health practitioner may be considered only if the information is based upon a solid scientific foundation. The Supreme Court justice who authored that opinion, the Honorable Harry Blackmun, concluded that scientific evidence is admissible only if the principle upon which it is based is "sufficiently established to have general acceptance in the field to which it belongs." Implicitly, the goal was to prevent triers of fact from being confused by experts who presented opinions that had not been accepted by a significant segment of the relevant scientific community. If the court determines that such techniques meet this standard, testimony and other evidence about them may be admitted; if not, it will be excluded.

With respect to the issue of mens rea and addiction, the issue that is primarily considered in the criminal justice system is that of substance intoxication. The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV TR), provides an excellent definition of substance intoxication, the caveats of using the DSM in a legal setting, the specific drugs that are associated with intoxication, and the relevance of intoxication to issues of mitigation. The essential elements of intoxication are that a person ingested a substance and, as a result of that ingestion, that person is at-risk to demonstrate impaired cognition (e.g., judgment) and/or emotional and behavioral abnormalities, such as belligerence, mood lability, and/or outright aggression. This generally accepted definition provides a framework for explaining why individuals who are intoxicated as a result of substance use are at-risk to evidence poor judgment.

While the DSM-IV TR provides a framework for explaining how substance intoxication can affect behavior, the manual also includes an important caveat regarding its use in forensic settings. For example, the cautionary statement includes specific wording that warns clinicians that it is inappropriate to utilize a DSM-IV TR diagnosis per se in order to address legal issues such as "individual responsibility, disability determination, and competency." Moreover, it also states that the DSM-IV TR is not meant to serve as a substitute for "…legal or other nonmedical criteria for what constitutes mental disease, mental disorder, or mental disability." This definition is not meant to dissuade clinicians from using the DSM-IV TR as a framework for explaining why intoxicated individuals are prone to behave in an aberrant manner. The DSM-IV TR criteria are actually quite helpful in this regard. Instead, the cautionary statement infers that it is incumbent upon the mental health provider to demonstrate explicitly how the intoxication led to specific behaviors by the defendant and how the intoxication affected the defendant's ability to reason and to modulate their behavior.

Negation or diminishment of intent are concepts that are used to explain why various mental diseases, disorders or conditions, such as intoxication from the misuse of alcohol and drugs, can potentially affect an individual's ability to make well-reasoned judgments.

Terms considered to be synonymous with "well-reasoned" include "impulsively" or "acting without thinking." Indeed, the DSM-IV TR indicates that intoxication from the following drugs is associated with a risk for impaired judgment: alcohol, amphetamine, cannabis, cocaine, hallucinogens, opioids, phencyclidine, and sedative-hypnotics. Others have defined intoxication as "…dysfunctional changes in physiological functioning, psychological functioning, mood state, cognitive process, or all of these, as a consequence of consumption of a psychoactive substance; usually disruptive, and often stemming from central nervous system impairment."

A brief review of the extant literature reveals that substance intoxication is associated with a host of negative outcomes. For example, intoxication on the following substances is associated with increased mortality rates or exposure to violence or physical injury: alcohol, cocaine, ecstasy, heroin, methamphetamine, PCP, and polysubstance use. Moreover, intoxication on the following substances is associated with an increased risk of propagating or experiencing a physical injury: alcohol, cannabis, cocaine, methamphetamine, and PCP. We specifically use the term "risk" as intoxication is not synonymous with impairment; however, the available literature provides a framework for showing how impairment might occur as a result of substance intoxication.

Categorizing Abused Drugs Behaviorally

The problem with classifying drugs behaviorally is we don't always behave the same after taking a drug, meaning drugs have such complex effects that it can be challenging to predict how a person might react to a given drug at one point in time based on their reaction at a previous point in time. Though drugs, like other stimuli we interact with, do have some powerfully predictable effects at specific dose ranges. For example, at a high enough dose of alcohol, everyone reacts the exact same—coma followed by death. On the other end of the continuum, everyone reacts the same to a very low dose of a drug—no effect at all. In order to understand how a drug impacts behavior, it is important to understand not only the broad classification of that drug, but also the behavioral state of the person prior to taking the drug. Drugs affect people's behavior differently depending on, among other factors, the frequency, intensity, and duration of the behavior prior to the drug exposure.

Case Study: Zach and Mark

Zach and Mark were both training for a long-distance race. However, Mark was more serious about the race than Zach was. In fact, Mark had raced competitively before and was planning on finishing in the top ten. Zach, on the other hand, had never finished a race. Several weeks prior to the race, Mark and Zach began to time their runs. Mark performed considerably better than Zach.

On the day of the race, Mark thought they could improve their timing if they used a stimulant such as amphetamine. The results were surprising. Zach's time improved by several minutes; in contrast, Mark's timing worsened, so much so that his time was not even competitive in the race.

Mark and Zach were exhausted after the race. They went to a local bar and had a couple of drinks. Later, Mark started dancing, while Zach nearly fell asleep.

Mark and Zach's experience provides some interesting insights into the categories of drugs and their effects. For example, Mark took amphetamine, a stimulant, but his running time worsened. After the race, he drank alcohol, a depressant, but his energy level increased. In Mark's case, amphetamine acted as a depressant, while alcohol acted as a stimulant. On the other hand, Zach's behavior was more typical—the stimulant improved his performance and the alcohol decreased his energy level.

Drugs are classified as stimulants, depressants, or hallucinogens. These broad categories, however, do not always accurately predict drug effects (Jones, 1987; Musto, 1991, 1996; Hopkins, 1998; Kosten and George, 2002). Stimulants, also known as psychomotor stimulants, are drugs that increase arousal, movement, attention, and energy. Depressants, also known as sedative or hypnotics, include drugs that decrease arousal, attention, movement, and energy. Hallucinogens are drugs that alter sensory experiences or produce dream-like states.

In addition to the particular drug category, there are several important variables, such as frequency and amount of drug use, baseline behavior, and drug-related expectations that contribute to drug-behavior relationships. Of these, the most important variable is baseline behavior.

Baseline behavior describes a person's current level of activity regarding some specific behavior, which encompasses frequency, intensity, duration, and range of that behavior. For example, most people have a predictable and consistent pattern of behavior across time. Although there may be variations in the exact pattern, their behavior tends to fall within an expected range. Specifically, most people have about the same amount of energy each day and sleep about the same number of hours each night, although the exact duration may vary from time to time, depending on circumstances. In addition, depending on the behavior being examined, it may occur frequently or rarely.

Baseline Level of Behavior

Behaviors that occur at low levels are not likely to be further suppressed by drugs, even depressants. This is termed as the floor effect because the behavior cannot go any lower. Similarly, behaviors that occur at high levels are not likely to be further elevated by drugs, even stimulants. This is termed as the ceiling effect because the behavior cannot go any higher. Therefore, the baseline level, or naturally occurring rate of a particular behavior, plays an important role in drug effects.

A drug's effect depends on the specific behavior being examined and the baseline level occurrence prior to the drug exposure. Individual differences in baseline levels of behavior also explain why people react differently to the same drug, even at the same dose. If a behavior is already occurring near its maximum level (i.e., an athlete running fast) then it is unlikely that even a powerful stimulant could improve behaviors because there is little room for improvement. Therefore, the only direction the drug can change the behavior is downward; consequently, the runner would slow down further after taking a stimulant as in the case of Mark. In addition, the behavior to be examined influences the interpretation of particular drug effects (i.e., running a race versus dancing at a club). Therefore, some drugs, such as alcohol, under specific situations, act as stimulants, while cocaine, under specific situations, acts as a depressant (Comer et. al., 2001; Visser et. al., 2007).

It is also important to consider the conditions under which the drug is being used, for example, its dose and duration of exposure. A drug's acute, or immediate, effects may be different from its chronic or repeated effects. Similarly, a low dose of a drug may produce qualitatively different effects compared to a high dose. For example, a high dose of amphetamine taken for an extended period of time can result in hallucinations. Even though amphetamine is considered a stimulant, under specific circumstances, it can act as a hallucinogen.

If a drug user is emotional and physically exhausted while experimenting with marijuana or lysergic acid diethylamide (LSD), the user may only experience the sedative component of the drug. If the user is angry and highly agitated, the same drug may result in a completely different experience. The user's expectation also plays an important role in drug effects. This means that the social context and what the drug user has been told about the drug can strongly influence how the drug affects the user (Henderson, 1994; Glennon, 2004). This is certainly the case with alcohol. Often the user's underlying emotional (i.e., psychological state) is enhanced or

"unmasked" with alcohol. Hence, a normally calm person becomes an angry drunk or a normally emotionally stable person starts crying after several drinks.

Therefore, although drugs may be collectively categorized as stimulants, depressants, or hallucinogens, their particular effects are dependent on a variety of environmental and individual factors—biopsychosocial factors. As a result, when dealing with a substance abuser and the particular drug of abuse, we should inquire about the abuser's baseline rate of behavior, the amount of drug used, and the amount of time or frequency of drug use.

Alcohol is one of the oldest and most frequently used recreational drugs, yet most people, even those who consume it regularly, have little knowledge of how it works or the type of reactions that can occur from its use. While the example below is just highlighting alcohol, most drugs produce complex reactions.

What Kind of Drug is Alcohol?

Is it a stimulant?

Conventionally, it is classified as a depressant. However, alcohol also acts as a stimulant in some situations, increasing the frequency, duration, and intensities of many behaviors.

Is it a depressant?

Yes. Alcohol suppresses breathing, heart rate, and overall brain function.

Is it a hallucinogen?

Yes, alcohol can cause hallucinations. Severe withdrawal from alcohol results in delirium tremens, a condition marked by significant hallucinations.

Is it an anti-anxiety agent?

Yes. Alcohol is the world's most commonly employed anti-anxiety agent, and people will often drink to reduce social and/or situational anxiety.

Is it an epileptic?

Yes. Alcohol is both an epileptic and an anti-epileptic. Acute use will prevent seizures, but severe withdrawal from alcohol can result in seizures, which can be fatal.

Is it a solvent?

Yes. Alcohol, at high concentrations, can damage and dissolve cell membranes.

Overview of Addiction

In any society, a certain percentage of the population experiments with drugs. For some people, however, this experimentation becomes compulsive, which turns into dependency, and then becomes an **addiction**. Therefore, while addiction is definitely harmful, it is not uncommon, especially in modern societies.

Problems of Terminology

There are a variety of terms and definitions used to explain the harmful patterns of drug. For example, there is **drug abuse**, which generally refers to the self-administration of any chemical in a pattern that deviates from the approved medical or societal patterns in a given culture. This particular definition is largely dependent upon what the "average" or "normal" person does. Furthermore, it is a function of what he or she does at one moment in time versus another as well as in one situation or another—so drug abuse is

dependent upon time and context. In most cultures, going to a religious event drunk would likely be seen as problematic, yet the same level of intoxication during a wedding party might be the expected behavior. To further complicate matters, what might be inappropriate at one age might very well be tolerated, even celebrated at a different age. Generally, the use of an illegal (i.e., illicit) drug is always considered drug abuse—this is dependent upon governments deciding what is legal. **Drug dependence** refers to a state in which the use of a chemical is necessary in order to maintain normal feelings or avoid aversive ones. This definition is often expanded to include a more specific label—physical dependence. **Physical dependence** is a product of tolerance (i.e., needing more and more of a drug to achieve the same effect or using the same dose of a drug with diminishing effects over time) and is revealed by **withdrawing** from the drug, also called **abstinence syndrome**. Physical signs of dependence are often regulated by the autonomic nervous system, which impacts all organ systems, thus having a pervasive impact on physiological functioning. Addiction, a more severe label, generally encompasses all of the above attributes.

The American Society of Addiction Medicine has two brief definitions for addiction:

"**Addiction** is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors."

"**Addiction** is characterized by inability to consistently abstain, impairment in behavioral control, craving, diminished recognition of significant problems with one's behaviors and interpersonal relationships, and a dysfunctional emotional response. Like other chronic diseases, addiction often involves cycles of relapse and remission. Without treatment or engagement in recovery activities, addiction is progressive and can result in disability or premature death."

According to the National Institute of Drug Abuse, addiction is defined as the following:

"**Addiction** is defined as a chronic, relapsing brain disease that is characterized by compulsive drug seeking and use, despite harmful consequences. It is considered a brain disease because drugs change the brain—they change its structure and how it works. These brain changes can be long lasting, and can lead to the harmful behaviors seen in people who abuse drugs."

There is a significant debate right now regarding the appropriate terminology for substance use disorders. Some favor maintaining the word addiction to describe the problem, while others want to focus exclusively on dependence.

Based on what you currently understand about abused drugs and what you have learned from this text so far, how would you define dependence or addiction? q

Case Study: Addiction Versus Dependence

Sarah is a professor and renowned for her work in particle physics. Her schedule is extremely busy and she often works late into the night, even on weekends, to get important work done. She drinks more coffee than she means to, having five cups of coffee throughout the day.

One morning, Sarah ran out of coffee. She had been having an exceptionally busy week and hadn't been able to make it to the store because of a very important deadline. Normally, she would just stop to get coffee on her way to work, but she needed to get to work early for an important meeting. Despite her best effort, Sarah simply couldn't follow what her colleagues were talking about. Additionally, she got a terrible headache. As soon

as the meeting was over, she went out to buy coffee. A half hour later, her headache was gone and she was feeling much better.

Richard used to be a metal worker at a local factory. He has been using methamphetamine for several years. Due to his methamphetamine use, he has what people commonly call "meth-mouth," namely severe deterioration to his teeth. He frequently has blisters on his face from the use of the drug.

When Richard worked previously at the factory, he was a supervisor and oversaw the work of about twenty employees. He worked for the company for thirteen years and used to be known for his dependability. However, when he began using methamphetamine, his performance at work suffered. His boss realized that he was coming to work under the influence of drugs on occasion and despite his first inclination to fire Richard on the spot, he decided to give him a serious warning about his drug-related behavior. Unfortunately, Richard's behavior didn't change, and he was fired several months later.

Richard's relationship with his wife also suffered because of his methamphetamine use. She was very upset about his drug use and the couple often got in fights about it. Richard didn't think his use of the drug was all that problematic, but his drug use was severely affecting their financial situation. When Richard lost his job, he wasn't very motivated to find a new job and the couple's financial situation collapsed. They were unable to pay their bills and the stress of all of this resulted in Richard's wife filing for divorce and leaving him.

When Richard goes too long without taking methamphetamines, he lacks the energy to do anything productive. He's always tired, and it interferes with his ability to look for new jobs.

At first, it had seemed to Richard that his drug use wasn't hurting anyone. Sure, he spent less time engaging in some of his other hobbies, but how he spent his free time was his business. In the end though, he found much of his life was wrapped up in and limited by his drug use.

It is easy to see from Sarah and Richard's examples the difference between dependence and addiction. Dependence simply means that your body has basically become used to a drug, like caffeine, and it is challenging, albeit not impossible, to get along without it. On the other hand, Richard's pattern of use clearly demonstrates addiction. All aspects of his life were harmed by his use—work, relationships, and hobbies. He was making a decision, perhaps not even consciously, to choose drugs over these other important responsibilities until he no longer had those responsibilities to make decisions about. Addiction is a transition from you controlling the drug to the drug controlling you.

To contribute to the problem, science provides the necessary technology to increase the supply and potency of abused drugs. Furthermore, abused drugs have improved in quality and so have their methods of administration, such as intravenous injections and free-base inhalation (Benke and Eyler, 1993; Beebe and Nalley, 1995). These advances have significantly reduced the time it takes for the onset of a drug's effects and, simultaneously, increased the drug dose. Both these factors increase drug abuse and generate a more rapid progress toward addiction.

In addition, people persistently try to develop more powerful drugs. For example, in the last 100 years, advances in organic chemistry have made possible the synthesis of naturally occurring drugs and designer drugs—drugs that are synthetic in origin and not derived from plant products.

While not directly related to substance abuse, advances in transportation combined with our modern infrastructure have also made the distribution of abused drugs easier and faster. For example, in the U.S., people have access to nearly every known drug of abuse and psychedelic agent ever identified. It is usually easy to procure abused drugs. No place in the U.S. is free from substance abuse problems (Goldstein, 1994). Drug abuse problems are known to occur even in maximum-security prisons. Therefore, if a person can access an abused drug in prison, access to an abused drug anywhere else is even easier. Increased availability also contributes to the growing problem of drug addiction. As noted previously, one of the most powerful predictors of use

is the accessibility of a given drug; if it is more easily accessible, use goes up, while if it is more difficult to access, use goes down.

Although no one decides to become a drug addict, addiction is an ever-growing problem. The reasons are many. Often, people start taking drugs for seemingly harmless reasons, such as to relax or reduce stress, and later become addicts (Matsuzawa and Suzuki, 2002; Book and Randall, 2002).

Addiction to alcohol, the second most widely used drug, is one of the most effective examples of the transition from drug use to addiction. Let us study the case of Steve who turned from an occasional drinker to a helpless dependent.

Case Study: Steve

Steve entered college on an academic scholarship. He was eager to do well during his first year. In fact, he contacted his psychology professors during the summer to procure the fall reading list. Along with doing well, Steve also wanted to have more fun during his college days. For this, he started attending parties. Occasionally, he drank at such parties. His new lifestyle was fun and relaxing, but it seemed to interfere with his academic success.

There were increased feelings of anxiety and stress. His continued apprehension made it difficult for him to sleep. As a result, in addition to parties, he began to have a couple of drinks every night even when alone. Steve began missing more and more classes, which affected his performance. The levels of anxiety and stress increased. To deal with these feelings, he started going to more parties and drinking more alcohol. Most of the time, he had no idea how much alcohol he had actually consumed. Gradually, it got to the point where Steve rarely went a day without drinking and often drank until he was completely drunk. Often, Steve had a drink or two in the morning in an effort to diminish the effects of his hangover.

During the spring break, he went home to visit his family. Although a well-defined "no drinking" policy was in place at Steve's home, Steve felt he couldn't last the entire week without a drink. In fact, within a couple of days, he began to feel sick and craved for a drink. Despite the risk of angering his parents, Steve went to a party and became drunk. While driving home, he was pulled over by a police officer and arrested for DUI—driving under the influence.

His parents were shocked and disappointed. When they contacted the college to notify them of Steve's predicament, they were stunned when informed that Steve had stopped participating in all extracurricular activities. In addition, he had not received passing grades in his courses. Steve spent three days in jail, was expelled from school, and was admitted to a hospital for the treatment of alcoholism.

Looking at Steve's story, it is easy to understand the basic definition of **addiction**—a compulsion to use a drug regardless of the consequences. This compulsion leads to repetitive use, which negatively impacts every aspect of a person's life. The consequences of addiction include maladaptive patterns of substance use that lead to clinical impairment across a wide variety of behaviors. Usually, family, work, and recreational activities are reduced. On the other hand, high-risk behaviors and legal problems increase (Demers-Gendreau, 1998).

Drug Use—An Age-Related Problem

Initiation of drug use and drug dependency problems, including alcohol and inhalants, almost always begin prior to the age of 21 years. Most people try their first drug between the ages of 14 and 16 years (Breslan et. al., 2001; Ellickson, 2003). In the U.S., recreational drug

and substance abuse problems are the highest among 18- to 25-year-old college goers followed by the 12- to 17-year-olds (i.e., middle and high school age; Bukstein, 1994, 1995; US DHHS, 2003, 2006). These statistics suggest that the most common location for drug distribution and drug networking are schools. Young people are very well connected to each other now and information that may have taken days or weeks to move through a population, like a school or college, just several years ago, can go "viral" and spread across the entire population in seconds to minutes. Increasing the size of a school, an emerging pattern in the US, along with the growing connectedness of students, students can find out about and access illegal drugs in record time—often within just hours.

The age when a person first uses a recreational drug is a strong predictor of future drug abuse problems and treatment; in other words, the earlier a person tries drugs, the worse the prognosis. In brief, one of the most significant factors in the progression from drug use to abuse is early experimentation with drugs (Kandel, 1992; Johnson, O'Malley, Bachman, Schulenburg, 2004). Perhaps the most challenging part of working with young people is the **lost potential** I continually observe as a result of recreational, intermittent, or moderate substance use (e.g., like Steve in the above case study). An analogous problem can be seen with weight gain—I see this frequently as well. Many students come to college having a long tradition of eating healthy and staying active and fit. However, once they are in college or just graduated from college, their lifestyle changes, often drastically. This results in not just less time for exercising but more processed or fast-food. The combination of less activity and less healthy meals results in greater weight gain, making activity that much more challenging and, thus, all the more infrequent. Without even knowing it, people change their behaviors and attitudes, saying things like "I didn't really have time to play sports" or "I am too busy with school anyway to get a healthy meal." Before too long, getting healthy again seems a long way off and just too much work. At this point, people just readjust their goals and daily activities.

This change in potential is even more dramatic with abused substances. Many students start college with big dreams of focusing on health sciences, business, engineering, pre-medical studies, or nursing. However, once they start using drugs often during the first 6 weeks of college, principally alcohol and marijuana, their performance drops and all of their academic work just seems harder than it should be. The drop in performance is quickly followed by readjusting their life goals and ambitions. Students inherently do this instead of altering their substance use—primarily because many of these students just can't believe their substance use is producing any negative outcomes. As their expectations for themselves change and/or go down, their substance use goes up (or vice versa). Like weight gain, this pattern makes it hard to recover. Abstaining is much easier than recovery. Nonetheless, within just a semester or two in college, too many students move toward mediocrity or drop out altogether because of drugs, and oftentimes, such students don't even connect the two activities together. For me, it is sad and frustrating to see this play itself out year after year. However, I made a decision to not be a passive observer in this process of lost potential—I would make the same recommendation to you.

In terms of lost potential consider the list of well-known celebrities that have died from drugs. This is by no means an exhaustive list. Furthermore, imagine how many other important people have died due to drugs. I would argue that everyone is important to someone.

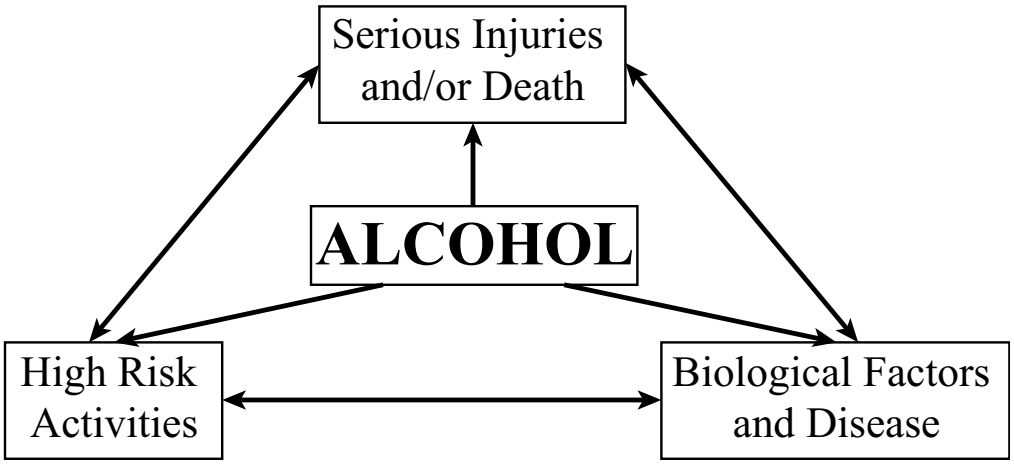
Name	Celebrity Status (Notable Contribution)	Age and Year
Whitney Houston	Singer and actress	48 and 2012
Amy Winehouse	Singer and songwriter	27 and 2012
Derek Boogaard	Professional hockey player	28 and 2011
Andy Irons	Professional surfer	32 and 2010
Billy Mayes	Spokesperson	51 and 2009
Michael Jackson	Pop singer, actor, songwriter	50 and 2009
Heath Ledger	Actor	28 and 2008
Christopher Bowman	Figure skater	40 and 2008
Ike Turner	Musician and songwriter	76 and 2007
Dee Dee Ramone	Musician and songwriter	50 and 2002
Chris Farley	Actor and comedian	33 and 1997
Kurt Cobain	Musician and songwriter	27 and 1994
River Phoenix	Actor	23 and 1993
John Belushi	Actor and comedian	33 and 1982
Keith Moon (The Who)	Musician	32 and 1978
Elvis Presley	Musician, songwriter, actor	42 and 1977
Jim Morrison (the Doors)	Musician and songwriter	27 and 1971
Janis Joplin	Musician	27 and 1970
Jimi Hendrix	Musician and songwriter	27 and 1970
Marilyn Monroe	Actress and singer	36 and 1962
Sigmund Freud	Neurologist	83 and 1939

Escalation from Use to Abuse

Drug abuse may also begin by the **misuse** of a drug (Dunne, 1994). For example, a person may consume a prescription painkiller to get high, consume more than the recommended amount of a prescription stimulant to stay awake, or drink alcohol to alleviate anxiety or induce sleep. Regardless of the reason, drug use can quickly become abuse after dependence and tolerance are established; however, the timeframe for this transition may vary.

In the beginning, the drug is consumed to get high. Eventually, the drug often loses its ability to produce euphoria, leaving the drug abuser in the precarious predicament of consuming the drug simply to avoid withdrawal or to continue trying to achieve that initial high that was so reinforcing. High doses of the drug affect the various organ systems. The consequences include considerable damage to the organ system, leading to pain, which further elevates the drug abuse problem.

Continued drug use despite a variety of adverse consequences is one of the symptoms of an addictive disorder (APA, 2000). Sometimes, the desire to get high supersedes almost all other desires, such as sleeping, eating, or drinking. Eventually, the immediate or direct effect of continued drug use can elevate a person's risk for a number of life threatening health problems (Cami and Farre, 2003). However, these problems are often minor in comparison to the direct effects of repeated drug use—effects such as liver damage, lung disease, seizures, or even death.



Having studied the transition from drug use to abuse, let us now understand how and when the use of drugs turns into a disorder.

Have you ever felt that your day is incomplete without a cup of coffee? If your answer is yes, then do you think that you suffer from a disorder because you are dependent on caffeine? Probably not!

Being dependent on a substance is not enough to meet the diagnostic criteria for substance abuse or dependency **disorder**.

Dependence is the necessary prerequisite for addictive disorders; however, a dependence problem alone is not enough to qualify as an addictive disorder. Dependency, in general, refers to biological problems or adaptations associated with repeated drug use.

The human body is complicated, and it is impossible to discuss the impact of all the available drugs on each organ system. However, a concise way to summarize the effects of drug use from the biological perspective is to examine the immediate, withdrawal, and long-term effects of abused drugs on the bodily systems.

In most cases, people use drugs for their immediate rewarding properties (Koob, 1992; Cami and Farre, 2003). For example, people ingest cocaine to receive instant pleasure. People drink alcohol to reduce or eliminate anxiety. Together, these two processes work to promote compulsive drug use (Rohde et. al., 2001).

As the drug serves to increase a reward, the body adapts by altering neural systems to reduce the reward. For example, if the drug serves to elevate the heart rate, the body responds by lowering the heart rate. As increasing amounts of the drug is ingested, the body adapts further; this is known as **tolerance**.

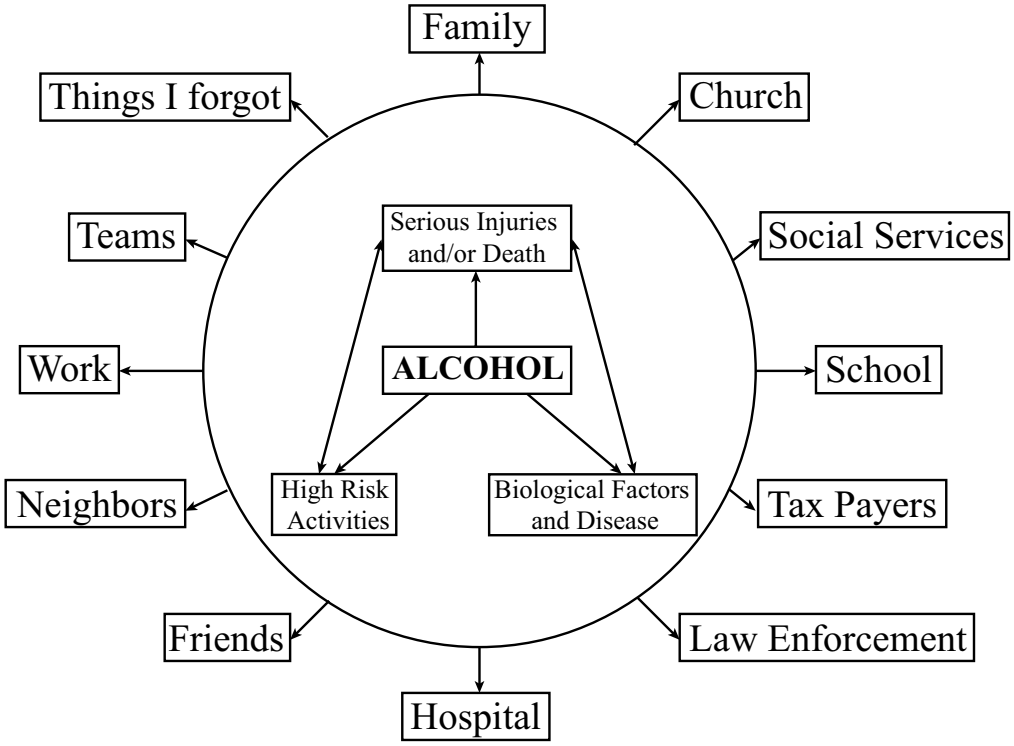
Therefore, when the person stops consuming the drug, the body is unable to bring those biological processes back to normal. This is the defining feature of **withdrawal**. The strongest evidence of dependence is typically during withdrawal.

A **substance dependence disorder** implies that the drug-related behavior significantly impairs a person's ability to carry out important daily activities necessary for survival and fulfillment (APA, 2000; O'Brien, 2001, 2004). In general, the defining features of a disorder are the psychological and sociological factors that result from a physical dependency. For example, because of a dependency on caffeine, people don't steal, physically or emotionally abuse their children or spouse, miss work, or engage in dangerous activity; however, all these maladaptive behaviors are common in people with a dependency disorder.

In addition to factors such as tolerance, withdrawal, and elevation in dose, there are a number of psychological and sociological factors important in determining if someone has a dependence disorder. The psychological determinants of dependence and addiction and the psychological factors responsible for an individual's vulnerability to dependence and addiction must be understood before an effective treatment and prevention strategy can be developed and implemented. While many people use the terms dependence and addiction as synonyms, the terms are often used to represent different types of problems.

Dependence refers to biological adaptations to repeated drug use, as a result of which the body can no longer function properly without the drug.

Addiction, when used as a separate term from dependence, is a more complex term. Addiction includes dependency as a subcomponent within its definition. In other words, everyone with an addiction is by definition dependent, but not everyone who is dependent has an addiction.



To explain, continued use of cocaine is likely to result in addiction; however, continued use of caffeine is likely to result in dependence. The difference may initially appear semantic, but actually it is not. The difference between addiction and dependence is about control and consequences. When the drug begins to control the user's life in a way that significantly impairs their ability to be successful in their work, relationships, and hobbies, then it is likely an addiction disorder. Further, when their drug use is out-of-control and compulsive, it is an addiction. However, this is distinct from dependence, which is often noted by two factors: withdrawal and tolerance. Tolerance and dependence, as might be the case with caffeine, are not enough to meet the criteria for an addiction disorder. It is very, very unlikely that anyone's life is going to be significantly impaired over caffeine.

Although there appear to be many concerns regarding drug abuse and its consequences, there is also some good news concerning substance abuse treatment. Scientific progress has made the treatment of substance abuse disorders more effective. As our understanding of drug dependence and addiction improves, so does our ability to diagnose and treat people impacted by these afflictions.

EXPERT COMMENTARY

Clark A. Ritchie
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As a lawyer, my input may seem somewhat unusual in this sort of publication. However, I believe that my professional experience has afforded me some valuable insight into the sources, development, and comprehensiveness of substance abuse. I have been a prosecutor for a number of years. I have handled hundreds and hundreds of cases of all types, including everything from simple theft to forcible rape. Issues of substance abuse are at the forefront of a significant number of the cases that I handle as a prosecuting attorney. Even cases that do not implicate or directly involve it often have as a source ingredient issues involving substance abuse. For every drug dealer on a drug distribution charge, there is an assault involving his purchaser who has gotten high or drunk; there is a fraud or theft from a desperate buyer; and there is raw, hollow neglect of a child from a parent enveloped by the cold sheets of addiction. One of the most disturbing things that I notice is that these things start so very early.

It is just an obvious unimpeachable fact that most of the adults that I prosecute who are struggling with addiction have been working themselves to that point since their youth. So many start using (and abusing) alcohol and drugs as juveniles. Simply put, people as a general rule, don't start a vicious cocaine habit at thirty-five. More often than not, I have seen them progress and develop their addiction (and their criminal record) for years. It has been a process that is rooted in exposure, experimentation, and socialization. For so many, the varying levels of seriousness the law, society, and familial structure put on different substances becomes the proverbial inch that turns into a dark and terrible mile. I have seen a juvenile come to court on minor charges after experimenting with "just a little" alcohol and/or marijuana and four years later come to court a haunted skeletal shell, ravaged by hard core addiction, and charged with stealing change from charity bins to buy crack.

Something that has been especially noteworthy is how drugs and abuse of alcohol actually affect a young person. Certainly, the actual "high" temporarily modifies behavior on a purely chemical level, but habitual use during teen years seems to actually adjust the outlook and personality traits of a young person in a much more permanent way. It seems that as they tick up into their adult years, they become more compulsive, reckless, and shortsighted than perhaps they would have been had their "infrastructure" not been altered by habitual substance abuse. This may be an incorrect observation, but it is one that has been made in my own six year informal courtroom study of simple observation.

I believe a more comprehensive understanding about the permanent effects of juvenile substance abuse is absolutely vital to preventing this wilting of mind and spirit. After having seen this transformation by so many of our society's youth, it seems that we need to stay vigilant in preventing juvenile substance abuse and stay committed to understanding how it affects the minds that may have had the potential to reach so much farther.

Stress and Coping

As previously noted, a leading cause of substance abuse initiation and escalation centers around a person's desire to suppress unwanted feelings like stress, anxiety, fatigue, and depression (discussed in more detail in Chapter 10). While intoxicating substances might initially appear to help with the problem, this type of coping strategy produces a whole host of negative outcomes—the most troubling include addiction and acceleration of the exact problem the person is trying to suppress with drugs. Because many people under stress just want to make it through the day, they often don't have the opportunity to really explore the factors and situations going on in their

lives that may be contributing to stress. Comparatively, if people are not aware of the stressors in their lives, they are not likely aware, at least directly, of the coping mechanisms they may be using to help manage such stressors. Having a better understanding of the factors that influence us can empower us to make better decisions about how we handle and deal with stressors.

EXPERT COMMENTARY

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Serenity Prayer
God, grant me the serenity
To accept the things I cannot change,
Courage to change the things I can,
And wisdom to know the difference.

Tough to know for sure who really penned—or uttered—this phrase first, but many link it to a preacher—Reinhold Niebuhr. Other figures in history have some sort of similar statement—from Thomas Aquinas to Augustine. Nonetheless, there is some important insight in this prayer. It is important enough—and relevant enough—for Alcoholics Anonymous to embrace it.

First of all, it recognizes that lots of stuff happens to us, around us, because of us, in spite of us, for us, against us, and with us. Yes, we tend to see ourselves in the center of things—but it is all about us here. All of this "stuff" is what we call stress, and stress is a highly personal thing. More accurately, the EXPERIENCE of stress is a highly personal thing. Two people can have the same THING happen to them, but each will EXPERIENCE that same thing in very different ways. Take most break-ups. A couple breaks up—and most often one person is impacted harder (the one who didn't see it coming and wasn't interested in the breakup). The one who does the breaking up is not likely to feel as badly—they may have felt badly leading up to the breakup, but the ACT of breaking up probably feels better than the experience of being together. Sometimes when we're bored we start looking around for stress to excite us. There are movies, video games, amusement parks, extreme sports, and risky behaviors that we kind of know we shouldn't do. Yet, we do them anyway because they are "exciting"—and exciting involves a physiological response (heart rate up, breathing up, ultra-sensing of surroundings), an emotional response ("jacked up" or exhilarated), and a cognitive response (mentally alert and attentive to all sorts of details). It's a type of "high"—linked to the experience. This points out the multi-dimensional aspect of stress. It is a biological and psychological experience for us. It also has an impact on our social lives—so we can make a three-ingredient recipe. Psychologists talk about this as a "bio-psycho-social" approach to understanding stress and how it impacts persons.

Second, the prayer recognizes that we reach some sort of limit. Too much stuff, we can get overwhelmed. Generally, we call this stress. Most times, we can handle the stress—but to the extreme, we can get stressed out, burned out, bottomed out, or have a break down. Not pleasant. But not everyone has the same limit or tolerance for stress. Some people have a personality that doesn't do well with stress. These folks generally like to keep things relatively the same—keep change to a minimum and limit any activity that might be risky or have the potential to end badly. Others seem to thrive on stress by seeking out situations that just ask for change or cause instability. If these are the two extremes, most folks are somewhere in between, but the range is stretched out pretty far. Everyone has a "preferred range" that they operate within. Enough stress or instability to stay motivated or interested in life as they live it, but not too much that it feels overwhelming. The response we have to limit negative

impact of stress is called "coping." This is any asset—be it internal such as how we think about things ("Wow, that was tough, but I am strong enough to manage") or external such as whom we can go talk to about things or what activity "blows off steam" (like working out or walking/running). Having more assets is better than fewer; and having stronger assets is better than having weaker. Coping keeps us from shutting down from too much stress. Therefore, it is important to develop coping assets that are effective, positively oriented, healthy, strong, and come in a variety.

Third, the prayer recognizes that there are some things within our control (change what we can) and things that are outside our control (things we can't control). Control is one of the two most important pieces in determining what makes something stressful—in an unwelcome kind of way (the other is being able to see something coming before it hits us). If something is under our control—even a little—then we have at least some influence to reduce the impact of that stressor. For instance, buying a brand new Mercedes or buying a used Toyota is a situation in which we have control. The stressor of financing a Mercedes is much harder for most people than financing a used Toyota. That's fairly easy to understand and see. Other situations are tougher to see how we have control. Working for a demanding boss or supervisor is a situation that may feel out of control. We can't say or do anything for fear of getting fired. Ultimately, this situation is under our control. We can get fed up with the situation and realizes that we don't HAVE to stay in the situation—there are other jobs and other places to work. It may not seem a good idea to quit a job, but it is an element of control. For some folks, just knowing that they have the power to leave a tough job or situation is enough to revive or strengthen them to get through the situation.

Fourth, the prayer acknowledges the to recognize what is worthwhile to try and combat. There will be times that we can't do a single thing to reduce stress. This happens. It is during these times that we have to recognize our human limits and seek out resources that are beyond our typical range of assets or resort to "licking our wounds" to help us feel better. However, sometimes we actually do things that we think are going to help us feel better, but in the end it only heaps on the very thing we don't need—more stress. Choosing to drink as a way to "escape" the pain or negative parts of stress is much more likely to add stressors (expense, making poor decisions when under the influence, increase risk of self-injury or injuring someone else, etc.) than to help a person.

Stress impacts everyone, nearly all the time, but what is too much? The answer is both individual and collective. For the individual answer, we have to get a better idea of how strong and varied the coping assets are for individuals. To complete the answer, we have to figure out whether the person is experiencing average stress, below average stress, or above average stress and relate it to a collective orientation. What follows is a questionnaire of several dozen stressful situations. Nobody experiences them all. Additionally, the sample stress items are not exhaustive so there are places to add ones that may be unique to you after each grouping of items. Complete the questionnaire and at the end you can figure out how your score compares to others who have taken this.

See Psychosocial Stress Check List at end of the chapter

Hopefully you were not stressed by completing the questionnaire! Some actually reveal that they thought they were stressed until they filled out the questionnaire. Then they realized how many stressful situations others might face, and their stressors didn't seem so bad. Whatever your immediate reaction, the following is how to place your stress level into perspective with others.

1. Add up all the 1's, 2's, and 3's for ALL items. (1+2+2+3+2+1+1+1+1+2+2+2+1…= ___)
2. The total number is your total stress impact score
3. If the number is

   below 50 = Your stress level is BELOW AVERAGE.
   50–85 = Your stress level is AVERAGE.
   85–120 = Your stress level is ABOVE AVERAGE.

above 120 = Your stress level is HIGH.

What do I do if I scored in the "HIGH" range? Am I crazy? Well, first of all, it probably isn't too much of a surprise. Now you have confirmation that things are different for you than most other folks. Second, note that we didn't consider any stress "assets" or coping strategies you have. If you feel that things are relatively under control, plus things are at least starting to turn around and getting less stressful—good! Stay strong and take care of yourself as you continue to make good life decisions on how to cope with life stressors. However, if you score in this "HIGH" range and you feel that things are not going so well, and might benefit from some extra help, it is close by and available. If you are a student, the school has a counselor that you can talk to and can start working with you to tackle stress. If you are not a student (or a student and want to go off-campus), almost all counselors and psychologists are trained to help people manage high stress. Yellow pages and recommendations from a medical doctor are good places to start for a name and number to call right away. The sooner you start taking steps to reduce or more effectively handle your stress, the better outlook you'll have in your daily life.

Regardless of which level your score, there are some things you can do to help your body out: get exercise, eat balanced meals, be sure to get adequate sleep, and stay connected with friends and family. All of these things help maintain a balance and connection to good biology, psychology, and social functioning.

SUMMARY

There is no single factor that directly causes addiction. This textbook examines the biological, psychological, and sociological factors that contribute to substance use and addiction. Substance use is the administration of any chemical compound in order to achieve an effect. Substance abuse is the self-administration of a drug in a way that differs from medical or societal patterns. Substance misuse is a more specific form of substance abuse that involves using a chemical in a way that is not congruent with its intended medical purpose.

Substance abuse problems are not new for society. Humanity has recreationally used and abused substances for millennia. Recent technological advances, however, have made abusing substances easier than ever before. Relevant scientific and technological advances include the hypodermic needle, agricultural advancements, the distillation process, a significantly greater understanding of chemistry, advances in transportation capabilities, and other advances in manufacturing processes that have lead to an increased production of drugs.

While the term addiction is often used in everyday language, it is actually a specific term that refers to the compulsive use of a drug despite adverse consequences. Tolerance, withdrawal, and dependence are important parts of addiction, but someone is not addicted to a substance unless their continued use of the drug is damaging their work, relationships, and recreational activities.

Drugs have been historically classified as stimulants, depressants, or hallucinogens. However, these broad categories often do not accurately portray all of a drug's effects. A drug may act as a stimulant for some behaviors and a depressant for others. Therefore, it is important to understand that the terms stimulant and depressant are most useful when applied to a specific behavior of interest. Additionally, drugs produce rebound and withdrawal effects that are the exact opposite of the effects produced immediately after administration. Finally, whether or not a drug suppresses or enhances a behavior depends on that behavior's baseline level of occurrence. Behaviors that occur rarely are unlikely to depressed further by a depressant. Likewise, behaviors that are already occurring at their maximum intensity or frequency are unlikely to be enhanced further by a depressant. Drugs may have seemingly paradoxical effects in these situations as a depressant might actually increase the occurrence of a behavior that occurs rarely.

The Drug Enforcement Agency (DEA) uses a different classification system for drugs. It organizes drugs into five categories, called Schedules, based on their proven medical benefit, potential for abuse, and addictive nature. Drugs classified as Schedule I controlled substances have a high

potential for abuse and no currently accepted medical treatment in the U.S. Drugs classified as Schedule II have an accepted medical use but still have high potential for abuse. Drugs under Schedules III, IV, and V still have an accepted medical use but progressively less risk for abuse. The DEA's scheduling of drugs partly determines penalties related to criminal offenses.

Key Words

Synthetic marijuana	Mephedrone	Baseline Level of Behavior
Addiction	Drug Abuse	Drug Dependence
Physical Dependence	Withdrawing	Abstinence Syndrome
Drug Misuse	Dependency Disorder	Tolerance
Therapeutic window	Lost potential	

Case Studies

Heather	Mary, Christopher, and Brandon	Kelsey
Zach and Mark	Steve	Sarah and Richard

Assessment

1. While substance abuse occurs across the entire lifespan, which developmental period seems to be a critical period for the initiation of substance use?
   A. Prenatal
   B. Adolescent
   C. Middle aged
   D. Elderly

2. Which of the following separates addiction from dependence?
   A. An inability to function normally without the drug
   B. Withdrawal from a substance
   C. Compulsive use despite adverse consequences
   D. Frequent blackouts

3. Which of the following factors has impacted substance abuse problems in the USA?
   A. Improvements in transportation
   B. Increased potency of abused substances
   C. Improvements in self-administration methods
   D. All of the above

4. All abused drugs _____:
   A. Increase energy
   B. Reduce anxiety
   C. Alter consciousness
   D. Focus attention

5. The body adapts to prolonged and repeated drug exposure through a mechanism referred to as _____, which is often noted during periods of drug absence referred to as _____.
   A. Tolerance; withdrawal
   B. Withdrawal; tolerance
   C. Misuse; addiction
   D. Addiction; tolerance

Ethical and Reflective Question

THE IMPACT OF DRUG ABUSE ON SOCIETY

Drug abuse is our nation's most expensive and debilitating public health problem. While the cost to our country is immeasurable, financial estimates looking at only tangible factors, like health care, crime, and lost wages, is estimated to be over half a trillion dollars per year. If everyone in the United States stopped using addictive drugs, we could pay for everyone's health care, schooling, and other important social programs.

Describe and discuss the adverse consequences of substance abuse from a biopsychosocial perspective. What are the consequences of drug use, misuse, and abuse on individuals, families, and societies?

Considering the scope of the problem, is this something that can be "solved" or will drug abuse always be our nation's biggest public health problem? What steps would you take to help reduce drug abuse problems?

EVALUATION CRITERIA:

The students should have been able to do the following:

- Demonstrate the significant damage that abused drugs cause to individuals, families, and society
- Identify several biological, psychological, and sociological benefits from reducing drug use and abuse
- Explore problems and controversies associated with developing more effective substance abuse prevention and treatment programs

Discussion Questions

Discussion Question 1:

People consume caffeinated beverages daily and develop a physical dependency; however, caffeine does not result in addiction. Using caffeine and alcohol as examples, explain the difference between dependence and addiction.

In general terms, describe several non-drug related things on which you are "dependent"—such as food, water, or shelter. Using the same broad definition, explain how drugs fit this general definition of dependency.

Although drug dependence and addiction are different, they are referred to as *biopsychosocial* problems. Provide examples of biological, psychological, and sociological consequences of dependence and addiction.

EVALUATION CRITERIA:

The students should have been able to do the following:

- Demonstrate an understanding of dependency
- Differentiate between dependence and addiction by comparing caffeine and alcohol
- Recognize how abused chemicals can interfere with biological, psychological, and sociological processes

Discussion Question 2:

Although the variety and quality of abused drugs has increased during the last several decades, the commonly held attitudes and stereotypes that concern who we think of as "addicts or junkies," perhaps, haven't changed. Which stereotypes come to your mind when you consider the labels "addict" or "junkie?"

Discuss to what extent you feel stereotypes may interfere with identifying and treating substance abuse problems.

EVALUATION CRITERIA:

The students should have been able to do the following:

- Identify the commonly held attitudes and stereotypes about drug addiction and how such beliefs could impact diagnosing and treating substance abuse problems
- Discover that drug abuse problems occur across people of all age groups, nationalities, socioeconomic status, and locations
- Understand that stereotypes may bias legal decisions, diagnostic severity, or even treatment programs

Discussion Question 3:

Marcus Jameson, a 19-year-old male, is in his second year of college. He reports this was a challenging year for him. He feels anxious about academics and consumes a couple of drinks in the evening to reduce stress and anxiety.

He attends most of his classes but admits that he recently missed several. Although he reports a three-year history of drinking, he insists that he does not have a drinking problem.

Being aware that alcohol is the second-most used addictive drug in the U.S. and is one of the costliest chemical dependency problems, how will you describe Marcus Jameson's current alcohol use? Is it use, misuse, abuse, dependence, or addiction? What are some biological, psychological, and sociological consequences of alcohol use?

EVALUATION CRITERIA:

The students should have been able to do the following:

- Discuss the psychological state of the person in the case study and identified how such a state could impact the continued use and potential abuse of alcohol
- Distinguish between misuse, abuse, dependence, and abuse
- Identify biological, psychological, and sociological consequences of alcohol use and abuse

Application Question

Factors that contribute to addiction and dependencies have changed dramatically during the last several decades. In addition to a variety of sociocultural factors such as divorce, mobility, and cultural diversity, new drugs that were not available even a generation ago are available today. The culmination of these and other factors made drug abuse problems increasingly complex.

Communicating drug-related information to a broad range of people is difficult. Explain the factors that may contribute to communication difficulties, taking into account age-related factors, cultural differences, and educational disparity.

PSCL

Psycho/Social Checklist

L. Alan Eby, Psy.D.

Directions:
This is a checklist, or questionnaire, that asks you to report how different life situations have impacted you. For the items that DO NOT apply to you (have not happened to you in the past year) indicate by marking the "0." For items that HAVE occurred in the past year, respond by marking the appropriate level of impact it had on you:

1 = It happened, but did not bother me at all, OR maybe it had a bit of an effect.
2 = It happened, and it bothered me some causing me to pay attention to it more than before and possibly changed my life in a MINOR way.
3 = It happened, and it REALLY bothered me causing me to change some things in my life in a MAJOR WAY.

Please circle, X, or check your answer to each item.

PSYCHOSOCIAL CHECKLIST
For each of the items that apply to you, indicate how much they have bothered or affected you—positively or negatively. Consider situations that occurred in the past year or so.

Does not apply	Little or No Effect	Moderate	Severe or Extreme	0 = did not happen to me in the past year 1 = it happened, but did not affect me at all OR maybe it had a bit of an affect—no biggie… 2 = it happened and it affected me some—possibly changed my life in a MINOR way 3 = it happened and it REALLY bothered me—caused me to change in a MAJOR way
				PRIMARY SUPPORT GROUP
0	1	2	3	1. Death of spouse
0	1	2	3	2. Death of a family member
0	1	2	3	3. Health problems in family
0	1	2	3	4. Separation or estrangement of a family member
0	1	2	3	5. Divorce (personal—parents)
0	1	2	3	6. Marriage or remarriage (self—parents)
0	1	2	3	7. Marital reconciliation
0	1	2	3	8. Change in family get-togethers (more or less than usual)
0	1	2	3	9. History of sexual/physical abuse or neglect
0	1	2	3	10. Parental overprotection or meddling
0	1	2	3	11. Children having too much freedom (not enough discipline)
0	1	2	3	12. Arguments/fights with siblings
0	1	2	3	13. Pregnancy (self/wife/close friend/family)
0	1	2	3	14. New family member (birth, adoption, older adult moving in)
0	1	2	3	15. Need for child care
0	1	2	3	16. Trouble with in-laws
0	1	2	3	17. Lack of emotional give and take in relationships
0	1	2	3	18. Increased or decreased arguments with spouse/significant other/friend
0	1	2	3	19. Need for parenting skills
0	1	2	3	20. Need to care for parents
0	1	2	3	21. Leaving home (self or son/daughter leaving for marriage, school, etc.)
0	1	2	3	22. Spouse beginning or ending work outside the home
0	1	2	3	23. Other
				SOCIAL ENVIRONMENT
0	1	2	3	24. Death or loss of friend
0	1	2	3	25. Beginning or ending a romantic relationship
0	1	2	3	26. Living alone
0	1	2	3	27. Experiencing harassment
0	1	2	3	28. Learning to know a new area
0	1	2	3	29. Learning to know a new group of people
0	1	2	3	30. Experiencing discrimination and/or prejudice
0	1	2	3	31. Adjustment to new phase of life (parenting, driving, adulthood, married life, empty nest)
0	1	2	3	32. Community involvement (volunteer, board member, public service, etc.)
0	1	2	3	33. Change in community-political activism (a cause, rally, or organization)
0	1	2	3	34. Change in social activities (clubs, dancing, movies, visiting, etc.)
0	1	2	3	35. Change in church activities (more or less)
0	1	2	3	36. Too much free time
0	1	2	3	37. Need for personal/spare time
0	1	2	3	38. Frequent conflicts with others (other than work or family)
0	1	2	3	39. Need or concern for pets
0	1	2	3	40. Feeling influenced by peer group
0	1	2	3	41. Spending too much time watching TV, playing video games, or on computer
0	1	2	3	42. Trouble fitting in with a group of peers (at church)
0	1	2	3	43. Other _____

Does not apply	Little or No Effect	Moderate	Severe or Extreme	0 = did not happen to me in the past year 1 = it happened, but did not affect me at all OR maybe it had a bit of an affect—no biggie… 2 = it happened and it affected me some—possibly changed my life in a MINOR way 3 = it happened and it REALLY bothered me—caused me to change in a MAJOR way
				EDUCATIONAL
0	1	2	3	44. Trouble with reading
0	1	2	3	45. Trouble with math
0	1	2	3	46. Experiencing a specific learning difficulty/disability
0	1	2	3	47. Academic problems (fall course, low grades, etc.)
0	1	2	3	48. Trouble getting along with teachers
0	1	2	3	49. Difficult school environment
0	1	2	3	50. Need for more education
0	1	2	3	51. Adjusting to a new school
0	1	2	3	52. Beginning or ending schooling
0	1	2	3	53. Trouble fitting in with a group of peers at school
0	1	2	3	54. Not enough financial aid for school
0	1	2	3	55. Other _____
				OCCUPATIONAL
0	1	2	3	56. Fired
0	1	2	3	57. Laid off
0	1	2	3	58. Suspended
0	1	2	3	59. Reprimand/on report/probation (work related)
0	1	2	3	60. Stressful work schedule (shift work, midnight shift, alternate shift of spouse/other)
0	1	2	3	61. Difficult/dangerous work conditions
0	1	2	3	62. Job dissatisfaction
0	1	2	3	63. Job change
0	1	2	3	64. Discord with boss or co-workers
0	1	2	3	65. Changing to a different line of work
0	1	2	3	66. Major business readjustment (merger, reorganization, bankruptcy, etc.)
0	1	2	3	67. Retirement from work
0	1	2	3	68. Change in responsibilities at work (promotion, demotion, lateral transfer)
0	1	2	3	69. Trouble fitting in with a group of peers at work
0	1	2	3	70. Other _____
				HOUSING
0	1	2	3	71. Homelessness (due to finances, fire, natural disaster, etc.)
0	1	2	3	72. Unsuitable housing
0	1	2	3	73. Unsafe neighborhood
0	1	2	3	74. Trouble getting along with neighbors
0	1	2	3	75. Eviction or trouble with landlord
0	1	2	3	76. Moving/change in residence
0	1	2	3	77. Change in living conditions (remodeling or deteriorating)
0	1	2	3	78. Other _____