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Social Violations of Expectations and Peer Influence in Adolescents

A dissertation submitted in partial satisfaction of the requirements of the degree Doctor of Philosophy in Psychology

by

Kaitlyn Suzanne Breiner

2016
ABSTRACT OF THE DISSERTATION

Social Violations of Expectations and Peer Influence in Adolescents

by

Kaitlyn Suzanne Breiner

Doctor of Philosophy in Psychology

University of California, Los Angeles, 2016

Professor Adriana Galván, Chair

A violation of expectations produces a prediction error, a learning signal by which organisms update current understanding and knowledge of expectations. The primary neural locus implicated in violations of expectations is the ventral striatum (VS), which undergoes significant development during adolescence, a period marked by sensitivity and responsivity to social feedback and reward. The VS demonstrates increased activation for reward and reward prediction errors in this age group compared to other age groups. Importantly, the VS is also recruited when adolescents take risks and are in the presence of their peers. While a few studies have examined social violations of expectations in adults, to our knowledge, none have examined social violations of expectations in adolescents. The goal of this dissertation was to implement novel, ecologically valid designs to determine whether neural responses to realistic social feedback from a friend was associated with a common risky behavior, substance use, in adolescents. We found that adolescents recruited the VS for positive social violations of
expectations compared to negative violations of expectations, and were happiest when their social expectations were met (compared to positive or negative violations). We found that adolescents who recruited the VS more for violations of expectations reported greater substance use, while adolescents who recruited the VS less for violations of expectations reported lesser substance use, increased susceptibility to peer influence, and were more susceptible to peer influence in an experimental manipulation. Taken together, this body of work suggests adolescents who are more attuned to social cues from peers (and are likely to modify their behaviors in response) require smaller expectancy violations to experience reward; while those who engage in increased social risk taking require greater expectancy violations by comparison to experience reward. Implications of this work are discussed with regard to determining which adolescents are most likely to take greater social (substance use) risks, based on their VS response to social violations of expectations.
The dissertation of Kaitlyn Suzanne Breiner is approved.

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2016
This dissertation is dedicated with love to my grandfather, Bob Dallow who inspired me to pursue a Ph.D.; and to my husband, Tyler Breiner, who has supported me wholeheartedly throughout this process.
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Chapter 1

Introduction
The ability to predict daily occurrences is beneficial and adaptive (Rescorla & Wagner, 1972; Sutton & Barto, 1981). For example, when deciding whom to ask to prom, a teenager might consider his current relationship status and prior interactions with a girl so he can expect with greater certainty that she will accept his offer. A violation of expectations is an unprecedented experience, and one that changes future behaviors and the expectations of future occurrences. If the girl unexpectedly rejects the teenager, he may be more hesitant to approach her again in the future. The experience of this violation of expectations might change his future behavior to include considering whether another potential prom date already has a date prior to asking her.

*Prediction Error*

A violation of expectations leads to a prediction error—a learning signal that is the calculated difference of an event’s outcome minus its expectation. Prediction errors have been examined extensively in behavioral reinforcement studies. This is evinced in a classic example: once a repeated presentation of a stimulus is conditioned to elicit a response (pecking) for the receipt of a reward, a pigeon learns to peck each time the stimulus is presented to continue to receive the reward. This behavior continues even after the reward is no longer presented, producing a prediction error in the pigeon, whereby the presentation of the stimulus yields pecking, but no receipt of reward (Brown & Jenkins, 1968; Morse & Skinner, 1957). Subsequently, the pigeon demonstrates a changed timing and increased effort of its pecking, suggesting it has learned that by pecking it will receive a reward.

To characterize neural responses to prediction error, researchers have examined changes in the signaling of dopamine (DA), a neuromodulator critical in reward receipt and reinforcement learning (Frank & Claus, 2006). Research by Schultz and colleagues assessing variability in
prediction error revealed that when monkeys expected juice (a primary reward) but did not receive it on schedule, there was decreased DA signaling, suggesting a negative prediction error. When monkeys were not expecting juice and received it, there was increased DA signaling, suggesting a positive prediction error. When the monkeys expected juice and received it, there was little change in the DA neurons, suggesting expectations were met (Wolfram Schultz, Dayan, & Montague, 1997). This seminal body of work suggests variability in reward modulation in dopaminergic regions is dependent on the valence of prediction error. Similar research assessing whether DA neurons encode prediction error found increases in midbrain DA firing when monkeys accurately predicted receipt of a reward compared to inaccurate predictions (Bayer & Glimcher, 2005). By using an interval-based reward saccade task, Bayer and Glimcher concluded that reward prediction errors could be tracked by measuring the increased firing rate of DA neurons—an occurrence that is indicative of reinforcement learning. The neural basis of prediction error with primary reward in humans (Pagnoni, Zink, Montague, & Berns, 2002) supports research in non-human primates, such that humans also demonstrate increased activation in dopaminergic brain regions in response to positive prediction errors, and decreased activation (by comparison) in response to negative prediction errors.

The valence of a violation of expectations (whether the outcome of a prediction error is positive or negative) has been examined neurobiologically in humans. When the violation is positive, researchers find greater activation of the ventral striatum (VS) (a mesolimbic brain region rich in dopamine receptors), while a negative violation of expectations is associated with activation in the amygdala (Yacubian et al., 2006) (a region associated with emotion and threat monitoring), and the insula (a region associated with pain (Bornhövd et al., 2002)). Classic studies assessing the magnitude of prediction error in animals have demonstrated that when a
violation of an expectation is large (unexpected), there is greater dopaminergic activation compared to when it is small (expected) (Cromwell & Schultz, 2003; Fiorillo, Tobler, & Schultz, 2003). Research in humans has also demonstrated differential activation in error detection (Bellebaum, Polezzi, & Daum, 2010) and reward circuitry (Abler, Walter, Erk, Kammerer, & Spitzer, 2006) by violation magnitude. The distinct responses in dopaminergic activation to violations of expectations demonstrate how sensitive humans and non-human animals are to this learning signal. It is perhaps unsurprising then, that prediction error is implicated in reward and learning-motivated behaviors, such as substance use and addiction.

Substance Use

Research on reward prediction errors has indicated that while receipt of primary rewards (i.e. food, sex, money) elicit a dopaminergic response, the chemical compounds associated in drugs of abuse and the drug receptors they act on can produce an even greater response by comparison (Kelley & Berridge, 2002). Addiction research has indicated that dopaminergic activation in response to receiving rewards (e.g. drugs of abuse) produces prediction errors that override decision-making systems (Redish, 2004). In this case, using an addictive substance produces a surge in dopamine and a large reward prediction error, leaving the user with an increased desire to reuse the substance to obtain the same rewarding sensation (Hyman, 2005).

Further examination of reward prediction errors in response to using a drug of abuse suggests that understanding how reward is processed can aid in identifying who may be more at risk for addiction. A review by Hyman and colleagues suggests that individuals who have more associations to the cue of the reward are at a greater risk for reusing and relapsing (Hyman, Malenka, & Nestler, 2006), as the associations cross multiple fields of dopaminergic innervations. Across multiple studies, researchers find that individuals who demonstrate
increased ventral striatum response in association with receiving a reward are more likely to engage in risky behaviors. This includes individuals who are sensitive to reward prediction errors (Pessiglione, Seymour, Flandin, Dolan, & Frith, 2006), those who have a preference for immediate rather than delayed rewards (Hariri et al., 2006), who are impulsive (Bechara, 2005), and adolescents (Galvan, Hare, Voss, Glover, & Casey, 2007). Adolescence can be considered an intersection in development where opportunities to engage in risky behavior, such as substance use, is met with a heightened sensitivity to reward, suggesting this population may be particularly vulnerable to addiction (Crews, He, & Hodge, 2007). Because opportunities to engage in substance use often occur in social settings and are promoted by social cues (Rademacher, Schulte-Rüther, Hanewald, & Lammertz, 2015), a full understanding reward prediction error should arguably consider the context in which it occurs in addition to the dopaminergic response.

*Violations of Expectations*

While prediction error is traditionally viewed as a learning signal, calculated by determining the difference between an expectation and its associated outcome, the present studies aim to assess violations of expectations, as they are more inclusive of the prediction error calculation and the context in which they occur. Violations of expectations are couched in Expectancy Violations Theory, which is inclusive of social rules in communication (Burgoon, 1978) and behavioral interactions between people (Burgoon, 1993). Research on this theory has demonstrated that people have unspoken expectations in relationships, and violating them can alter the relationship (Bachman & Guerrero, 2006). Additionally, different cognitive and affective processes result from experiencing expectancy violations. Upon reading incongruent statements (e.g. “I like my coffee with cream and dog”) compared to congruent statements (e.g.
“I like my coffee with cream and sugar”), adults demonstrate increased event-related potential (ERP—a measurement of electrical brain activation) amplitude. When participants read negatively valenced incongruent semantic statements (i.e. negative statements regarding a character that were inconsistent with the character’s depiction, such as an abusive philanthropist) they showed negative affect compared to when the statements were positive (Bartholow, Fabiani, Gratton, & Bettencourt, 2001), suggesting people are sensitive to incongruences of their expectations. Functional Magnetic Resonance Imaging (fMRI) studies have reported similarities between activation in regions implicated in prediction error and expectancy violations, such that positive expectancy violations result in activation of striatal regions (implicated in reward), whereas negative expectancy violations result in activation of frontal regions (implicated in cognitive control) (Harris & Fiske, 2010).

The aforementioned studies on the effects of expectancy violations focus on semantic incongruences; but importantly, additional neural activation is implicated in social incongruences. Researchers have found that upon realization of a social expectancy violation, participants show increased activation in regions associated with recognition of expectation inconsistency, including the posterior medial frontal cortex (pMFC) (Izuma, 2013). Social neuroscience research has explored responses to violations of expectations from relationship partners (Poore et al., 2012), whereby participants learned how favorably or unfavorably their significant other felt about them. This study demonstrated activation in regions associated with socioemotional decision-making, motivation, and reward, including the ventral medial prefrontal cortex, ventral tegmental area, and the ventral striatum. People also tend to recruit cognitive control regions, such as the dorsolateral prefrontal cortex (dIPFC) when they learn their beliefs are inconsistent with a group’s beliefs (Spitzer, Fischbacher, Herrnberger, Grön, & Fehr, 2007).
In a study by Klucharev and colleagues, participants rated images of women. When they were prompted with their rating followed by a group’s collective rating, participants changed their responses to match the group (Klucharev, Hytonen, Rijpkema, Smidts, & Fernandez, 2009).

Recognizing these differences in expectations leads to social conformity, whereby a person realizes their expectation deviates from an outcome, and makes an effort to change their opinion to match the group’s opinion (Izuma, 2013). When people recognize a discrepancy between their beliefs and someone else’s, error detection and eagerness to reduce error is present in brain activation (Carter et al., 1998). People are typically inclined to modify their opinions and behaviors to conform to a group’s beliefs when they realize their beliefs differ from the group’s (Asch, 1955; Costanzo & Shaw, 1966). Researchers examining individual differences in responses to positive violations of expectations have found that individuals with traits that are characteristic of adolescents, such as sensation seeking, novelty seeking (Abler et al., 2006), and impulsivity (Boksem, Tops, Wester, Meijman, & Lorist, 2006) demonstrate an increased neural response to an unexpected outcome. Exploring the effects of social violations of expectations in an adolescent population is important because teenagers are particularly sensitive to social feedback (Guyer, Choate, Pine, & Nelson, 2012; Jones et al., 2014) and are more reactive in socioemotional contexts (Hare et al., 2008; Steinberg, 2008) compared to other age groups. Notably, adolescents are also susceptible to peer influence (Steinberg & Monahan, 2007), suggesting these phenomena should be explored in concert.

*Peer Influence in Adolescence*

Adolescents demonstrate a diminished ability to distinguish between different levels of positive social feedback—finding all positive social feedback rewarding (Jones et al., 2014), and are especially afflicted when they have been ostracized by their peers (Sebastian, Viding,
Williams, & Blakemore, 2010), demonstrating a heightened sensitivity to both positive and negative social feedback. In the laboratory, researchers have found adolescents take more risks when they are in the presence of their peers compared to when they are alone (Gardner & Steinberg, 2005), and demonstrate increased neural activation in reward sensitive brain regions (including the ventral striatum) compared to adults when making risky decisions in the presence of their peers (Chein, Albert, O’Brien, Uckert, & Steinberg, 2011). Reports indicate that adolescents partake in many real-world risky activities such as speeding while driving, binge drinking, and using and abusing illicit drugs (J. Arnett, 1992). Additionally, they demonstrate delinquent behaviors (Knecht, Snijders, Baerveldt, Steglich, & Raub, 2010) perhaps in an effort to achieve the sensation of reward—though the outcome of these activities can have dangerous and sometimes fatal consequences.

Adolescents are more reactive in affective contexts than adults, demonstrating increased mesolimbic neural activation and impaired decision-making in the “heat of the moment” (Blakemore & Robbins, 2012). A potential reason for this may be due to an imbalance that exists between the cognitive control and emotional arousal systems during adolescence (Casey, Jones, & Hare, 2008). While reward circuitry is recruited for emotional and rewarding experiences, the prefrontal cortex, which is associated with cognitive control and is known to aid in emotion regulation, does not fully mature until adulthood and is less functionally mature in adolescence by comparison (Casey et al., 2008; Sowell, Trauner, Gamst, & Jernigan, 2002). Many fMRI studies illustrate decreased engagement (measured as blood oxygenated level-dependent (BOLD) signal) of these areas in adolescents compared to adults when performing the same tasks requiring cognitive control (Bunge & Wright, 2007; Geier, Terwilliger, Teslovich, Velanova, & Luna, 2010); while others suggest enhanced activation relative to adults (Casey et al., 1997).
Protracted development of the prefrontal structures and increased engagement of subcortical structures have been implicated in reward and sensation-seeking behaviors (Casey et al., 2008; Crone & Dahl, 2012; Galvan et al., 2006) during adolescence. Because adolescents spend more time with peers than other age groups (Larson & Verma, 1999), understanding their behavior following an emotional event is critical in determining how adolescents behave and respond neurobiologically when their peers violate their expectations.

While adolescence marks a time of sensitivity to peer feedback, it is plausible that some individuals are more sensitive than others, and are thus more susceptible to peer influence than others—making a more concerted effort to be well received and accepted by their peers. Several vulnerability factors have been implicated in characterizing individuals who are more susceptible to peer influence, including those who have low self-esteem (O’Dea & Caputi, 2001) are sensitive to rejection (Sebastian et al., 2010), and/or are victims of bullying (Juvonen & Galvan, 2009). Notably, not all peer influence is explicit—in fact, adolescents report choosing to partake in risky behaviors in an effort to be more well-liked or accepted by their friends and higher status peers, more than they report feeling coerced (Bot, Engels, Knibbe, & Meeus, 2001). This suggests adolescents are primarily motivated to mirror their peers’ behaviors to achieve the sensation of reward (via peer acceptance). Additionally, research has shown that compared to individuals who are more susceptible to peer influence, individuals who report increased resistance to peer influence demonstrate greater recruitment of cognitive control regions in emotional contexts (Grosbras et al., 2007). This suggests that perhaps individuals who are more likely to succumb to peer influence demonstrate a lesser engagement of cognitive control regions to regulate their emotions, and are particularly sensitive to social feedback. These individual differences associated with peer influence are essential to consider because individuals who are
more sensitive to social feedback may also demonstrate greater emotional and behavioral reactivity when that feedback is unexpected.

**Significance**

The goal of this dissertation was to implement novel, ecologically valid experimental designs to determine whether neural responses to social feedback were associated with real world behaviors in adolescents. Implementing an ecologically valid task is meaningful, as previous research has demonstrated individuals are sensitive to feedback in computer-like games from unknown peers—suggesting that actual evaluative feedback from a close friend may elicit a more robust or different neural response, and may also be more closely aligned with an individual’s real-world behaviors. As previously mentioned, violations of expectations occur in both humans and non-human primates, suggesting that across species, it is a critical signal for learning. Importantly, while many studies have examined this phenomenon in adults, few have examined violations of expectations in adolescents (but see Cohen et al., 2010; Somerville, Heatherton, & Kelley, 2006 who examined it in non-social tasks). Because adolescence is marked by an increase in sensitivity and responsivity to social feedback and reward, examining social violations of expectations in this age group may elucidate whether there are differential neural and behavioral responses that are specific to social (compared to non-social) feedback. Additionally, by examining behaviors that are known to be associated with reward in adolescence, we can determine whether neural responses to social feedback may be associated with behaviors that occur in social settings (e.g. using substances and succumbing to peer influence). The following chapters present new task designs and evidence to use for future research to predict which adolescents will be most likely to use substances and become susceptible to peer influence.
Summary of Studies

Study 1

The goal of the first study was to examine the neural mechanisms in adolescents associated with learning social information from a friend by using a novel social violations of expectations task. We hypothesized that adolescents would report feeling happier and demonstrate activation in dopaminergic rich brain regions, such as the ventral striatum (VS) when their expectations were positively violated compared to negatively violated, where they would report feeling less happy by comparison and demonstrate increased activation in regions associated with pain and rejection, such as the insula (Preuschoff, Quartz, & Bossaerts, 2008) and subgenual anterior cingulate cortex (subACC) (Masten et al., 2009), respectively. We found greater VS activation for positive social violations and greater insula and subACC activation for negative social violations. Participants reported feeling happiest when expectations were met compared to when expectations were positively or negatively violated. This study suggests that while learning unexpected positive information compared to negative information may be preferred, learning unexpected social information during adolescence could be disruptive to the cognitive harmony that a teenager has regarding his/her friendship, which may have implications for adolescent behavior in affective contexts.

Study 2

The second study sought to understand whether neural responses to social violations of expectations evinced in Study 1 were associated with self-reported substance use. We hypothesized that adolescents who demonstrated an increase in ventral striatal (VS) response when expectations were positively violated would have a greater affinity for reward and use more substances than adolescents who demonstrated a decreased ventral striatal response when
experiencing a positive violation of expectations. We found adolescents reported using socially acceptable substances (alcohol, tobacco, cannabis) more than less socially acceptable substances; and those who demonstrated increased VS response for violations of expectations used more socially acceptable substances than adolescents who demonstrated decreased VS response by comparison. We conclude that adolescents who feel rewarded when they receive new social information from a friend are socially more likely to act in ways to reinforce a rewarding sensation when they are with their friends, including engaging in socially acceptable substance use.

**Study 3**

In the third study, we assessed whether ventral striatal (VS) response to violations of expectations in Study 1 and self-reported substance use in Study 2 was associated with self-reported and experimentally manipulated susceptibility to peer influence. We hypothesized that self-reported susceptibility to peer influence would be associated with experimentally manipulated peer influence. We also hypothesized that adolescents would be more susceptible to peer influence if they demonstrated an increase VS response to violations of expectations and reported using substances. We found that participants who reported a greater susceptibility to peer influence reported a greater likelihood to use socially acceptable substances following the peer influence manipulation. We also found participants who demonstrated increased VS activation for violations of expectations reported sharing their opinions with their peers. This study concludes that adolescents who are more susceptible to peer influence are more considerate of their peers’ perspectives and have a greater motivation to modify their social behaviors to be accepted.
Chapter 2

Neural Correlates of Social Violations of Expectations in Adolescents
Adolescence is a pivotal time to learn social information from peers, who provide insight about the dynamic social landscape. Adolescents show an increased desire for positive peer feedback compared to other age groups (Jones et al., 2014), and are more likely than adults to change their behavior in the presence of their peers (Chein et al., 2011). Neuroimaging research suggests that the observed hypersensitive response in mesolimbic circuitry to emotional and rewarding stimuli, coupled with the protracted development of cognitive control circuitry in the brain may explain enhanced sensitivity to social information evinced during adolescence (B J Casey et al., 2008).

Extensive research on prediction error (PE) (defined as the computation of the difference between the expectation of an event and its actual outcome), has demonstrated that accurate predictions in daily life are beneficial and adaptive (Krigolson, Hassall, & Handy, 2014; Rescorla & Wagner, 1972; Sutton & Barto, 1981). Organisms (including people) can only learn about the environment (and adjust our behavior accordingly) by evaluating whether our expectations of what we think is true or what we think will happen are violated or not. Functional Magnetic Resonance Imaging (fMRI) research has identified the striatum (a reward sensitive brain region) as a key hub in PE learning (Pagnoni et al., 2002), along with the insula (Preuschoff et al., 2008) and anterior cingulate cortex (ACC) (Ide, Shenoy, Yu, & Li, 2013). These regions also exhibit significant neurodevelopment during adolescence (Sowell et al., 2002). Indeed, the first study to have examined PE in adolescents found that teenagers exhibit a similar, albeit stronger striatal response for positive PE compared to adults (J. R. Cohen et al., 2010), and a more recent study found adolescents learn faster from reward PE than adults (Hauser, Iannaccone, Walitza, Brandeis, & Brem, 2015), suggesting that key PE learning systems are similar though perhaps more sensitive during adolescence. In the current study, we
adopted a violations of expectations (VoE) framework, which is reflective of both the PE calculation as well as the social context (i.e. non-verbal and verbally communicated expectancies between people (see Burgoon, 1993)) in which it occurs. Within this framework, we sought to determine whether adolescents show exaggerated behavioral responses to VoEs, and to extend this question to examine whether they demonstrate unique neural responses when they receive expected and unexpected social feedback from a friend.

In adults, social learning tasks with relationship partners (Poore et al., 2012) and conspecifics (Klucharev, Hytönen, Rijpkema, Smidts, & Fernández, 2009) implicate a similar neural network as that involved in PE, suggesting that PE computations are conserved across domains. Adolescents spend much of their time with friends (Fuligni & Eccles, 1993) but it is unknown whether specific peer feedback (such as its novelty (whether it is expected/unexpected), valence, and value (the extent to which it is surprising)) from known peers (friends) influences behavior and recruitment of still-maturing neural regions. Although several studies have examined adolescent neural reactivity to unexpected peer feedback (Guyer et al., 2012; Jones et al., 2014; Masten et al., 2009) and peer evaluation (Gunther Moor, van Leijenhorst, Rombouts, Crone, & Van der Molen, 2010; Guyer, McClure-Tone, Shiffrin, Pine, & Nelson, 2009; Somerville, Heatherton, & Kelley, 2006), few have done so within the context of a close friend (but see (Chein et al., 2011; Fareri & Delgado, 2014)), whose opinion may yield more realistic behavioral and neural responses.

The goal of this study was to identify the neural mechanisms associated with learning social information from a friend using a novel social PE task in adolescents. Exploring this phenomenon in adolescents is important compared to other developmental age groups because adolescents often rely on their friends’ opinions to form perceptions of themselves (Berndt,
1992), and learn many social skills necessary for development during this time from their friends. Because building up social expectations is challenging in a laboratory setting, we leveraged real-life social expectations between friends and manipulated them in the laboratory. We hypothesized that adolescents would: 1) demonstrate decreased reaction time when expectations were met compared to when they were violated (Dolcos & McCarthy, 2006); 2) report feeling happier learning their friend reported something better than they expected compared to something worse than what they expected (Cooper, Dunne, Furey, & O’Doherty, 2014); 3) activate brain regions previously associated with PE, such as the ventral striatum (VS) (J. R. Cohen et al., 2010; Jones et al., 2014) when they learned something better than expected from their friend; and 4) activate regions associated with socioemotional processing, such as the subgenual anterior cingulate cortex (subACC) (Masten et al., 2009) when they learned something worse than expected from their friend.

Method

Participants

Twenty-six right-handed adolescent participants (53.8% female, ages 14-17, M= 15.81, SD= 1.02) and their age- (M= 15.56) and gender-matched friends were recruited from the Los Angeles area to participate in the study. The target participant group was ethnically diverse (34.6% Caucasian, 30.8% Hispanic/Latino, 11.5% African American, 7.7% Asian, 15.4% Other), and did not differ from the friend group by race/ethnicity (c²(4, N = 26) = 7.46, p = .11) or socioeconomic status—measured as average level of parental education obtained in the household (c²(10, N = 26) = 13.23, p = .15).

Procedure
Each target participant brought a same-aged, same-gender close friend to the first of two sessions. At the first session, participants were consented according to ethical standards and guidelines from the University’s Institutional Review Board. During the first session, the target participants and their friends provided demographic information and completed the Friendship Questionnaire. The session took approximately 20 minutes and both participants received $10.00 compensation for participation.

Target participants were invited to the Staglin Center for Cognitive Neuroscience between 7 and 14 days after the initial session to participate in the second session and undergo an fMRI scan. While in the scanner, target participants completed the Social Violations of Expectations task. Upon completion, they exited and answered a post-task survey, which reminded them of the questions, their expectations, and their friend’s responses. They reported how they felt after viewing their friend’s response to each item.

At the end of the second session, the target was debriefed and told that the items presented during the fMRI task were manipulated by the research team. Following debriefing, participants were asked if they had any questions about the study, were paid $45, and thanked for their time.

Materials and Apparatus

Session 1

The target participant and the friend completed the questionnaires in separate rooms. They completed a demographic questionnaire (which included questions pertaining to their age, gender, race, parental education, and friendship duration (in months)), and a Friendship Questionnaire, comprised of 40 items, which were adapted from the McGill Friendship Questionnaire, Friendship Functions (Mendelson & Abound, 2012) and the Friendship Quality
Questionnaire (Parker & Asher, 1993). Thirty-five of the items presented to the participants were social in nature, five were non-social. Social items were evaluative, sample items for the target included: “My friend is nice;” “Our friendship is accepted by my friend’s family.” The remaining items pertained to non-social information and were factual (e.g. “My friend likes horses;” “My friend hates country music”) (Appendix A). The target was asked to predict his/her friend’s responses to the items on the questionnaire, on a scale of 1 (not true at all) to 10 (definitely true). Certain items were reverse scored to ensure that higher numbers indicated a positive valence. For analysis purposes, we indexed the items based on the question category, which included closeness of the relationship, how participants acted around peers, evaluative information, and non-social information; and wording of the question (positive (i.e. “My friend thinks I’m nice”); and negative (i.e. “We are bullied)). Both participants were assured their respective responses on the Friendship Questionnaire would be confidential and that their answers would not be shared with their friend.

Session 2

Task. Participants completed a Social Violations of Expectations task while undergoing a brain scan. In this task, we presented target participants with statements that were purportedly based on the friends’ responses to the Friendship Questionnaire. The responses were presented as if they represented the friend’s true response, but in fact they were manipulated. To create positive violations of expectations, we changed the friend’s responses to be greater than the target’s expectation (e.g. if the target responded with a “6” that her friend would think she is nice, we changed the 6 to a higher value, such as a “10”). To meet the expectations of the participant, we modified the friend’s response to match the target’s prediction (e.g. if the target responded with a “6”, we did not change the value). To create negative violations of
expectations, we modified the friend’s response to be worse than the target’s expectation (e.g. if the target responded with a “6”, we changed the 6 to a lower value, such as a “2”).

Because the dyads were close friends, participants tended to have relatively positive expectations of their friends’ responses, which limited our ability to change valence (positive or negative violations) and VoE value (i.e, adding to or subtracting from the number the target guessed) of the friend’s “responses”. Thus, during the session, each participant was presented with an average of 14.96 positive violations, 7.04 items where expectations were met, and 17.88 negative violations.

The task was programmed in E-Prime 2.0 and was presented through an LCD Optoma projector connected via fiber optic cables. Participants were presented with all 40 statements from the Friendship Questionnaire and were asked to press a button on a 4-button button box with their right index finger to proceed to the next question/trial. The trial began with the presentation of the question, followed by the target’s expectation, a 2000-6000ms jittered inter-stimulus-interval (ISI), their friend’s “response,” a jittered ISI, and a request to press a button to proceed to the next trial followed by a 4000-8000ms jittered inter-trial-interval (ITI). Participants were allotted a maximum of 5000 ms to press the button before a jittered fixation cross appeared on the screen, and the subsequent trial began (Figure 1.1).

Following the scan, participants completed a questionnaire that contained each statement from the Friendship Questionnaire, along with their predictions and their friend’s “responses.” For example, participants were reminded of the statement, “My friend thinks I’m nice” and were shown that they expected their friend to report 6, while their friend “reported” 10. They were asked to report how seeing this made them feel on a scale of 1 (very hurt) to 10 (very happy).

*Design*
The present study was a within-subjects, event related design. Our independent variable was the violation of expectation, operationalized by modifying the friend’s initial response to be better than, equal to, or worse than the target’s expectation. Our dependent variables were 1) behavioral response, 2) self-reported response, and 3) neural activation when targets experienced a violation of expectations. Behavioral response was measured by indexing reaction time (RT) to press a button on a response box to move on to the next trial. Self-reported responses were collected via survey following completion of the task. Neural activation was examined using a priori regions of interest (ROIs).

**Behavioral Analyses**

IBM SPSS Statistics Software, version 23.0 was used to analyze RT and self-report responses to social violations of expectations. The data were analyzed three ways: 1) effects of expected versus unexpected information; 2) effects of valence (whether the violations were negative, positive, or whether expectations were met); and 3) parametric effects (irrespective of social/non-social trial type) of incremental differences between the expectations and the associated outcomes—which was represented by violations that ranged between 9 values less than their expectation (VoE$_{-9}$) and 9 values greater than their expectation (VoE$_{+9}$).

**fMRI Analyses**

Images were collected using a 3-Tesla Siemens Trio MRI machine equipped with 16-channels at the Staglin Center for Cognitive Neuroscience at UCLA. Two structural MRI images were collected at the start of the scan: a T1-weighted magnetization-prepared rapid-acquisition gradient echo image (MPRAGE; 160 sagittal slices; slice thickness, 1 mm; repetition time (TR), 2000 ms; echo time (TE), 2100 ms; matrix, 256 x 256; and field of view, 250 mm) and a T2-weighted matched bandwidth high-resolution scan, which was prescribed to the functional
images. One functional run was collected and consisted of a maximum of 440 and an average of 382 T2*-weighted echo-planar images (EPIs) (34 slices; slice thickness, 4 mm; TR, 2000 ms; TE, 30 ms; flip angle, 90°; matrix, 64 x 64; and field of view, 192 mm). The first three TRs of the run were automatically discarded.

Data preprocessing and analyses were conducted using the FMRIB (functional magnetic resonance imaging of the brain) Software Library (FSL) version 5.0 (www.fsl.fmrib.ox.ac.uk). Images were corrected for motion using MCFLIRT (motion correction, using FMRIB’s linear image registration tool) and de-noised using multivariate exploratory linear optimized decomposition into independent components analysis. Data were smoothed using a 5-mm full-width-half-maximum Gaussian kernel and filtered with a nonlinear high-pass filter (66-s cutoff). A three-step registration process was used to align individual participant data into standard Montreal Neurological Institute (MNI) space. EPI images were first registered to the matched-bandwidth image, then to the MPRAGE image, and finally to MNI space. Two subjects’ data required truncating of the last 115 volumes due to excess motion (> 2 mm) in the latter half of the scan.

Data were analyzed using a subtraction method to model violations of expectations, the difference between the outcome (friend’s response) and the expectation (target’s prediction). This regressor of interest was convolved with a canonical hemodynamic response function. Six motion parameters were included as covariates in the model for each run for each of the participants. Statistical analyses were performed on each participant’s data using a general linear model to observe neural activation associated with change in expectations.

Each participant’s data were modeled using a three-column regressor that contained the onset of each event (either the expectation or outcome), its duration, and a standard weight of 1.
(to assess each event equally). Neuroimaging analyses were performed three ways to examine neural response to the following: 1) social versus non-social trials; 2) violations versus non-violations of expectations; and 3) valence of information (positive violations, negative violations, and when expectations were met). To compare neural activation to violations versus non-violations of expectations, we averaged all VoE values different from 0 (violations) and tested them against VoE₀ (when expectations were met). To compare neural activation by valence (positive, negative, or when expectations were met), violations between VoE₀ and VoE₁ were grouped and averaged as negative trials, non-violations were grouped and averaged to represent when expectations were not violated (VoE₀), and VoE₁ to VoE₉ were grouped and averaged as positive trials; respectively.

Analyses were conducted using FMRI expert analysis tool (FEAT), first at a lower level to represent one level of a condition within an individual subject, then at a second level using a fixed-effects model to represent all levels of a condition for one subject. Finally, data were analyzed at a group level analysis using FMRIB’s Local Analysis of Mixed Effects with automatic outlier detection to group all participants together and compare contrasts of interest. Structural ROI masks containing a cluster radius of 6 voxels were created for the amygdala, dorsal anterior cingulate cortex (dACC), insula, subgenual anterior cingulate cortex (subACC), and ventral striatum (VS) based on probability maps from Neurosynth (Yarkoni, Poldrack, Nichols, Van Essen, & Wager, 2011). These masks were added as the Pre-threshold Masks for each respective ROI and were clustered at the voxel level with a Z threshold of 2.3 and probability threshold of $p = .05$.

Results

*Reaction Time (RT)*

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To compare the RT between trial types (social/non-social) to information type (expected/violations), a two-way repeated measures analysis of variance (ANOVA) was performed. This analysis did not reveal a main effect of trial type or information, or an interaction ($p > .05$). To determine whether there were differences between valences in the violations, we ran a two-way repeated measures ANOVA comparing trial type to valence of the violations (negative/positive/expected). The results revealed no main effect of valence or interaction between trial type and valence ($p > .05$). Thus, we sought to determine whether there were parametric differences between VoE values.

Because not all participants had the same number of valence and value trials, a cross-classification analysis was performed by indexing each variable of interest by each individual trial. This analysis enabled us to account for the variation that naturally occurred within each participant’s responses, as well as between participants. A regression was performed on the re-organized cross-classified data to account for 1) each trial for each participant; and 2) each VoE value associated with each trial. From this analysis, a general linear regression was performed on RT, which revealed a significant linear relationship between RT and VoE value, such that participants demonstrated decreased reaction time as expectations were increasingly positively violated (from VoE$^-$9 to VoE$^+$9) $F(1,978) = 5.47, p = .020$ (Figure 1.2).

Within the restructured cross-classified data, an analysis of covariance (ANCOVA) was performed on question category and wording of the question to determine if either had an effect.

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An ANOVA was performed on RT collapsing VoE$^{-}$9 to VoE$^{-}$3 to represent negative violations of expectations; VoE$^{-}$2 to VoE$^{+}$2 to represent met expectations; and VoE$^{+}$3 to VoE$^{+}$9 to represent positive violations of expectations—on the assumption that values close to but not necessarily 0 may reflect semi-accurate expectations. This analysis revealed a significant main effect of information type, whereby participants demonstrated the shortest RT when expectations were met ($M = 793.33$ ms, $SE = 35.77$) compared to negatively violated ($M = 900.12$, $SE = 43.96$) or positively violated ($M = 821.93$, $SE = 46.03$) $F(2,50) = 7.69, p = .001$. 

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on RT, controlling for VoE value. This analysis did not reveal a significant main effect of question category $F(3,962) = .64, p = .592$ or wording of question on RT $F(1,962) = .28, p = .600$. There was also no interaction between question category or wording of question $F(1,962) = 0, p = .995$.

Self-Report Questionnaire

To examine whether there were differences between trial type and information type in the self-report questionnaire following the task, a two-way repeated measures ANOVA was performed. This analysis revealed no main effect of trial type ($p > .05$), but a significant main effect of information type, such that participants reported feeling happier when expectations were met ($M = 9.01, SE = .24$) compared to when they were violated ($M = 7.22, SE = .25$) $F(1,23) = 51.56, p < .001$. A significant interaction was also revealed, such that participants reported feeling happier when social expectations were met ($M = 9.51, SE = .12$) compared to when social expectations were violated ($M = 7.21, SE = .20$); and compared to when non-social expectations were met ($M = 8.5, SE = .35$) $F(1,23) = 9.07, p = .006$. Next, a two-way repeated measures ANOVA comparing trial type to valence revealed a main effect of valence, such that participants reported feeling happier when expectations were met ($M = 9.01, SE = .24$) compared to when they were positively ($M = 7.79, SE = .32$) or negatively ($M = 6.60, SE = .28$) violated $F(2,36) = 52.32, p < .001$. A significant interaction was also revealed, such that participants reported feeling happiest when social expectations were met ($M = 9.51, SE = .12$) compared to when non-social expectations were met ($M = 8.5, SE = .35$); and reported feeling happier when social expectations were positively violated ($M = 8.49, SE = .25$) compared to when they were negatively violated ($M = 5.93, SE = .23$), and compared to when non-social expectations were
positively violated \( (M = 7.09, \ SE = .38) \) \( F(2,36) = 22.55, \ p < .001 \). Participants reported feeling happier when their social expectations were positively violated compared to negatively violated \( t(25) = 9.26, \ p < .001 \). A cross-classification analysis was performed to account for 1) each trial for each participant; and 2) each VoE value associated with each trial. From this, a general linear regression was performed to determine whether there were differences in self-reported happiness parametrically based on iterative VoE values. This analysis revealed a significant linear regression, such that participants reported feeling least happy when expectations were more negatively violated, and reported feeling increasingly happier as expectations were met (when values were collapsed by valence) and more positively violated (upon parametric examination of values) \( F(1,967) = 224.69, \ p < .001 \) (Figure 1.3).

Within the restructured cross-classified data, an ANCOVA was performed on question category and wording of the question controlling for VoE value to determine if either had an effect on self-reported happiness. This analysis did not reveal a significant main effect of question category \( F(3,962) = .20, \ p = .898 \) on self-reported happiness. There was a main effect of wording of question on self-reported happiness; such that participants reported feeling happier when questions were positively worded \( (M = 7.58, \ SE = .09) \) compared to when they were

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\(^2\) An ANOVA was performed on self-reported happiness, collapsing VoE\(_0\) to VoE\(_{-2}\) to represent negative violations of expectations; VoE\(_{-2}\) to VoE\(_{+2}\) to represent met expectations; and VoE\(_{+3}\) to VoE\(_{+9}\) to represent positive violations of expectations—on the assumption that values close to but not necessarily 0 may reflect semi-accurate expectations. This analysis revealed a significant main effect of information type, whereby participants were happiest when expectations were met \( (M = 8.42, \ SE = .20) \) compared to negatively \( (M = 5.15, \ SE = .28) \) or positively \( (M = 7.50, \ SE = .30) \) violated \( F(2,50) = 54.66, \ p < .001 \).

\(^3\) A non-social variation of this experiment was performed (Appendix B), which revealed that (similar to the social variation, Figure 1.3B) participants’ felt happiest when their expectations were met \( (M = 9.31, \ SE = .53) \) compared to when expectations were positively \( (M = 5.64, \ SE = .56) \) or negatively \( (M = 5.64, \ SE = .53) \) violated \( F(2, 48) = 14.15, \ p < .001 \). There were no other differences in self-reported happiness, nor any differences in reaction time.
negatively worded \( (M = 6.95, SE = .24) \) \( F(1,962) = 5.78, p = .016 \). There was no interaction between question category or wording of question \( F(1,962) = 1.53, p = .217 \).

**fMRI Analyses**

Three fMRI analyses were conducted on *a priori* regions of interest (ROIs) that are known to be implicated in social processing and prediction error, including the amygdala (a region known to be associated with emotion and fear learning (Li & McNally, 2014; Seymour & Dolan, 2008)), dACC (a region implicated in error monitoring and detection (Wolfram Schultz, 2015)), insula (a region implicated in uncertainty processing (Preuschoff et al., 2008)), subACC (a region implicated in rejection (Masten et al., 2009)), temporal parietal junction (TPJ) (a region implicated in theory of mind (Saxe & Kanwisher, 2003), and VS (a region implicated in reward prediction error (J. R. Cohen et al., 2010)).

First, we examined neural responses to violations of expectations compared to when expectations were met. These analyses did not reveal significant activation in the regions of interest; however, we found activation at sub-threshold levels \( (Z = 2.0, p < .05) \) for violations compared to when expectations were met in the bilateral insula (MNI coordinates: right = 40 x 10 x -4; left = -42 x 2 x -4). Second, a comparison of neural response to social trials compared to non-social trials revealed significant activation in the subACC (MNI coordinates: 4 x 18 x -10; \( Z = 2.33, p < .05 \)) and VS (MNI coordinates: 6 x 14 x -10; \( Z = 2.04, p < .05 \)). Third, a comparison of neural response to positive versus negative violations of expectations (collapsing social and non-social trials) revealed significant activation in the VS (MNI coordinates: 8 x 8 x -8; \( Z = 2.29, p < .05 \)). An analysis comparing negative to positive violations of expectations revealed significant activation in the insula (MNI coordinates: 42 x 22 x -4; \( Z = 2.47, p < .05 \)).
Due to the significant activation we found in the social compared to non-social trials, we further interrogated the differences in valence in the social trials only. We found that for social positive compared to social negative violations, participants recruited the VS (MNI coordinates: 8 x 8 x -6; Z = 2.62, p < .05); while for social negative compared to social positive violations, participants recruited the insula (MNI coordinates: 40 x 22 x -4; Z = 2.40, p < .05) and subACC (MNI coordinates: 0 x 24 x -8; Z = 2.55, p < .05) (Figure 1.4).

**Correlational Analyses**

Bivariate correlational analyses were performed to determine whether demographic information, self-reported happiness, RT, and neural activation were associated. These analyses revealed that participants who reported feeling happier when expectations were positively violated had fewer differences on average between what they expected and what their friend actually reported on the Friendship Questionnaire $r(23) = -.47$, $p = .024$. Additionally, participants who reported feeling happier when they experienced positive social violations were more accurate in predicting their friend’s actual responses to the Friendship Questionnaire $r(25) = .48$, $p = .016$. Participants who had greater friendship durations reported feeling happier when expectations were met $r(19) = .53$, $p = .020$. Participants who reported feeling happier for the social items had greater differences between what they expected and what their friend reported on the Friendship Questionnaire $r(25) = .40$, $p = .048$. Participants who took longer to respond after experiencing positive social violations recruited the VS ($r(26) = .55$, $p = .004$) and insula ($r(26) = .44$, $p = .023$) for those trials. Individuals who had fewer differences between what they expected and what their friend reported on the Friendship Questionnaire were more likely to recruit the subACC for negative social violations $r(25) = -.41$, $p = .043$. Finally, participants who were more accurate in their predictions of what their friend would report on the Friendship
Questionnaire were more likely to recruit the VS for negative social violations $r(25) = .44, p = .029$ (Table 1.1).

Discussion

The goal of this study was to characterize the neural correlates of social violations of expectations in adolescents based on feedback from a close friend. Behaviorally, we found that adolescents’ reaction times decreased linearly as social expectations transitioned from negative to increasingly positive violations. Self-reported happiness increased linearly for social information, as social expectations transitioned from negative to increasingly positive violations. Correlational analyses indicated participants who reported closer friendships were happier to learn they were accurate in their expectations about their friendship, while participants who were not as close were happier when their expectations were positively violated. Neurobiologically, participants demonstrated greater recruitment of the VS for social positive compared to social negative violations; and greater recruitment of the subACC and insula for social negative compared to social positive violations.

These results are in accordance with previous literature, such that increased reaction time to negative social expectations may have reflected greater cognitive interference on these trials (Bush et al., 1998), especially when the stimuli are emotional in nature (Dolcos & McCarthy, 2006; Drueke et al., 2015). This may have been true specifically for increasingly negative social violations compared to positive social violations, as positive social violations may not have been as surprising to participants who were close friends. Thus, we speculate that participants’ self-reported closeness may have contributed to this result, whereby participants were more surprised to receive negative social feedback from their friend.
Interestingly, we found participants who reported being closer friends reported feeling happier when expectations were not violated compared to when they were violated, and were increasingly happier as social expectations were increasingly positively violated. Reminding participants of their predictions and their friends’ responses may have felt threatening (Lazarus, 1999; Leknes, Lee, Berna, Andersson, & Tracey, 2011) whereby participants knew their friend could have reported something worse than they expected. In turn, this may have amplified the happiness they reported when expectations were met, perhaps indicating they were relieved (Leknes et al., 2011) and were pleased to experience reciprocity (Cooper et al., 2014) or something better than what they expected. We posit that experiencing a violation of any kind is conflicting and emotionally arousing for an adolescent, as they are hyper-sensitive to peer feedback, and learning they are incorrect about their friendship (even if the feedback is positive) may be disconcerting compared to learning they are correct. It is possible that the response to experiencing of a positive violation of expectations compared to a non-violation of expectations is not reflected in the adult literature (Poore et al., 2012) because adults are less sensitive to uncertainty in social contexts compared to adolescents (Smith, Steinberg, Strang, & Chein, 2015). Thus, perhaps meeting social expectations in adolescence is [developmentally] a phenotypically unique phenomenon.

Additionally, we suggest it may be likely that if adolescents receive unexpected positive feedback from an unknown peer compared to a known friend, it would result in self-reported happiness (Jones et al., 2014), as they would have fewer relationship priors on which to base their expectations. Notably, adolescents spend more time with known peers than unknown peers, so a task that manipulates statements from a known peer may elicit stronger and perhaps different behavioral and neural responses from an adolescent than if the statements were from
someone the adolescent did not know well. We propose that tasks assessing responses to social
expectations in adolescents should consider the nature of the relationship of the peer (whether
known or unknown), as the response of the target may vary significantly based on prior
knowledge of the relationship.

Our neuroimaging results demonstrate that adolescents recruit more affective circuitry
(i.e. the subACC and VS) when processing social violations of expectations compared to non-
social violations of expectations. This finding is consistent with literature suggesting greater
subcortical recruitment in adolescents when they receive social compared to non-social feedback
(Blakemore, 2008). Additionally, adolescents recruited the VS and insula differentially when
they experienced positive compared to negative violations of expectations. Positive social
violations compared to social negative violations also yielded activation in the VS, insula, and
subACC. While we did not find significant behavior associated with neural activation, we posit
that the increased happiness participants reported for positive compared to negative social
violations suggests participants were happier and recruited the VS (a region that has previously
been implicated in reward receipt (Galvan et al., 2006) when they experienced positive social
violations of expectations. When they experienced negative social violations of expectations,
they reported feeling less happy by comparison and recruited the subACC (a region implicated in
rejection (Masten et al., 2009)) and the insula (a region implicated in social pain (Masten,
Morelli, & Eisenberger, 2011)). These results highlight important associations in how
adolescents report feeling and the neural regions recruited when they learn new social
information from someone they care to receive social feedback from.

Finally, participants who had been more accurate in their expectations of what their
friend would report and what their friend reported in the Friendship Questionnaire, and who had
fewer total differences between their expectations and their friend’s reported responses reported feeling happier after experiencing a positive violation of expectations. This result supports our hypothesis that friendship closeness or quality may account for the differences exhibited in behavior and self-report when participants experienced a violation of their expectation. Furthermore, adolescents who reported greater friendship duration were particularly happy when expectations were met, suggesting they may be more knowledgeable about their friendship and felt more relief knowing they were accurate in their expectations. This supports our rationale to include a friend as a peer in the study design—as this addition suggests response to a peer may be specific to the closeness of the relationship given that behavioral and neural responses between adolescents who were not as close were different by comparison.

While our study has notable strengths, we acknowledge a few caveats. We were limited in the extent to which we could modify the valence and VoE value of violations. Thus, it was more challenging to assess positive violations of expectations (many participants had relatively high expectations) compared to negative violations of expectations. Future research in this area should consider how to increase values of positive social violations of expectations to test this effect more precisely. Additionally, we posit that responses to violations of expectations in a friendship of a wide range (such as VoE−9 to VoE+9) may encompass thought processes (e.g. confusion) that a restricted range may avoid. Indeed, when we restrict our analyses to a range of VoE−4 to VoE+4 values of violations, we find significant differences in behavior as we predicted, and more robust differences in self-report and neural recruitment. However, we recognize that by restricting our analyses, we also limit the amount of statistical power associated with our questions, and remove any significant responses to violations that may lend themselves to future responses. Finally, we found few significant differences between social and non-social trials in
our task, perhaps due to the limited number of non-social items. Future research should consider expanding on non-social items to further probe these differences.

To our knowledge, the present study is the first to highlight differences in adolescent responses to social feedback from a friend based on valence and VoE value. Understanding these differences is important, as differential feedback (in novelty, valence, and value) has been known to influence behavior, especially in adolescence, as teenagers’ behaviors can be reflective of their diminished cognitive control (compared to adults) in affective situations. Moreover, most adolescent peer interactions occur with friends, and adolescents are particularly keen on social acceptance. Thus, by incorporating “authentic” feedback (from known peers) participants are actually interested in outside of the laboratory, we can elucidate differences that may not otherwise appear had we used a confederate or virtual peer. Learning new social information is critical during adolescence, as it is a time in development spent largely with friends. While research has determined receiving unexpected positive feedback results in more approach behaviors and receiving unexpected negative feedback results in more avoid behaviors (Barter et al., 2015; Smillie, 2008), our study finds that receiving expected social feedback may result in greater approach behaviors, as it may be more reinforcing, or rewarding than unexpected positive social feedback. We found that adolescents who are close friends prefer to learn they were correct in their expectations about their friendship, even if their friend reports something better than they expected; while adolescents who are not as close prefer to learn something better than expected and take longer to respond—perhaps indicating they are learning something new about someone they know only somewhat well. We suggest that learning unexpected social information at this age can be discordant with internal representations, which perhaps allows for it to be more easily remembered. However, we conclude that any new and unexpected social
information garnered during this age about a close friendship may be disruptive to the cognitive harmony that a teenager has regarding his/her friendship, which may have implications for adolescent behavior in affective contexts.
Figure 1.1.

*Social Violations of Expectations Task.*
Figure 1.2.

Reaction Time (RT).

Figure 1.2. Participants’ RT when their expectations were violated compared to not violated. As the violation of expectation value increased from negative to positive violations, participants demonstrated decreased reaction times $F(1,978) = 5.47$, $p = .020$. 
Figure 1.3.

Self-reported happiness.

Figure 1.3. Self-reported happiness when participants’ expectations were violated compared to when they were not violated. A. A significant main effect of information type was revealed, such
that participants were happier when social expectations were met \((M = 9.51, SE = .12)\) compared to when social expectations were violated \((M = 7.21, SE = .20)\) \((F(1,23) = 51.56, p < .001)\) and compared to when non-social expectations were met \((M = 8.5, SE = .35)\) \(F(1,23) = 9.07, p = .006)\. There was no main effect of trial type \(p > .05\). B. A main effect of valence was revealed, such that participants reported feeling happier when social expectations were met \((M = 9.51, SE = .12)\) compared to when social expectations were positively \((M = 8.49, SE = .25)\) or negatively \((M = 5.93, SE = .23)\) violated. A significant interaction was revealed, such that participants reported feeling happiest when social expectations were met compared to when non-social expectations were met \((M = 8.5, SE = .35)\), and were least happy when their social expectations were negatively violated \(F(2,36) = 22.55, p < .001\). C. Participants reported feeling least happy when expectations were more negatively violated, and reported feeling increasingly happier as expectations were increasingly positively violated \(F(1,967) = 224.69, p < .001\)
Figure 1.4.

*Regions of Interest (ROI) Analyses: Valence comparisons of social violations of expectations.*

*A. Ventral striatum (VS) activation was revealed in social positive > social negative violations (x = 8, y = 8, z = -6; Z = 2.62, p < .05).*

*B. Subgenual anterior cingulate cortex (subACC) (x = 0, y = 24, z = -8; Z = 2.55, p < .05) and insula (x = 40, y = 22, z = -4; Z = 2.40, p < .05) activation were revealed in social negative > social positive violations.*
### Table 1.1.

**Correlations between behavior, self-report, and neural activation.**

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*Note. *p < .05, **p < .01, ***p < .001.*
Chapter 3

Ventral Striatum Activation to Violations of Expectations and its Association to Substance Use in Adolescents
Adolescence marks a time of increased exploration and socialization with peers, where teenagers take risks more than other age groups, and often do so in the presence of their peers (Gardner & Steinberg, 2005). While many of the risks they take lead to positive long-term outcomes (i.e. learning how to resolve conflict (Laursen & Collins, 1994), and finding a romantic partner (Connolly & McIsaac, 2011)), some can lead to negative outcomes, including health-compromising behaviors such as getting into automobile accidents (J J Arnett, 2002), and substance use (Murphy, Kochanek, Xu, & Heron, 2015). It has been proposed that a cascade of developmental changes in the brain during adolescence underlie these behaviors (Crone & Dahl, 2012). As the brain develops during adolescence, there is a surge in dopamine (a neuromodulator critical in reward receipt and reinforcement learning) in the limbic system coupled with a lack of functional connectivity with the prefrontal cortex (a region associated with cognitive control and higher-order thinking) (B J Casey et al., 2008). Thus, adolescents are more inclined to engage in reward-related activities, in part because they demonstrate diminished cognitive control (Andrews-Hanna et al., 2011) and an increased neural response to reward (Galvan et al., 2006).

The same neural circuitry that is involved in reward processing also processes prediction error (PE) (J. R. Cohen et al., 2010; Wolfram Schultz, 2015), defined as the neural computation of the difference between the expectation of an event and its actual outcome. PEs are positive or rewarding in nature when the actual outcome is better than the expected outcome and negative when the actual outcome in worse than the expected outcome. Our research is consistent with a large literature on PE (Hollerman & Schultz, 1998; O’Doherty, 2004; Pagnoni et al., 2002; Pessiglione et al., 2006) in demonstrating that the neural circuitry implicated in reward PE (e.g. the ventral striatum (VS)—a region rich in dopamine receptors) is also implicated in positive social violations of expectations (VoE), suggesting the neural processing of basic reward
learning extends to the experience of positive social VoE in adolescence (see Chapter 2). While researchers have associated real-world behaviors with neural activation to reward PE in adults (Pessiglione et al., 2006; Preuschoff et al., 2008), none have determined whether an association exists between positive social VoE and real-world behaviors in adolescents. It is especially important to explore if the same processes are involved for basic reward and positive social processing in adolescents, as we may expect adolescents who demonstrate enhanced engagement of these processes to partake in more rewarding activities.

Many adolescents in the United States have had social experiences in which they have been offered or have used licit/illicit substances (41.8% of adolescents reported having had a drink of alcohol in the past 30 days that was given to them from someone else (Kann et al., 2014)) (an activity that is endorsed by adolescents (Beyth-Marom, Austin, Fischhoff, Palmgren, & et al, 1993) as risky). Research indicates that nationwide, 18.1% of adolescents have had alcohol prior to age 13, and 34.9% have had a drink at least once in the past month (Kann et al., 2014). Alcohol and drug induced deaths are one of the most avoidable causes of accident and death in the United States (Murphy et al., 2015). Like most risk taking behaviors, adolescents are more likely to use substances with their peers or in social settings (Simons-Morton & Farhat, 2010), suggesting that substance use in adolescence is a social behavior. Additionally, the types of substances adolescents use varies greatly, though most commonly, adolescents tend to use alcohol and tobacco and are least likely to use heroin (Kann et al., 2014)—as the former is perceived as having fewer severe consequences and is more socially acceptable. They are also more likely to use alcohol and tobacco more frequently than other substances (Kann et al., 2014). Recently, researchers have associated the basic reward processes involved in PE to vulnerability
to substance addiction in adults (Huys, Tobler, Hasler, & Flagel, 2014), though none have associated response to VoE with self-reported substance use in adolescents.

The goal of this study was to elucidate the relation between the rewarding experience of learning social information from a friend to self-reported risky and rewarding social behaviors in adolescents with the aim of identifying whether the ventral striatum (VS) activation evinced in social VoE is associated with the extent to which adolescents use substances. Because previous research has demonstrated a positive association between ventral striatal response to reward PE in adults and their substance use behaviors, we hypothesize adolescents who demonstrate greater ventral striatal activation in response to positive social violations of expectations (unexpectedly rewarding feedback) will also report greater and more frequent use of substances than those who demonstrate decreased VS recruitment.

Method

Participants

Twenty-six participants completed the initial fMRI study (Study 1) that assessed behavioral and neurobiological responses to social violations of expectations. Nineteen adolescents (73.08% of the original sample: 57.89% female, ages 16-19, $M = 17.53$, $SD = 0.96$) were re-enrolled in the behavioral follow-up study (henceforth referred to as Study 2); primary reason for subject attrition was college attendance out of state. The average amount of time that elapsed from participation in the first study to the second was 613.11 days ($SD = 78.95$). The participant group was ethnically diverse (36.8% Hispanic/Latino, 31.6% Caucasian, 5.3% African American, 5.3% Asian, 21.1% Other), and did not differ by socioeconomic status—measured as average level of parental education obtained in the household ($c^2(8, N = 19) = 6.22$, $p = .62$).
Design

In Study 1, the independent variable was the violation of expectation, created by modifying the friend’s initial response to be better than, equal to, or worse than the target’s expectation. The dependent variables were 1) behavioral response, 2) neural activation, and 3) self-reported response when targets experienced a violation of their expectations. Behavioral response was measured by indexing reaction time (RT) to press a button on a response box to advance to the next trial. Neural activation was assessed by examining peak voxel activation from a priori regions of interest (ROIs). Self-reported responses were collected on a survey following completion of the task. In Study 2, our predictor variables were the dependent variables from Study 1, and our criterion variables were responses to the Study 2 self-report questionnaires.

Procedure

In Study 2, target participants from Study 1 were invited back to our lab to complete follow-up self-report questionnaires. Participants were told that we were interested in understanding whether their self-reported risk taking and substance use was associated to their responses in the Social Violations of Expectations task. Participants were asked to complete questionnaires on a laptop computer programmed with E-Prime 2.0. They were instructed that they could choose to skip any questions they felt uncomfortable answering, and could ask any questions they had about the items. They were assured all of their responses would be kept confidential. Completion of the surveys took approximately one hour, and upon study completion, participants were paid $30 and were thanked for their time.

Materials and Apparatus

Study 1 (see Chapter 2, Method)
Study 2

Task. Target participants completed self-report surveys that assessed their friendship status with the friend that completed Study 1 with them; rejection sensitivity (RSQ, (Downey & Feldman, 1996); resistance to peer influence (RPI, (Steinberg & Monahan, 2007) (for a description, see Chapter 4 Method); and risk taking and substance use behaviors (Drug Use Inventory—Revised (DUSI-R), (Tarter, Kirisci, Habeych, Reynolds, & Vanyukov, 2004); Ontario Student Drug Use and Health Survey (OSDUHS), (Boak, Hamilton, Adalf, & Mann, 2013). Friendship status questions asked participants how close they remembered being friends with the friend who accompanied them at Study 1, and how close they were at Study 2. Participants responded on a Likert scale from 1 (not close at all) to 5 (best friends). A Friendship Difference Score was calculated by subtracting the friendship status score reported from Study 1 from the friendship status score reported from Study 2 to determine whether participants were closer or less-close between Study 1 and Study 2.

Items from the RSQ first asked participants how concerned or anxious they would be about someone’s response to a question (i.e. “You ask someone in your class if you can borrow his/her notes”); followed by asking them how they thought a person would respond (i.e. “I expect that the person would willingly give me his/her notes”) on a scale of 1 (very uninterested/very likely) to 6 (very concerned/very unlikely). Participants responded to 18 pairs of questions (Appendix C) prior to proceeding to the OSDUHS.

Items from the OSDUHS (Appendix D) asked participants about their demographic information and behavioral information (including substance use, health history, and risk taking). Items pertaining to their substance use requested history of use, frequency of use in the past 12 months, frequency of use in the past 4 weeks, and how usage impacted daily life. Participants
responded by selecting an answer that best corresponded to their habits. A sample item read, “In the last 12 months, how often did you use cannabis (also known as marijuana, weed, pot, grass, hashish, hash, hash oil, etc.)?” Participants responded by selecting one of the following: “1 or 2 times; 3-5 times; 6-9 times; 10-19 times; 20-39 times; 40 or more times; used but not in the last 12 months; never used in lifetime; don’t know what cannabis is.” Items pertaining to their risk taking behavior asked about activities they participated in while they or a peer was under the influence. A sample item includes “In the last 12 months, have you driven a snowmobile, motor boat, Sea-doo, or all-terrain vehicle (ATV) within an hour of drinking 1 or more drinks of alcohol?” Responses to this item include “Did not drive a snowmobile, motor boat, Sea-doo, or ATV in the last 12 month; Yes; No.” Participants answered 131 questions from this measure approved by the University IRB prior to completing questions from the DUSI-R.

Items from the DUSI-R (Appendix E) asked participants to indicate their frequency and behaviors, as well as their peer’s behaviors, pertaining to substance use. Sample items include “In the past year, did you drink large quantities of alcohol when you went to parties?”; “In the past year, did any of your friends regularly use alcohol or drugs?” Participants responded by indicating “yes” or “no” to all items. Participants responded to 142 IRB approved items from the questionnaire. Participants also responded to questions about their likelihood to use substances if given the opportunity (for a detailed description, see Chapter 4, Method). These questions were interspersed with the OSDUHS and DUSI-R (Appendix F).

**Behavioral Analyses.** Data were analyzed using SPSS 23.0. Adolescents reported their lifetime, past year, and regular usage of tobacco, alcohol, cannabis, pain killers (without a prescription), spice, heroin, Attention-Deficit/Hyperactivity Disorder (ADHD) medication (without a prescription), cocaine, methamphetamine (meth), psilocybin, methylenedioxy-
methamphetamine (MDMA), and Lysergic acid diethylamide (LSD). Due to potential individual variation within our sample size, we grouped drugs into categories based on reported usage and perceived consequences among this age group (Kann et al., 2014) as follows: Group I (tobacco, alcohol, cannabis); Group II (pain killers, ADHD medication, psilocybin); Group III (spice, MDMA, cocaine); Group IV (heroin, meth, LSD). We also categorized time points of usage by lifetime use, use in the past 12 months, and using frequently, as listed in the OSDUHS questionnaire (Boak et al., 2013). Using “frequently” was measured as 11-15 times a day for tobacco, 2-3 times a month for alcohol, and 6-9 times a year for all other substances. Endorsement of use was weighted based on the Group, whereby Group I drugs were assigned a weight of 1, Group II, a weight of 2, etc. Each endorsement of a drug in the group was multiplied by the weight and added to the totals of the other Groups to create a Drug Use composite score. Additionally, we created composite scores based on time points (lifetime, past 12 months, and frequently) by adding the scores generated from the grouped drugs across each respective time point.

Results

Study 1

All results for Study 1 are reported in Chapter 2. Of the previously reported results, we restate notable differences pertinent to Study 2 below.

Self-Report Questionnaire

As reported in Study 1, to examine whether there were differences between trial type and information type in the self-report questionnaire following the task, a two-way repeated measures ANOVA was performed. This analysis revealed no main effect of trial type ($p > .05$), but a significant main effect of information type, such that participants reported feeling happier
when expectations were met \((M = 9.01, SE = .24)\) compared to when they were violated \((M = 7.22, SE = .25)\) \(F(1,23) = 51.56, p < .001\). A significant interaction was also revealed, such that participants reported feeling happier when social expectations were met \((M = 9.51, SE = .12)\) compared to when social expectations were violated \((M = 7.21, SE = .20)\); and compared to when non-social expectations were met \((M = 8.5, SE = .35)\) \(F(1,23) = 9.07, p = .006\). Next, a two-way repeated measures ANOVA comparing trial type to valence revealed a main effect of valence, such that participants reported feeling happier when expectations were met \((M = 9.01, SE = .24)\) compared to when they were positively \((M = 7.79, SE = .32)\) or negatively \((M = 6.60, SE = .28)\) violated \(F(2,36) = 52.32, p < .001\) (see Chapter 2, Figures 1.3A and 1.3B, respectively).

fMRI Analyses

fMRI analyses were conducted on a priori regions of interest (ROIs) that are implicated in prediction error, including the VS (a region implicated in reward prediction error (J. R. Cohen et al., 2010)). We found that for social positive compared to social negative violations, participants recruited the VS (MNI coordinates: 8 x 8 x -6; \(Z = 2.62, p < .05\)) (see Chapter 2, Figure 1.4A). For the purposes of this study, we do not focus on other brain regions associated with VoE.

Study 2

Self-Report

A 3 (frequency of use: lifetime, past 12 months, frequent) x 4 (drug type: Group I, Group II, Group III, Group IV) repeated measures Analysis of Variance (ANOVA) was performed to compare self-reported substance use among the adolescents in our sample. We found a main effect of drug type, such that adolescents endorsed using Group I drugs (tobacco, alcohol, cannabis) the most \((M = .42, SE = .07)\), \(F(3,54) = 22.85, p < .001\). We also found a main effect
of frequency of use over time, such that adolescents reported using more substances over the course of their life ($M = .25, SE = .07$) than in the past 12 months ($M = .20, SE = .05$) or frequently ($M = .06, SE = .02$) $F(2,36) = 26.58, p < .001$. An interaction was revealed, whereby adolescents reported greater usage of Group I (tobacco, alcohol, cannabis) substances frequently ($M = .14, SE = .05$) compared to using Group II substances (pain killers, ADHD medication, psilocybin) in their lifetime ($M = .11, SE = .06$) $F(6,108) = 8.42, p < .001$ (Figure 2.1). We further explored self-reported usage of Group I drugs (tobacco, alcohol, cannabis), and found adolescents endorsed greatest lifetime (84.21% of participants), past 12 months (73.68% of participants), and frequent (31.58% of participants) use of alcohol. No adolescents reported past 12 months or frequent usage of spice or psilocybin. No adolescents reported frequent usage of MDMA or LSD.

Because most participants endorsed using Group I substances (tobacco, alcohol, cannabis) compared to other substances, we examined whether there were differences between neural and self-reported responses to violations of expectations by severity of Group I substance use. Of the participants who endorsed using Group I substances, categories were divided based on severity of use, including use in lifetime but not in the past 12 months (Minimum); use in the past 12 months but not frequently (Moderate); and frequently (Maximum). A 2 (ventral striatal activation to violations of expectations/expectations met) x 3 (severity of use) repeated measures analysis of covariance (ANCOVA) was performed—controlling for age. This analysis did not reveal a main effect of violation or of use, though demonstrated a trending interaction $F(2,13) = 2.80, p = .097$. Further investigation of this interaction revealed that participants who used Group I substances minimally had decreased VS activation when their expectations were violated in Study 1 ($M = -.08, SE = .02$) compared to participants who reported a moderate use of Group I
substances ($M = -.02, SE = .02$) and a maximum use of Group I substances ($M = .04, SE = .03$) $F(2,13) = 4.47, p = .033$ (Figure 2.2A). There were no differences between VS activation by valence (positive/negative) for violations of expectations and substance use. A similar analysis of self-reported happiness when participants experienced a violation of their expectations in Study 1 to self-reported severity of substance use in Study 2 was performed. This analysis did not reveal a significant main effect of violation, of substance use, or an interaction; though the data trended in a pattern suggesting compared to other severity levels, participants who used a minimum amount of Group I substances were happier when expectations were met ($M = 8.88, SE = .96$) compared to when expectations were violated ($M = 6.79, SE = .68$) (Figure 2.2B).

**Correlational Analyses**

Bivariate correlational analyses were performed to determine whether there were associations between age, self-reported rejection sensitivity; substance use; and behavior, and ventral striatal activation from the Social Violations of Expectations task. Results from this analysis revealed older adolescents were more likely to use drugs over the course of their life $r(19) = .46, p = .049$; in the past 12 months $r(19) = .53, p = .021$; and frequently $r(19) = .46, p = .046$. They were also more likely to use Group I substances (tobacco, alcohol, cannabis) $r(19) = .54, p = .018$. Adolescents who reported greater sensitivity to rejection were more likely to use Group IV substances (heroin, meth, LSD) $r(19) = .53, p = .019$.

Our analyses comparing the results from the Study 1 to Study 2 revealed adolescents who reported feeling happier when their social expectations were met used fewer Group II (pain killers, ADHD medication, psilocybin) $r(19) = -.46, p = .046$; Group III (spice, MDMA, cocaine) $r(19) = -.46, p = .046$; and Group IV (heroin, meth, LSD) $r(19) = -.55, p = .014$ substances. They also used fewer substances over the course of their life $r(19) = -.50, p = .028$ and in the past 12
months $r(19) = -.49$, $p = .032$. Finally, adolescents who reported feeling happier when their social expectations were met reported less total Drug Use $r(19) = -.49$, $p = .032$. Associations to the neuroimaging analyses revealed adolescents who demonstrated greater recruitment of the VS for social trials were more likely to use Group I substances (tobacco, alcohol, cannabis) frequently $r(19) = .46$, $p = .047$. Adolescents who recruited the VS when their social expectations were met were less likely to use Group I substances in their life $r(19) = -.47$, $p = .045$, or in the past 12 months $r(19) = -.47$, $p = .043$. There was no association between VS activation for non-social violations and substance use, or non-social non-violations and substance use. All correlational analyses are depicted in Table 2.1.

Discussion

The goal of this study was to determine whether adolescent neural responses to social violations of expectations were associated with substance use behaviors. Our results indicate that adolescents who demonstrated increased ventral striatal response when expectations were violated used more Group I substances compared to adolescents who demonstrated a decreased VS response when expectations were violated. Older adolescents used more illicit substances, and used substances more frequently than younger adolescents. Most adolescents endorsed using Group I (tobacco, alcohol, cannabis) substances compared to other substances. Adolescents who had greater Rejection Sensitivity Questionnaire scores used substances with greater consequences (e.g. Group IV drugs (heroin, meth, LSD)).

Ventral striatal activation to violations was greatest in adolescents who endorsed using the most Group I (tobacco, alcohol, cannabis) substances compared to adolescents who endorsed using the fewest Group I substances. Researchers have proposed that individuals who use substances may require greater prediction errors to elicit the level of reward exhibited in
individuals who use fewer substances by comparison (Hyman, Malenka, & Nestler, 2006; Hyman, 2005; Schultz, 2000). Additionally, previous research has supported this difference, whereby adolescents who demonstrate a greater ventral striatal response to non-social violations of expectations (Spicer et al., 2007) were more likely to engage in risky behaviors (Galvan et al., 2007). Perhaps, then, it is unsurprising that adolescents who demonstrate increased ventral striatum response when social expectations were met reported engagement in fewer risky activities by comparison—as these adolescents may require a diminished PE to elicit a dopaminergic or rewarding response. Self-reported happiness to violations of expectations from Study 1 mirrored the aforementioned neural responses; such that participants who reported using a minimum amount of Group I (tobacco, alcohol, cannabis) substances were less happy upon experiencing a violation of expectations compared to when expectations were met. While this effect is not statistically significant, it does suggest that the ventral striatum activation from Study 1 is reflective of a reward prediction error, as adolescents’ self-reported responses were in accordance with their ventral striatum response to violations. Separating the data in this way (by use of an endorsed substance group amongst adolescents) allowed us to account for individual variation that may have otherwise been lost in analyses, and elucidates important differences in ventral striatal activation with respect to reported substance use. The current study’s novel contribution to the literature is in showing that ventral striatum activation to social feedback is associated with real-world behaviors.

We hypothesized that adolescents who demonstrated increased ventral striatal recruitment to positive social violations of expectations would use more types of substances more frequently than adolescents who demonstrated decreased recruitment by comparison. We did not find this association to be significant in our analyses. Instead, we found that for social
trials, adolescents who recruited the ventral striatum used Group I substances (tobacco, alcohol, cannabis) more frequently, and adolescents who recruited the VS when their social expectations were met used fewer Group I substances in the past 12 months and in their lifetime. While we expected an association between ventral striatal response to positive social violations of expectations to predict behavior, as previously mentioned in Chapter 2, it’s likely adolescents were happier/more rewarded when their social expectations were met. Thus, it is unsurprising that a neural region implicated in reward (the ventral striatum) demonstrates greatest response to reinforcing social feedback, which in turn is most associated with real-world social behaviors in adolescents.

We suggest that in line with the results on self-reported happiness, adolescents who recruit the ventral striatum when their social expectations are met would be more inclined to act in a way that supports meeting their peers’ expectations—such as avoiding engaging in risky substance use behaviors (including using substances earlier in life, a behavior not typically endorsed by adolescents (Kann et al., 2014)). Because many adolescents nationwide and in our sample endorse using Group I substances (tobacco, alcohol, cannabis), it is then likely that adolescents who recruited the ventral striatum for social trials were attuned to social norms, and were more likely to engage in social behaviors that were greatly endorsed by their peers.

Consistent with national and regional reports on adolescent drug use (Kann et al., 2014), we found that older adolescents in our sample used more substances more frequently than younger adolescents. Research has indicated that older adolescents have greater access to more substances than younger adolescents (Harrison, Fulkerson, & Park, 2000) and are eager to model their older peers’ behavior (Prinstein, Boergers, & Spirito, 2001).
We also found that adolescents who reported feeling more sensitive to rejection used more Group IV substances (heroin, LSD, meth). This is in accordance with literature suggesting adolescents who are more sensitive to rejection take more dangerous risks—including using dangerous substances and engaging in health-compromising activities with their peers (Leventhal, Francione Witt, & Zimmerman, 2008; Pachankis, Hatzenbuehler, & Starks, 2014). We propose these teenagers engage in such activities because they are concerned about being rejected by their peers if they choose not to. It is likely that factors that contribute to rejection sensitivity (i.e. familial upbringing, socioeconomic status, and typical interactions with peers) may be better predictors of this type of substance use. We suggest adolescents who are not sensitive to rejection do not feel the same pressure to make such risky decisions with such serious consequences—and for them, the potential consequences outweigh the potential rewards of engaging in those behaviors.

While our study has notable strengths, we acknowledge its weaknesses—namely, our sample size. Admittedly, our sample is not large enough to generalize to a greater population of adolescents to suggest novel information about adolescent substance use. Instead, we relied upon existing published reports, and found substance use endorsement within our sample was relatively comparable to the national population. We found age was associated with self-reported substance use, and suggest it may function as a moderator between ventral striatal activation and self-reported substance use, as older adolescents have greater access to substances (Toumbourou et al., 2007) and likely have older friends who use substances (Fisher, Miles, Austin, Camargo, & Colditz, 2007). Additionally, we note that it would have been beneficial to collect substance use information at the first time point when they received a scan to 1) draw a more direct correlation to task behavior; and 2) determine how substance use behavior changes over the
course of two years in adolescence. Future studies should consider data collection in this way to increase internal validity and shed light on differences in adolescent behavior over time.

Our study makes a novel contribution to the prediction error literature in that it differentiates adolescent ventral striatum response to social expectations with their real-world behaviors. These differences suggest future research should consider whether neural responses to social violations of expectations could be predictive of behaviors (i.e. substance use) in adolescence. We propose that adolescents who use socially acceptable substances (e.g. tobacco, alcohol, cannabis) recruit the ventral striatum and are happier in response to experiencing a violation of expectations, as they require a large violation of their expectation to achieve a rewarding sensation (and perhaps receive it via substance use) and are attuned to and prefer to learn new social information. We conclude that adolescents who feel rewarded when they receive new social information about their friendship are socially more likely to act in ways to reinforce a rewarding sensation when they are with their friends, including engaging in socially acceptable substance use.
Figure 2.1. Participants’ self-reported use of substances by drug type and frequency. Participants report using more Group I substances ($M = .42, SE = .07$) compared to higher Group substances $F(3,54) = 22.85, p < .001$. They also endorsed using more drugs over the course of their life ($M = .25, SE = .07$) than any other time $F(2,36) = 26.58, p < .001$. There was also an interaction $F(6,108) = 8.42, p < .001$, such that adolescents used Group I drugs more frequently than they did Group II drugs $t(18) = 2.36, p = .030$. 

*Self-reported substance use.*
Figure 2.2. Ventral striatum (VS) activation and self-reported happiness (from Study 1) by severity of Group I substance use (from Study 2).

A.

B.

Figure 2.2. Ventral striatum (VS) activation and self-reported happiness to violations of expectations from Study 1 by Group I use severity, for adolescents who endorsed using Group I substances, controlling for age. A. Participants who used a minimum amount of Group I
substances demonstrated decreased VS activation when expectations were violated compared to participants who endorsed using a maximum amount of Group I substances $F(2,13) = 4.47, p = .033$. B. Participants who reported using a minimum amount of Group I substances were happier when expectations were met ($M = 8.88, SE = .96$) compared to when expectations were violated ($M = 6.79, SE = .68$).
**Table 2.1.**

**Correlations between Study 1 and Study 2.**

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<td>0.25</td>
<td>-0.13</td>
<td>0.2 *-0.47</td>
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**Note.** *p < .05, **p < .01, ***p < .001.

**Table 2.1 Key.** 3. RSQ = Rejection Sensitivity Questionnaire. 4. Happiness: Social Exp Met = Self-reported happiness when participants’ social expectations were met in Study 1. 5. VS: Avg Social Trials = Activation in the ventral striatum when participants experienced social trials in Study 1. 6. VS: Social Exp Met = Activation in the ventral striatum when participants’ social expectations were met in Study 1. 7. Group I, Lifetime = Group I substance use across the lifetime. 8. Group I, 12 Months = Group I substances use over the past 12 months. 9. Group I, Frequently = Group I frequent substance use. 10. Group I Composite = Group I substance use composite score (averaging Group I use across time points). 11. Group II Composite = Group II substance use composite score (averaging Group II use across time points). 12. Group III Composite = Group III substance use composite score (averaging Group III use across time points). 13. Group IV Composite = Group IV substance use composite score (averaging Group IV use across time points). 14. Lifetime Composite = the average of all substances Group across the lifetime. 15. 12 months Composite = the average of all substances used across the past 12 months. 16. Frequently Composite = the average of all substances frequently used. 17. Drug Use Composite = the average of all substances Group I composite use across the lifetime.
**Use Composite** = the average of all substance use scores (weighted based on Group) across time points.
Chapter 4

Associations Between Self-Reported and Experimentally Manipulated Peer Influence in Adolescents
Adolescents are often faced with complex social decisions. Deciding how to behave in “the heat of the moment” (e.g. when in the presence of peers) can be challenging for an adolescent—in part because cognitively, they are capable of making an informed and rational decision, but also their decisions tend to be emotional in nature, which can override rational thought (Steinberg & Cauffman, 1996; Steinberg, 2005). This is supported by neurobiological research on adolescents, which suggests the limbic system (an area associated with emotion and reward) is more responsive during adolescence, while the prefrontal cortex (an area associated with higher-order decision-making) is less so by comparison (B J Casey et al., 2008). Additionally, researchers have considered adolescence as a sensitive period for socioemotional development (Blakemore & Mills, 2013), where compared to other age groups (Jones et al., 2014), and other people (Fuligni & Eccles, 1993) teenagers are more attuned to peer feedback. Considering the developmental changes evinced in neurobiological processes, psychological processes, and social salience during adolescence, it is no wonder making well-informed decisions in an emotional context can be particularly challenging.

Behavioral research has indicated that compared to other age groups and compared to when they are alone, adolescents make riskier decisions when they are in the presence of their peers (Gardner & Steinberg, 2005). They also report being more susceptible to peer influence compared to other age groups (Steinberg & Monahan, 2007). A neurobiological study assessing peer influence found that not only do adolescents take more risks compared to young adults or adults, they also recruit regions implicated in reward—including the ventral striatum (VS) more than young adults or adults (Chein et al., 2011). While these studies and others (Lourenco et al., 2015; Pfeifer et al., 2011; Smith, Chein, & Steinberg, 2014; Weigard, Chein, Albert, Smith, & Steinberg, 2014) have assessed adolescent response to peer influence in a laboratory setting
(whereby participants play a computer game), very few have manipulated peer influence to assess real-world behaviors (but see (Allen, Porter, & McFarland, 2006)). In their study, Allen and colleagues presented adolescents with a hypothetical scenario and asked them to decide on their own whom to save from a planet before meeting with others to decide collectively. They found that after meeting with other peers, adolescents changed their original choices to be more aligned with the group’s decision.

While some adolescents make decisions reflective of a hyperactive reward system coupled with a diminished cognitive control system (e.g. acting particularly risky by having using illicit substances), most adolescents report engaging in moderate amounts of risky behaviors (e.g. using only legal substances) (Kann et al., 2014), suggesting that adolescents are capable of making safer, albeit risky decisions in emotional contexts. However, individual differences (i.e. culture, gender, socioeconomic status) may lead adolescents to partake in some risky behaviors (e.g. binge drinking) but not others (e.g. violent behavior) (Prinstein et al., 2001), and some peers may be more influential than others (Prinstein, Meade, & Cohen, 2003). Notably, not all forms of peer influence are implicit or subtle—some are more explicit and are typically considered “peer pressure” (Jeffrey Jensen Arnett, 2007). Adolescents reporting on their own susceptibility to peer influence indicate that they are not often coerced, but instead go along with their peers in an effort to be accepted or more liked by them (Denscombe, 2001). Additionally, these adolescents are also more likely to partake in risky social activities (smoking and drinking, specifically) when a best friend or a higher status/more popular peer is partaking (Andrews, Tildesley, Hops, & Li, 2002; Bot et al., 2001). Taken together, it is likely that adolescents recognize the risk in using substances, but find the risk is outweighed by the reward of peer acceptance.
To our knowledge, studies on peer influence in adolescents have primarily focused on the effect of the presence of a same-sex peer, though notably, adolescents are eager to impress members of the opposite sex (Andrews et al., 2002; S. Miller et al., 2009). Because adolescence marks a time of sexual maturation and increased desire to find a romantic other (Connolly & McIsaac, 2011; Miller & Benson, 1999), we were interested in understanding whether an opposite-sex peer would influence adolescent self-report.

The first goal of this study was to attempt to experimentally manipulate peer influence in an adolescent sample to determine whether adolescent self-reported susceptibility to peer influence was associated with experimentally manipulated peer influence. The second goal of this study was to determine whether adolescents would report a greater likelihood to engage in behaviors endorsed by an attractive opposite-sex peer than their original independent report. We hypothesized that 1) adolescents who demonstrated an increased ventral striatal response to peer feedback would be more susceptible to experimentally manipulated peer influence; 2) self-reported peer influence would be associated with experimentally manipulated peer influence; and 3) adolescents would report a greater likelihood to partake in risky behaviors after viewing an attractive opposite-sex peer’s “responses.”

Method

Participants

Twenty-six participants completed the initial fMRI study (Study 1) that assessed behavioral and neurobiological responses to social violations of expectations. Nineteen adolescents (73.08% of the original sample: 57.89% female, ages 16-19, $M=17.53$, $SD=0.96$) were re-enrolled in the behavioral follow-up studies (henceforth referred to as Study 2 and Study 3); primary reason for subject attrition was college attendance out of state. The average amount
of time that elapsed from participation in the first study to the second was 613.11 days (SD = 78.95). The participant group was ethnically diverse (36.8% Hispanic/Latino, 31.6% Caucasian, 5.3% African American, 5.3% Asian, 21.1% Other), and did not differ by socioeconomic status—measured as average level of parental education obtained in the household (c²(8, N = 19) = 6.22, p = .62).

Design

In Study 1, the independent variable was the violation of expectation, created by modifying the friend’s initial response to be better than, equal to, or worse than the target’s expectation. The dependent variables were 1) behavioral response, 2) neural activation, and 3) self-reported response when targets experienced a violation of their expectations. Behavioral response was measured by indexing reaction time (RT) to press a button on a response box to advance to the next trial. Neural activation was assessed by examining peak voxel activation from a priori regions of interest (ROIs). Self-reported responses were collected on a survey following completion of the task. In Study 2, our predictor variables were the dependent variables from Study 1, and our criterion variables were responses to the Study 2 self-report questionnaires. In Study 3, our predictor variables were the dependent variables from Study 1 (self-report and neural activation to violations of expectations), and our criterion variables were responses to a peer influence questionnaire, and responses to substance use likelihood questionnaires pre- and post-peer influence manipulation task.

Procedure

In Study 1, each target participant brought a same-aged, same-gender close friend to the first of two sessions. At the first session, participants were consented according to ethical standards and guidelines from the University’s Institutional Review Board. During the first
session, the target participants and their friends provided demographic information and completed the Friendship Questionnaire. The session took approximately 20 minutes and both participants received $10.00 compensation for their participation.

Target participants were invited to the Staglin Center for Cognitive Neuroscience between 7 and 14 days after the initial session to participate in the second session and undergo an fMRI scan. While in the scanner, target participants were presented with one item from the Friendship Questionnaire per trial. The trial began with the presentation of the question, followed by the target’s expectation, a jittered inter-stimulus-interval (ISI), their friend’s “response,” a jittered ISI, and a request to press a button to proceed to the next trial followed by a jittered inter-trial-interval (ITI). Participants were allotted a maximum of 5000 ms to press the button before a jittered fixation cross appeared on the screen, and the subsequent trial began (see Chapter 2, Figure 1.1). After participants completed the Social Violations of Expectations task in the scanner, they exited and answered a post-task survey, which reminded them of the questions, their expectations, and their friend’s responses. They reported how they felt after viewing their friend’s response to each item.

At the end of the second session, the target was debriefed and told that the responses they were presented with on the Friendship Questionnaire were not actually from their friend, and instead were manipulated by the research team based on their predictions in an effort to understand how they responded when they were presented with something better than, worse than, or exactly what they expected their friend would report about their friendship. Following debriefing, participants were asked if they had any questions about the study, were paid $45, and thanked for their time.
In Study 2, target participants from Study 1 were invited back to our lab to complete follow-up self-report questionnaires. Participants were told that we were interested in understanding whether their self-reported risk taking and substance use was associated to their responses in the Social Violations of Expectations task. Participants were asked to complete questionnaires on a laptop computer programmed with E-Prime 2.0. They were instructed that they could choose to skip any questions they felt uncomfortable answering, and could ask any questions they had about the items. They were assured all of their responses would be kept confidential.

In Study 3, participants believed a questionnaire (Study 2) terminated prematurely—as the E-Prime task exited mid-session without warning (Figure 3.1). Immediately following the end of Study 2, participants were presented with several open windows on their computer screen, including two open computer folders, a stickie note, and an Excel file titled “kaitlyn study data.” This mock data file was located on the bottom right side of the screen and took up approximately 75% of the screen space. It included an image of an attractive opposite-sex adolescent, along with a bar graph depicting likelihood of self-reported substance use and risk taking—purportedly from Study 2. Participants alerted the experimenter they believed the task completed. The experimenter notified the participant that she would assist them momentarily and attended to the participant 1.5 minutes after notification. Upon viewing the computer screen, the experimenter appeared confused and alarmed, and mentioned she forgot to ask the participant for a personal photograph. She then said the participant should not have seen the data file on the screen and apologized before scrolling through a computer folder pretending to look for a data file. She apologized again and mentioned that it appeared the data from Study 2 did not save, and asked if the participant would not mind completing an abbreviated version of the same questionnaire—
indicating it would only take about 10 minutes (Figure 3.2). All participants agreed to complete the post-peer influence manipulation questionnaire on the same computer. Completion of the questionnaire took approximately 10 minutes, and upon study completion, participants were debriefed about the study goals, paid $30, and were thanked for their time.

*Materials and Apparatus*

**Study 1 (see Chapter 2, Method)**

**Study 2 (see Chapter 3, Method)**

**Study 3**

**Task.** In the questionnaires administered during Study 2, participants completed self-report surveys that assessed their resistance to peer influence (RPI, Steinberg & Monahan, 2007) and likelihood to use substances. The RPI assesses an individual’s ability to resist peer pressure. Participants were posed with two opposing situations and asked to indicate which one best represented them. For example, one item reads: “For some people, it's pretty easy for their friends to get them to change their mind.” OR “For other people, it's pretty hard for their friends to get them to change their mind.” Items were scored on a 4-point scale, with a higher score indicating greater resistance to peer influence; individual composite scores were created by averaging items that were associated with fitting in, going along with a crowd, changing their mind, engaging in bad behavior, and hiding their opinion. An overall composite score was calculated by averaging all ten items.

The Likelihood to Take Risks Questionnaire was administered along with the Drug Use Inventory—Revised (DUSI-R) (Tarter, Kirisci, Habeych, Reynolds, & Vanyukov, 2004) and Ontario Student Drug Use and Health Survey (OSDUHS) (Boak, Hamilton, Adlaf, & Mann, 2013). Between answering questions about their actual substance use, participants were asked
about their likelihood to engage in substance use activities, risk-taking activities, and prosocial activities (Appendix G). A sample item included “If you were given an opportunity to use alcohol, how likely would you be to use it?” Participants responded on a Likert scale from 1 (Definitely would) to 7 (Definitely would not). Responses were recoded (where 7 = “Definitely would” and 1 = “Definitely would not”) and rescored (where 0 = “Definitely Would Not” and 6 = “Definitely Would”). Following presentation of the mock data, participants responded to filler questions about their engagement in other activities (i.e. frequency of visiting social media websites) along with the same likelihood questions administered in Study 2.

**Analyses.** Responses to the RPI, pre-, and post- peer influence manipulation questionnaires were analyzed using SPSS 23.0. In both the pre- and post-peer influence manipulation questionnaire, adolescents reported their likelihood to use Group I (tobacco, alcohol, cannabis); Group II (pain killers, ADHD medication, psilocybin); Group III (spice, MDMA, cocaine); and Group IV (heroin, meth, LSD) substances; to engage in risk-taking activities; to engage in pro-social activities; and to engage in anti-social activities. Data were binned based on the above listed groups, and analyzed by subtracting the likelihood score reported in the pre-peer influence manipulation questionnaire from the likelihood score reported in the post-peer influence manipulation questionnaire, where a -6 change indicated “definitely less likely” and a +6 change indicated “definitely more likely”. A composite Peer Influence score was calculated by averaging the change scores across all activities surveyed.

**Results**

*Study 1*

All results for Study 1 are reported in Chapter 2. Of the previously reported results, we restate notable differences pertinent to Study 3 below.
**Self-Report Questionnaire**

As reported in Study 1, to examine whether there were differences between trial type and information type in the self-report questionnaire following the task, a two-way repeated measures analysis of variance (ANOVA) was performed. This analysis revealed no main effect of trial type ($p > .05$), but a significant main effect of information type, such that participants reported feeling happier when expectations were met ($M = 9.01, SE = .24$) compared to when they were violated ($M = 7.22, SE = .25$) $F(1,23) = 51.56, p < .001$. A significant interaction was also revealed, such that participants reported feeling happier when social expectations were met ($M = 9.51, SE = .12$) compared to when social expectations were violated ($M = 7.21, SE = .20$); and compared to when non-social expectations were met ($M = 8.5, SE = .35$) $F(1,23) = 9.07, p = .006$. (see Chapter 2, Figure 1.3A).

**fMRI Analyses**

fMRI analyses were conducted on *a priori* regions of interest (ROIs) that are implicated in prediction error, specifically, the VS (a region implicated in reward prediction error (Cohen et al., 2010)). We found that for social positive compared to social negative violations, participants recruited the VS (MNI coordinates: $8 \times 8 \times -6; Z = 2.62, p < .05$) (see Chapter 2, Figure 1.4A). For the purposes of this study, we do not focus on other brain regions associated with VoE.

**Study 3**

**Descriptive Reports**

All participants changed at least one of their responses in the post-peer influence manipulation questionnaire. Across all items, 36.84% of participants reported a greater likelihood to engage in behaviors, 63.16% of participants reported a decreased likelihood to engage in behaviors post-manipulation.
Between the categories of questions in the questionnaire, we found that 26.32% of participants reported an increased likelihood to use substances, 57.89% of participants reported a decreased likelihood to use substances, and 15.79% of participants reported no change in likelihood to use substances following the peer influence manipulation. Of the questions pertaining to risk-taking, 15.79% of participants reported a greater likelihood to take risks, 31.58% of participants reported a decreased likelihood to take risks, and 47.37% of participants reported no change in likelihood to take risks following the peer influence manipulation. Of the questions pertaining to antisocial behaviors, no participants reported an increased likelihood to engage in antisocial behaviors, 36.84% of participants reported a decreased likelihood to engage in antisocial behaviors, and 57.89% of participants reported no change in likelihood to engage in antisocial behaviors following the peer influence manipulation. Of the questions pertaining to prosocial behaviors, 42.11% of participants reported an increased likelihood to engage in prosocial behaviors, 21.05% of participants reported a decreased likelihood to engage in prosocial behaviors, and 36.84% of participants reported no change in likelihood to engage in prosocial behaviors following the peer influence manipulation (Figure 3.3A).

Between the groups of substances participants were surveyed on, we found 26.32% of participants reported an increased likelihood to use Group I substances (tobacco, alcohol, cannabis), 21.05% of participants reported a decreased likelihood to use Group I substances, and 52.63% of participants reported no change in likelihood to use Group I substances following the peer influence manipulation. Of the questions pertaining to Group II substance use (Attention-Deficit/Hyperactivity Disorder (ADHD) medication (without a prescription), pain killers, psilocybin), we found 15.79% of participants reported an increased likelihood to use Group II substances, 47.37% of participants reported a decreased likelihood to use Group II substances,
and 36.84% of participants reported no change in likelihood to use Group II substances following the peer influence manipulation. Of the questions pertaining to Group III substance use (spice, methylenedioxymethamphetamine (MDMA), cocaine), we found 15.79% of participants reported an increased likelihood to use Group III substances, 21.05% of participants reported a decreased likelihood to use Group III substances, and 63.15% of participants reported no change in likelihood to use Group III substances following the peer influence manipulation. Of the questions pertaining to Group IV substance use (methamphetamine (meth), heroin, Lysergic acid diethylamide (LSD)), 5.26% of participants reported an increased likelihood to use Group IV substances, 5.26% of participants reported a decreased likelihood to use Group IV substances, and 89.47% of participants reported no change in likelihood to use Group IV substances following the peer influence manipulation (Figure 3.3B).

**Self-Report Questionnaires**

To determine whether there were differences between the type of risky behavior participants responded to in the Likelihood to Take Risks Questionnaire both pre- and post-peer influence manipulation, we conducted a 2 (peer effect (pre-manipulation/post-manipulation)) x 4 (risky behavior (drug use/risk-taking/antisocial/prosocial)) repeated-measures ANOVA. This analysis revealed a significant main effect of peer influence manipulation, such that participants reported a greater likelihood to engage in risky behaviors pre-manipulation ($M = 2.20$, $SE = .17$) compared to post-manipulation ($M = 2.11$, $SE = .16$) $F(1,51) = 5.23$, $p = .035$. There was also a significant main effect of risky behavior, such that participants reported a greater likelihood to engage in prosocial behaviors ($M = 4.57$, $SE = .21$) compared to antisocial behaviors ($M = 1.75$, $SE = 1.19$) $t(18) = 6.89$, $p < .001$; risk-taking ($M = 1.31$, $SE = .70$) $t(18) = 7.55$, $p < .001$; and drug use ($M = .99$, $SE = .23$) $t(18) = 7.48$, $p < .001$; $F(3,51) = 54.36$, $p < .001$. We also found a
significant interaction $F(3,51) = 3.00, p = .039$, where [compared to other risky behaviors] participants reported an increased likelihood to engage in antisocial behaviors prior to the peer influence manipulation ($M = 1.89, SE = .27$) and a decreased likelihood to engage in antisocial behaviors following the peer influence manipulation ($M = 1.61, SE = .27$) $t(17) = 2.76, p = .016$ (Figure 3.4). We also found a significant effect of gender when controlling for age, such that male participants reported a decrease in likelihood to use substances ($M = -.36, SE = .12$) compared to female participants, who reported an increase in likelihood to use substances ($M = .12, SE = .10$) following the peer influence manipulation $F(1,16) = 9.55, p = .007$.

To assess whether participants reported an increase in likelihood to use different types of substances following the peer influence manipulation, we performed a 2 (peer influence manipulation (pre/post manipulation)) x 4 (drug type (Group I/II/III/IV)) repeated measures ANOVA. There was no significant main effect of peer influence manipulation $F(1,18) = 1.43, p = .248$; though a significant main effect of drug type was revealed, such that participants reported a greater likelihood to use Group I (tobacco, alcohol, cannabis) ($M = 2.19, SE = .38$) compared to Group II (pain killers, ADHD medication, psilocybin) ($M = 1.47, SE = .43$), Group III (spice, MDMA, cocaine) ($M = .81, SE = .33$), and Group IV (heroin, meth, LSD) ($M = .56, SE = .33$) drugs $F(3,54) = 19.06, p < .001$. A moderately significant interaction was also revealed $F(3,54) = 2.75, p = .052$, such that participants reported a greater likelihood to use Group II substances (pain killers, ADHD medication, psilocybin) pre-peer influence manipulation ($M = 1.65, SE = .44$) compared to post-peer influence manipulation ($M = 1.28, SE = .44$) $t(18) = 2.05, p = .056$ (Figure 3.5). There were no differences between other substances for pre- and post-manipulation reports, or effects of gender.

**Correlational Analyses**
Bivariate correlational analyses were performed to determine if there were associations between neural responses to violations of expectations in Study 1, and RPI, and pre- and post-peer influence manipulation responses to the Likelihood to Take Risks Questionnaire in Study 3. This analysis revealed a significant association between self-reported happiness in Study 1 when expectations were violated to going along with the crowd in the RPI measure, such that participants who were happier upon experiencing a violation of expectations were less resistant to peer influence and more likely to go along with the crowd (as measured by the RPI) \( r(19) = -.52, p = .023 \). Participants who were happier when expectations were met were also less resistant to peer influence and more likely to go along with the crowd (as measured by the RPI) \( r(19) = -.61, p = .005 \). Participants who demonstrated increased ventral striatal response to violations of expectations were more resistant to peer influence in hiding their opinion (as measured by the RPI) \( r(19) = .61, p = .006 \). Participants who demonstrated increased ventral striatal response when expectations were met were less resistant to peer influence in fitting in with others (as measured by the RPI) \( r(19) = -.61, p = .006 \) and demonstrated an increase in their likelihood to use Group I substances (tobacco, alcohol, cannabis) following the peer influence manipulation \( r(19) = .53, p = .019 \). Participants who were less resistant to peer influence in fitting in with others (as measured by the RPI) demonstrated an increase in their likelihood to use Group I substances (tobacco, alcohol, cannabis) following the peer influence manipulation \( r(19) = -.69, p < .001 \) (Figure 3.6A). Participants who were less resistant to peer influence in engaging in wrongful behaviors (as measured by the RPI) demonstrated an increase in their likelihood to engage in risk-taking following the peer influence manipulation \( r(18) = -.71, p = .001 \). Participants who were less resistant to peer influence (as measured by the RPI) demonstrated an increase in likelihood to use Group II substances (pain killers, ADHD medication, psilocybin)
following the peer influence manipulation $r(19) = -.68, p = .001$ (Figure 3.6B). All correlational analyses are depicted in Table 3.1.

Discussion

The goal of this study was to determine whether self-reported susceptibility to peer influence was associated with experimentally manipulated peer influence, and associate ventral striatal activation in response to violations of expectations with susceptibility to peer influence. We found that participants modified their responses following the peer influence manipulation. Additionally, we found self-reported susceptibility to peer influence was associated with experimentally manipulated peer influence. We also found that participants who demonstrated increased ventral striatum activation in response to experiencing a violation of expectations were more likely to share their opinions with their friends, as indicated in the Resistance to Peer Influence questionnaire.

To our knowledge, our study is the first to validate this measure with an experimental manipulation pertaining to real-world behaviors in an adolescent sample. Specifically, we found that participants who were more susceptible to peer influence with regard to fitting in with others reported an increase in likelihood to use Group I substances (tobacco, alcohol, cannabis) following the peer influence manipulation. Reports on adolescent substance use indicate that adolescents use more Group I substances (tobacco, alcohol, cannabis) than other substances (Kann et al., 2014) and are more likely to try these types of substances if they are susceptible to peer influence (Brechwald & Prinstein, 2011; Dishion, Spracklen, Andrews, & Patterson, 1996). We posit that adolescents who are eager to fit in with other peers are likely to consider engagement in socially acceptable behaviors they believe their peers engage in (Brechwald & Prinstein, 2011; Cohen & Prinstein, 2006), which in this study, resulted in reporting a likelihood
to use socially acceptable substances. This echoes previous literature suggesting adolescents are likely to use substances if a well liked or high status peer is using substances (Bot et al., 2001). This suggests that explicit peer influence is not necessary for adolescents to modify their behavior; instead, subtly providing information may be sufficient for adolescents to reconsider their own likelihood to engage in risky behaviors. We expect that in accordance with the literature, if adolescents’ own friends endorsed socially acceptable substance use, adolescents would also endorse using substances (Andrews et al., 2002).

We found that adolescents who were susceptible to peer influence (as measured by the Resistance to Peer Influence questionnaire) reported an increased likelihood to engage in risky behaviors—such as using Group II substances (ADHD medication, pain killers, psilocybin) following the peer influence manipulation. Previous research has indicated that adolescents who are likely to use these types of substances are susceptible to peer influence and may also have low self-esteem (Kaplan, Martin, & Robbins, 1984), be rejected or bullied by other peers (Juvonen & Galván, 2008), have greater access to these types of substances (Harrison et al., 2000; Resnick et al., 1997), and may be more likely to take risks (Gardner & Steinberg, 2005)—all of which may be moderators of likelihood to use substances that have greater consequences and are less socially acceptable than alcohol, tobacco, or cannabis. Additionally, we found participants who had decreased self-reported happiness when they received social feedback from Study 1 (the Violations of Expectations task) were more likely to go along with the crowd—as measured by the Resistance to Peer Influence questionnaire, perhaps because unhappy adolescents preferred to rely upon others rather than risk rejection (Juvonen & Galván, 2008) and experience additional unhappiness. We suggest future research disentangle the mechanisms that
lead adolescents to considering socially acceptable substance use compared to socially unacceptable/illegal substance use.

All participants modified their responses to the Likelihood to Take Risks questionnaire following the peer influence manipulation. This result is the first to replicate that of the study by Allen and colleagues (Allen et al., 2006), whereby adolescents modified their responses after viewing a peer’s responses. However, upon further examination, we found that rather than reporting a greater likelihood to engage in risky behaviors, in general, adolescents reported a decreased likelihood to engage in risky behaviors following the peer influence manipulation. We suspect that viewing an opposite-sex peer’s responses led participants to respond more conservatively than they reported prior to the peer influence manipulation because they may have been concerned another peer was going to view their data (as the data on the screen was presented to be another participant’s data). Thus, they may have been more eager to shield their actual behaviors rather than endorse riskier behaviors, fearing judgment (Downey, Bonica, & Rincon, 1999).

There were gender differences in response to peer influence manipulation, where males reported a decrease in likelihood to engage in substance use, females endorsed an increase in likelihood to engage in substance use. We suspect participants responded in a fashion that was more aligned with how they expected a peer of the opposite-sex to respond—in this case, less risky for males, and riskier for females (Spigner, Hawkins, & Lorens, 1993). Interestingly, this difference did not extend beyond substance use. Research has suggested that adolescents perceive out-group others as using substances differently than they do (Helms et al., 2014), though it is unclear whether this extends to other types of risk-taking. Given the prevalence of Group I substance use presented to participants compared to the other risks, it may be the case
that modifying that behavior was due to the salience of that item compared to the others. We also found participants were less likely to engage in antisocial behaviors following the peer influence manipulation. We suspect that the image of an attractive peer was a cue that became salient to the participant during the post-manipulation, and participants were less inclined to report being likely to engage in antisocial behaviors, as researchers have demonstrated that viewing an image of a peer encourages people to be prosocial (van't Wout & Sanfey, 2008).

Participants who demonstrated increased ventral striatum activation reported they would share their opinion with peers (as measured by the Resistance to Peer Influence questionnaire). Researchers have posited that adolescents who recruit the ventral striatum are also motivated by reward (Silverman, Jedd, & Luciana, 2015; Somerville, Jones, & Casey, 2010) and social feedback (Jones et al., 2014). We suggest participants who reported being bold enough to voice their opinions to their peers were eager to test their social climate and found reward in receiving social feedback (Jones et al., 2014; Powers, Somerville, Kelley, & Heatherton, 2013)—thereby demonstrating greater ventral striatum activation.

While our study has many notable strengths, we acknowledge its weaknesses—specifically, our small sample size. We recognize few generalizations can be made with a sample of 19 adolescents; however, an a priori power analysis indicated a sample of 18 participants would be sufficient to conclude significant differences. Our experimental peer influence manipulation, while novel, has limitations, such as we did not measure whether or how attractive participants believed the photographs of the “peer” in manipulation to be. Additionally, we were not able to time how long participants viewed the data and photograph on the screen, though we did monitor participants from our periphery to ensure they saw the monitor before the experimenter approached them to proceed. We are unable to draw conclusions about whether an
opposite-sex peer is more influential than a same-sex peer because we did not have a comparison condition in our study. However, our study is the first to successfully introduce an opposite-sex peer influence manipulation in an adolescent sample. Future studies should examine whether a same-sex or opposite-sex peer influences adolescents differentially. While we find our result pertaining to ventral striatum activation enticing, we hesitate to draw broad conclusions, as the variation in self-reported resistance to peer influence is slight. We suggest future research enroll a larger sample to test the differences, and perhaps focus on collecting self-esteem and risk preference information to determine whether these indices moderate or predict experimentally manipulated and self-reported susceptibility to peer influence.

The present study validated the Resistance to Peer Influence questionnaire by using an experimentally manipulated peer influence task that asked adolescents about their real-world social behaviors. While other studies have manipulated peer influence in adolescence, we successfully did so in an ecologically valid manner—by collecting information from adolescents regarding their likelihood to engage in risky social behaviors typical of teenagers. While overall self-reported peer influence was not directly associated with experimentally manipulated peer influence, we found variation within question types, such that specific types of peer influence (e.g. eagerness to fit in, going along with the crowd) were more predictive of changes in specific behaviors (e.g. likelihood to use substances). We propose that adolescents demonstrated greater variability within these types of questions because they are not susceptible to all forms of risk taking, and do not partake in all types of risks. We conclude that adolescents who are more susceptible to peer influence are more considerate of their peers’ perspectives and have a greater desire to be accepted socially—leading to an increased likelihood to engage in behaviors adolescents believe their peers endorse.
Figure 3.1.

Task schematic.
Figure 3.2.

Timeline of Study 3.

<table>
<thead>
<tr>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-manipulation questionnaire (45 minutes)</td>
<td>Peer Influence Manipulation</td>
</tr>
<tr>
<td>Task ends prematurely (1 minute)</td>
<td>Participant notifies experimenter (2 minutes)</td>
</tr>
<tr>
<td></td>
<td>Experimenter addresses participant (2 minutes)</td>
</tr>
<tr>
<td></td>
<td>Post-manipulation questionnaire (10 minutes)</td>
</tr>
</tbody>
</table>
Figure 3.3.

Percentage of participants likely to engage in behaviors following the peer influence manipulation.

A.

B.

Figure 3.3. Percentage of participants reporting changes in likelihood to engage in behaviors following the peer influence manipulation. A. Most participants reported an increased likelihood
to engage in prosocial behaviors, and a decrease in likelihood to use substances following the peer influence manipulation. **B.** Most participants reported no change in likelihood to use Group IV substances, an increased likelihood to use Group I substances, and a decreased likelihood to use Group II substances following the peer influence manipulation.
Figure 3.4.

Self-reported likelihood to engage in various risk-taking behaviors pre- and post-peer influence manipulation.

---

Figure 3.4. Participants’ self-reported likelihood to engage in risky behaviors pre- and post-peer influence manipulation. Participants reported a greater likelihood to engage in behaviors pre-manipulation ($M = 2.20, SE = .17$) compared to post-manipulation ($M = 2.11, SE = .16$) $F(1,51) = 5.23, p = .035$. They also reported a greater likelihood to engage in prosocial behaviors ($M = 4.57, SE = .21$) compared to other risky behaviors $F(3,51) = 3.00, p = .039$. Post-hoc paired-samples t-tests revealed significant differences between likelihood to engage in prosocial behaviors compared to antisocial behaviors ($M = 1.75, SE = 1.19$) $t(18) = 6.89, p < .001$; risk-taking ($M = 1.31, SE = .70$) $t(18) = 7.55, p < .001$; and drug use ($M = .99, SE = .23$) $t(18) = 7.48$. A significant interaction was revealed such that participants reported an increased likelihood to engage in antisocial behaviors pre-manipulation ($M = 1.89, SE = .27$) compared to post manipulation ($M = 1.61, SE = .27$) $F(3,51) = 3.00, p = .039$. 

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Figure 3.5. Participants’ self-reported likelihood to use substances pre- and post-peer influence manipulation. A significant main effect was revealed such that participants reported a greater likelihood to use Group I ($M = 2.19$, $SE = .38$) compared to Group II ($M = 1.47$, $SE = .43$) $t(18) = 2.82$, $p = .011$; Group III ($M = .81$, $SE = .33$) $t(18) = 6.19$, $p < .001$; and Group IV ($M = .56$, $SE = .33$) $t(18) = 6.20$, $p < .001$ drugs $F(3, 54) = 19.06$, $p < .001$. Post hoc paired-samples t-tests revealed participants reported a greater likelihood to use Group II compared to Group III $t(18) = 2.81$, $p = .012$; and Category IV $t(18) = 3.22$, $p = .005$ substances. A moderately significant interaction was revealed, such that participants reported a greater likelihood to use Group II substances pre-peer influence manipulation ($M = 1.65$, $SE = .44$) compared to post-peer influence manipulation ($M = 1.28$, $SE = .44$) $t(18) = 2.05$, $p = .056$. 

*Self-reported likelihood to use substances pre- and post-peer influence manipulation.*
Figure 3.6.  

Self-reported Resistance to Peer Influence (RPI) scores and change in likelihood to use substances based on pre- and post-peer influence manipulation responses.

A.

![Figure A](image.png)

B.

![Figure B](image.png)

Figure 3.6. Associations between the Resistance to Peer Influence (RPI) scale and change in likelihood to use substances following the peer influence manipulation. A. Participants who were less resistant to peer influence (specifically, fitting in with a crowd) were reportedly less likely to
use Group I substances following the peer influence manipulation $r(19) = -.69$, $p = .001$. B. Participants who were less resistant to peer influence reported a greater likelihood to use Group II substances following the peer influence manipulation $r(19) = -.68$, $p = .001$. 
Table 3.1.

Correlations between self-report and neural responses to Violations of Expectations (VoE) from Study 1; and self-reported responses to the Resistance to Peer Influence (RPI) questionnaire and likelihood to use substances pre- and post-peer influence manipulation.

<table>
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<tr>
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<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Happiness: Violations</td>
<td>0.22</td>
<td></td>
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<td></td>
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<tr>
<td>2. Happiness: Expectations Met</td>
<td></td>
<td>0.22</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3. VS: Violations</td>
<td>-0.17</td>
<td>-0.29</td>
<td></td>
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<td>4. VS: Expectations Met</td>
<td>-0.33</td>
<td>-0.13</td>
<td>0.15</td>
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<tr>
<td>5. RPI: Go Along</td>
<td>*-0.52</td>
<td>**-0.61</td>
<td>0.23</td>
<td>0.13</td>
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<tr>
<td>6. RPI: Fitting in</td>
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<td>-0.24</td>
<td>-0.04</td>
<td>**-0.61</td>
<td>-0.07</td>
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<td>7. RPI: Doing Wrong</td>
<td>-0.17</td>
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<td>-0.03</td>
<td>0.32</td>
<td>0.05</td>
<td>-0.25</td>
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<tr>
<td>8. RPI: Hiding Opinion</td>
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<td>**0.61</td>
<td>0.20</td>
<td>-0.14</td>
<td>-0.12</td>
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<td>9. RPI Total</td>
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<td>0.34</td>
<td>0.44</td>
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<td>10. Risk-taking Change Score</td>
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<td>0.19</td>
<td>0.14</td>
<td>-0.14</td>
<td>-0.10</td>
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<td>***-0.71</td>
<td>0.03</td>
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<tr>
<td>11. Group I Substances Change Score</td>
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<td>0.33</td>
<td>-0.28</td>
<td>*0.53</td>
<td>-0.18</td>
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<td>12. Group II Substances Change Score</td>
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<td>-0.12</td>
<td>-0.31</td>
<td>***-0.68</td>
<td>-0.004</td>
<td>-0.09</td>
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</tbody>
</table>

Note. * p < .05, ** p < .01, *** p < .001.

Table 3.1 Key. 1. Happiness: Violations = self-reported happiness in Study 1 when participants experienced a violation of their expectations. 2. Happiness: Expectations Met = self-reported happiness in Study 1 when participants’ expectations were met. 3. VS: Violations = ventral striatum activation in Study 1 when participants experienced a violation of their expectations. 4. VS: Expectations Met = ventral striatum activation in Study 1 when participants’ expectations were met. 5. RPI: Go Along = Composite score from Resistance to Peer Influence (RPI) questionnaire pertaining to questions that asked about going along with a group decision. 6. RPI: Fitting In = Composite score from RPI questionnaire pertaining to questions that asked about fitting in with peers. 7. RPI: Doing Wrong = Composite score from RPI questionnaire pertaining to questions that asked about engaging in wrongful acts. 8. RPI: Hiding Opinion = Composite score from RPI questionnaire pertaining to questions that asked about hiding a personal opinion from others. 9. RPI Total = Total composite score from all items on the RPI questionnaire. 10.
Risk-taking Change Score = Difference score between the post-peer influence manipulation and the pre-peer influence manipulation regarding likelihood to engage in risk-taking activities. 11.

Group I Substances Change Score = Difference score between the post-peer influence manipulation and the pre-peer influence manipulation regarding likelihood to use Group I substances. 12. Group II Substances Change Score = Difference score between the post-peer influence manipulation and the pre-peer influence manipulation regarding likelihood to use Group II substances.
Chapter 5

Conclusion
Interacting with peers is critical for social development, and how one chooses to respond to peer feedback may have significant implications for adolescents, particularly because of the heightened experimentation with drugs of abuse and peer influence during this developmental window. Sensitivity to peer feedback, peer influence, and substance use do not occur independently during adolescence; but surprisingly, these phenomena are often assessed independently of one another. In the last decade or so, research using brain imaging has revealed the neural substrates that might underlie these characteristic adolescent behaviors. One region in particular, the ventral striatum, has been linked to risk taking (Galvan et al., 2007; Spicer et al., 2007) and susceptibility to peer influence (Pfeifer et al., 2011). This dissertation makes a novel contribution to the literature in that it associates ventral striatum response to social violations of expectations with self-reported real-world social behaviors in adolescents.

This dissertation implemented multiple methodologies, including self-report, novel experimental designs, and fMRI to examine how adolescents respond to peer feedback, and whether their response is associated with their real-world social behaviors. Results indicate that adolescents prefer to learn they are accurate about their expectations that pertain to their friendship, over and above learning something better than expected from a friend (Chapter 2). This suggests a social violation of expectations from a friend is not necessarily a welcomed experience for an adolescent, perhaps because adolescents encounter an abundance of social uncertainty in their daily lives (both positive and negative) and are on alert for violations in their social encounters in an effort to adjust their behavior to fit in with their peers. However, a positive violation of expectations from an unknown other may be a welcomed experience by comparison (Jones et al., 2014) because adolescents would have fewer relationship priors by which to set their expectations. Thus, for unknown peers, we suggest positive violations of
expectations may be rewarding to an adolescent, while for well-known peers, non-violations of expectations are more rewarding by comparison. It is then likely that learning they are accurate about their social expectations within their friendship is somewhat of a “relief” signal (Leknes et al., 2011), whereby adolescents do not need to make the cognitive effort to update their expectations about a relationship that is important to them. It is unknown whether there are developmental differences in meeting or exceeding expectations within a close friendship. We suggest future studies examine differences in meeting/positively violating expectations in an adolescent and adult sample between close friends and unknown-peers to elucidate these supposed differences, as this information may have implications for further identifying a sensitive period for social learning.

This study also revealed increased activation in the ventral striatum for positive social violations of expectations, and increased activation in the insula and subgenual anterior cingulate cortex for negative social violations of expectations, though not for non-social violations of expectations. Taken together with self-reported happiness, these results suggest that during adolescence, learning a friend said something better than expected about the friendship is rewarding, while learning a friend said something worse than expected about the friendship is disconcerting by comparison. This study presents novel fMRI and self-report results comparing valence of social statements, and suggests that adolescents are sensitive (neurobiologically, behaviorally, and emotionally) to social feedback from a friend. In addition to the neurobiological and self-reported happiness results, this study revealed that adolescents were fastest when their expectations were increasingly positively exceeded. This result could have implications for understanding adolescent behavior in an affective context, where experiencing a negative social violation of expectations from a friend may give a teenager reason to pause and
update his expectations; a social positive violation of expectations from a friend may accelerate decision-making in a social context. Future research should consider assessing the differences between positive social violations of expectations, and meeting social expectations within a close friendship in adolescents—while both may be rewarding, the violation magnitude of the former may be more inherently confusing or conflicting, and result in more impulsive behavior.

Ventral striatum response to violations of expectations from a friend was found to be associated with real-world socially acceptable substance use, as reported by adolescents (Chapter 3). Categorically defining substances by which are “socially acceptable” compared to those that are less socially acceptable or are perceived to have greater consequences by comparison may elucidate distinct differences in the association of recruited brain regions or behavioral differences. Most research has associated ventral striatum response to general substance use (Hyman et al., 2006; May et al., 2004), including drugs not frequently used by adolescents. Because adolescents report using alcohol, tobacco, and cannabis more so than other substances (Kann et al., 2014), this association suggests that the rewarding experience of using these substances transcends the neurochemical rewarding effects of them and perhaps permeates the rewarding experience of social interactions. In addition to the results presented in Chapter 3, this also suggests that substance use would not be as rewarding to adolescents if it was independent of social factors, and that the interaction of using these substances that are socially acceptable exacerbates the reward response.

The aforementioned theory is supported by the results reported in Chapter 4, such that the adolescents who reported using socially acceptable substances reported being susceptible to peer influence and demonstrated susceptibility to experimentally manipulated peer influence, indicating they cared about being accepted by their peers, using substances perhaps as a means to
be accepted by their peers and experience a greater sensation of reward. The experimental peer influence task was validated by the self-report resistance to peer influence measure, contributing to the literature in suggesting likelihood to use socially acceptable substances (alcohol, tobacco, cannabis) increases the more adolescents demonstrate a desire to fit in. Thus, adolescents who avoid using these types of substances may not care as much about peer acceptance and social status amongst their peers—perhaps finding reward either in prosocial (Telzer, Fuligni, Lieberman, & Galván, 2013) or academic (Diego, Field, & Sanders, 2003; Hussong, 2002) activities; while adolescents who use substances that are less socially acceptable by comparison may find more reward in using substances than the contextual factors associated with them (Trezza, Damsteegt, Achterberg, & Vanderschuren, 2011)—suggesting environmental and historical factors may contribute to these individual differences (Conrod & Nikolaou, 2016; Mackey et al., 2016). This suggests that using tobacco, alcohol, and cannabis occurs in adolescence due to the socially rewarding experience that is associated with them. While novel, the social violations of expectations task used in Study 1 precludes us from identifying whether ventral striatal response to social or non-social reward may be more closely associated with self-reported substance use and susceptibility to peer influence—as it is a social task. While our data suggest ventral striatum activation to social violations is associated with the aforementioned variables, future studies should consider implementing a social and non-social design to compare whether ventral striatum activation to rewarding social feedback (compared to rewarding non-social feedback) is more closely associated with likelihood to use substances and succumb to peer influence.

Taken together, this research suggests ventral striatal response to social feedback from a friend is associated with self-reported real world socially rewarding behaviors. Future research
should consider developing a model to examine adolescent responses to socially rewarding experiences as a predictor of behaviors that occur in social contexts, such as using socially acceptable substances and succumbing to peer influence. This association trifecta provides essential insight into adolescent risk taking, suggesting that beyond the chemical properties of reward, social feedback may exacerbate the experience of reward in adolescence, such that adolescents who care to be accepted by their peers and are attuned to peer feedback are more likely to engage in socially accepting (and sometimes risky) behaviors.

This research has important implications for examining real world behaviors through a violations of expectations framework. Results from all three studies indicate there may be distinct types of adolescents—those who are already using socially acceptable substances and require a greater violation of expectations to experience reward; and those who are likely to use socially acceptable substances, are susceptible to peer influence, and require a decreased violation of expectations to experience reward by comparison. Using this basic social learning construct may function as an aid in predicting which adolescents may fit into either group, and whether the adolescents who are susceptible to peer influence eventually become more resistant to it, and require a greater social violation of expectations in order to experience the sensation of reward in a social context.
Appendix A.

Example of the Friendship Questionnaire.

1) Adriana thinks I’m a nice person.
   1 2 3 4 5 6 7 8 9 10
   (Not at all true) (Sometimes true) (Definitely true)

2) Our friendship is strong.
   1 2 3 4 5 6 7 8 9 10
   (Not at all true) (Sometimes true) (Definitely true)

3) We cooperate with each other.
   1 2 3 4 5 6 7 8 9 10
   (Never) (Sometimes) (Always)

4) We figure out ways to get out of trouble together.
   1 2 3 4 5 6 7 8 9 10
   (Not at all true) (Sometimes true) (Definitely true)

5) Adriana would like me even if others didn’t.
   1 2 3 4 5 6 7 8 9 10
   (Not at all true) (Sometimes true) (Definitely true)

6) We are like family.
   1 2 3 4 5 6 7 8 9 10
   (Not at all true) (Sometimes true) (Definitely true)

7) I apologize when I hurt Adriana’s feelings.
   1 2 3 4 5 6 7 8 9 10
   (Not at all true) (Sometimes true) (Definitely true)
8) Other people want to be more like us than we want to be like them.

   1  2  3  4  5  6  7  8  9  10
   (Not at all true) (Sometimes true) (Definitely true)

9) Adriana knows I would stick up for him/her if I heard a rumor about him/her.

   1  2  3  4  5  6  7  8  9  10
   (Not at all true) (Sometimes true) (Definitely true)

10) Our friendship is acceptable by Adriana’s family.

   1  2  3  4  5  6  7  8  9  10
   (Not at all true) (Sometimes true) (Definitely true)

11) We would do anything for each other.

   1  2  3  4  5  6  7  8  9  10
   (Not at all true) (Sometimes true) (Definitely true)

12) We take risks to try and impress other people.

   1  2  3  4  5  6  7  8  9  10
   (Not at all true) (Sometimes true) (Definitely true)

13) Adriana thinks I’m smart.

   1  2  3  4  5  6  7  8  9  10
   (Not at all true) (Sometimes true) (Definitely true)

14) Adriana likes horses.

   1  2  3  4  5  6  7  8  9  10
   (Not at all true) (Sometimes true) (Definitely true)
15) **We stand up for each other when one of us is picked on.**

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16) **Adriana thinks I am well liked by other people in school.**

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17) **If Adriana is in trouble, s/he knows I would help him/her.**

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18) **Adriana can count on me to keep promises.**

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19) **Adriana has allergies.**

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20) **Adriana says nice things about me.**

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21) **Adriana likes gym class.**

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22) **We will do something we don’t really want to do if it means we’ll be accepted.**

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23) Adriana thinks I've spread rumors about him/her.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

24) We make up easily when we get in a fight.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

25) Adriana thinks I have trouble fitting in.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

26) Adriana doesn’t like country music.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

27) Adriana thinks I say mean things about him/her to other people.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

28) We are bullied.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

29) We tell each other the truth, no matter what.

1 2 3 4 5 6 7 8 9 10
(Never) (Sometimes) (Always)

30) Adriana thinks I’m good looking.

1 2 3 4 5 6 7 8 9 10
(Not at all true) (Sometimes true) (Definitely true)
31) Adriana thinks I have nice things.

1 2 3 4 5 6 7 8 9 10
(Not at all true) (Sometimes true) (Definitely true)

32) We give each other advice to figure things out.

1 2 3 4 5 6 7 8 9 10
(Not at all true) (Sometimes true) (Definitely true)

33) Adriana is afraid of needles.

1 2 3 4 5 6 7 8 9 10
(Not at all true) (Sometimes true) (Definitely true)

34) We tell each other about our problems.

1 2 3 4 5 6 7 8 9 10
(Not at all true) (Sometimes true) (Definitely true)

35) We are great friends.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

36) Adriana thinks the things I like are cool.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

37) Adriana thinks I bug him/her a lot.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)

38) Adriana thinks I have cool clothes.

1 2 3 4 5 6 7 8 9 10
(Not true at all) (Sometimes true) (Definitely true)
39) **We follow the lead of more popular kids.**

    1  2  3  4  5  6  7  8  9  10
    (Not true at all)  (Sometimes true)  (Definitely true)

40) **We share secrets with each other.**

    1  2  3  4  5  6  7  8  9  10
    (Never)  (Sometimes)  (Always)

**Key**
Closeness items: 2, 3, 6, 7, 10, 11, 18, 24, 29, 32, 34, 35, 37, 40
Non-Social items: 14, 19, 21, 26, 33
Peer items: 4, 5, 8, 9, 12, 15, 16, 17, 20, 22, 23, 25, 27, 28, 39
Personal items: 1, 13, 30, 31, 36, 38
Appendix B.

Example of the Non-Social Predictions Questionnaire.

For the first 5 statements in each category, please circle on the scale the likelihood you believe each of the below events will occur in Westwood/on UCLA campus four days from now. For the last 5 statements in each category, circle the number that corresponds to your guess for each question.

WEATHER

1) Is it going to rain?

1  2  3  4  5  6  7  8  9  10
Definitely Not  Definitely So

2) Is it going to be sunny?

1  2  3  4  5  6  7  8  9  10
Definitely Not  Definitely So

3) Will there be an earthquake in a 50 mile radius?

1  2  3  4  5  6  7  8  9  10
Definitely Not  Definitely So

4) Will wind gusts exceed 5 mph?

1  2  3  4  5  6  7  8  9  10
Definitely Not  Definitely So

5) Will the waves in Santa Monica exceed 3 feet?

1  2  3  4  5  6  7  8  9  10
Definitely Not  Definitely So

6) What will the high air temperature be?

61  62  63  64  65  66  67  68  69  70

7) What will the nearest earthquake magnitude (in the units listed below) be to UCLA?

1.1  1.2  1.3  1.4  1.5  1.6  1.7  1.8  1.9  2.0

8) How much rain (in inches) will have accumulated for the year?

4.7  4.8  4.9  5.0  5.1  5.2  5.3  5.4  5.5  5.6

9) How high will the highest wind gust be (in mph)?

3  4  5  6  7  8  9  10  11  12

10) What will the high water temperature be?

55  56  57  58  59  60  61  62  63  64
TRAFFIC

11) Will there be a traffic accident in Westwood?

1 2 3 4 5 6 7 8 9 10
Definitely Not Definitely So

12) Will there be a special event on campus?

1 2 3 4 5 6 7 8 9 10
Definitely Not Definitely So

13) Will a traffic light go out?

1 2 3 4 5 6 7 8 9 10
Definitely Not Definitely So

14) Will someone be issued a ticket for jay walking?

1 2 3 4 5 6 7 8 9 10
Definitely Not Definitely So

15) Will a Metro bus break down in Westwood?

1 2 3 4 5 6 7 8 9 10
Definitely Not Definitely So

16) How many traffic accidents will occur?

0 1 2 3 4 5 6 7 8 9

17) How many events will be on campus?

0 1 2 3 4 5 6 7 8 9

18) How many traffic lights will be out?

0 1 2 3 4 5 6 7 8 9

19) How many tickets will be issued for jay walking?

0 1 2 3 4 5 6 7 8 9

20) How many busses will break down in Westwood?

0 1 2 3 4 5 6 7 8 9

CRIME

21) Will there be a robbery on campus?

1 2 3 4 5 6 7 8 9 10
Definitely Not Definitely So
22) Will someone find their car broken into?
   
   1 2 3 4 5 6 7 8 9 10
   Definitely Not Definitely So

23) Will someone report a missing laptop?

   1 2 3 4 5 6 7 8 9 10
   Definitely Not Definitely So

24) Will someone report a phishing attack?

   1 2 3 4 5 6 7 8 9 10
   Definitely Not Definitely So

25) Will someone be assaulted?

   1 2 3 4 5 6 7 8 9 10
   Definitely Not Definitely So

26) How many robberies will occur on campus?

   0 1 2 3 4 5 6 7 8 9

27) How many cars will be broken into?

   0 1 2 3 4 5 6 7 8 9

28) How many laptops will be reported missing?

   0 1 2 3 4 5 6 7 8 9

29) How many people will have fallen for a phishing attack?

   0 10 20 30 40 50 60 70 90 100

30) How many people will have been assaulted?

   0 1 2 3 4 5 6 7 8 9

PHILANTHROPY

31) Will someone find a missing dog?

   1 2 3 4 5 6 7 8 9 10
   Definitely Not Definitely So

32) Will someone give a homeless person $20?

   1 2 3 4 5 6 7 8 9 10
   Definitely Not Definitely So
33) Will someone give a meal to someone in need?

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34) Will UCLA receive an endowment exceeding $20,000?

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35) Will a parking enforcer choose not to ticket an illegally parked car?

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36) How many dogs will be found?

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

37) How many homeless people will be given money?

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

38) How many homeless people will be fed?

|   | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

39) How many endowments will UCLA receive?

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

40) How many people will not receive tickets for having parked illegally?

|   | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
Appendix C.

*Example of the Rejection Sensitivity Questionnaire for Adolescents.*

Each of the items below describes things college students sometimes ask of other people. Please imagine that you are in each situation. You will be asked to answer the following questions:

1) How concerned or anxious would you be about how the other person would respond?

2) How do you think the other person would be likely to respond?

### 1. You ask someone in class if you can borrow his/her notes.

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<tr>
<th>How concerned or anxious would you be over whether the person would want to lend you his/her notes?</th>
<th>very unconcerned</th>
<th>very concerned</th>
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<td>1 2 3 4 5 6</td>
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I would expect that the person would willingly give me his/her notes.

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<th>I would expect that the person would willingly give me his/her notes.</th>
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### 2. You ask a new group of friends if you can sit with them at lunch.

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<th>How concerned or anxious would you be over whether they would let you join them?</th>
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<th>very concerned</th>
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I would expect that they would let me join them.

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<th>I would expect that they would let me join them.</th>
<th>very likely</th>
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### 3. You ask your parents for help in deciding what classes to take or colleges to apply to.

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<th>How concerned or anxious would you be over whether your parents would want to help you?</th>
<th>very unconcerned</th>
<th>very concerned</th>
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I would expect that they would want to help me.

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<tr>
<th>I would expect that they would want to help me.</th>
<th>very likely</th>
<th>very unlikely</th>
</tr>
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<td>1 2 3 4 5 6</td>
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### 4. You ask someone you don’t know well out on a date.

<table>
<thead>
<tr>
<th>How concerned or anxious would you be over whether the person would want to go out with you?</th>
<th>very unconcerned</th>
<th>very concerned</th>
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<td></td>
<td>1 2 3 4 5 6</td>
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I would expect that the person would want to go out with me.

<table>
<thead>
<tr>
<th>I would expect that the person would want to go out with me.</th>
<th>very likely</th>
<th>very unlikely</th>
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<td></td>
<td>1 2 3 4 5 6</td>
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</table>
5. Your boyfriend/girlfriend has plans to go out with friends tonight, but you really want to spend the evening with him/her, and you tell him/her so.

How concerned or anxious would you be over whether or not your boyfriend/girlfriend would decide to stay in? very unconcerned very concerned

I would expect that the person would willingly choose to stay in.

6. You ask your parents for extra spending money.

How concerned or anxious would you be over whether or not your parents would help you out? very unconcerned very concerned

I would expect that my parents would not mind helping me out.

7. After class, you tell your teacher that you have been having some trouble with a section of the course and ask if he/she can give you some extra help.

How concerned or anxious would you be over whether or not your professor would want to help you out? very unconcerned very concerned

I would expect that my professor would want to help me out.

8. You approach a close friend to talk after doing or saying something that seriously upset him/her.

How concerned or anxious would you be over whether or not your friend would want to talk with you? very unconcerned very concerned

I would expect that he/she would want to talk with me to try to work things out.

9. You pass a note to someone in one of your classes.

How concerned or anxious would you be over whether or not he/she would write back? very unconcerned very concerned

I would expect that he/she would write back.
10. After graduation, you ask your parents if you can live at home for a while.

How concerned or anxious would you be over whether or not your parents would want you to come home? very unconcerned very concerned

I would expect I would be welcome at home. very likely very unlikely

11. You ask your friend to go on a vacation with you over Spring Break.

How concerned or anxious would you be over whether or not your friend would want to go with you? very unconcerned very concerned

I would expect that he/she would want to go with me. very likely very unlikely

12. You call your boyfriend/girlfriend after a bitter argument and tell him/her you want to see him/her.

How concerned or anxious would you be over whether or not your boyfriend/girlfriend would want to see you? very unconcerned very concerned

I would expect that he/she would want to see me. very likely very unlikely

13. You ask a friend if you can borrow something of his/hers.

How concerned or anxious would you be over whether or not your friend would want to loan it to you? very unconcerned very concerned

I would expect that he/she would willingly loan me it. very likely very unlikely

14. You ask your parents to come to an occasion important to you.

How concerned or anxious would you be over whether or not your parents would want to come? very unconcerned very concerned

I would expect that my parents would want to come. very likely very unlikely
15. **You ask a friend to do you a big favor.**

How concerned or anxious would you be over whether or not your friend would do this favor?  

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I would expect that he/she would willingly do this favor for me.  

| 1 | 2 | 3 | 4 | 5 | 6 |

16. **You ask your boyfriend/girlfriend if he/she really loves you.**

How concerned or anxious would you be over whether or not your boyfriend/girlfriend would say yes?  

| 1 | 2 | 3 | 4 | 5 | 6 |

I would expect that he/she would answer yes sincerely.  

| 1 | 2 | 3 | 4 | 5 | 6 |

17. **You go to a party and notice someone on the other side of the room and then you ask them to dance.**

How concerned or anxious would you be over whether or not the person would want to dance with you?  

| 1 | 2 | 3 | 4 | 5 | 6 |

I would expect that he/she would want to dance with me.  

| 1 | 2 | 3 | 4 | 5 | 6 |

18. **You ask your boyfriend/girlfriend to come home to meet your parents.**

How concerned or anxious would you be over whether or not your boyfriend/girlfriend would want to meet your parents?  

| 1 | 2 | 3 | 4 | 5 | 6 |

I would expect that he/she would want to meet my parents.  

| 1 | 2 | 3 | 4 | 5 | 6 |
Appendix D.

Example of the Ontario Student Drug Use and Health Survey.

2013 ONTARIO STUDENT SURVEY
(Grades 9–12)

THIS IS NOT A TEST. These questions are to find out what students, like yourself, know about alcohol and other drugs (for example, tobacco, cannabis, cocaine, and medical drugs), and how you feel about alcohol and other drugs. There is no assumption that students who answer the questionnaire have ever used alcohol or other drugs. This survey also asks about your general health and how you are feeling.

Do NOT put your name on this survey. The information you give will be kept completely secret and confidential. Therefore, we ask you to be completely honest and accurate when you answer the questions. If you do not want to answer a question, leave it blank. Also, you may withdraw from the survey at any time.

THANK YOU VERY MUCH FOR YOUR HELP.
BEFORE STARTING TO ANSWER THIS SURVEY, PLEASE INDICATE THE CURRENT TIME AND DATE.

TIME: __ : __ : __ (For example, 10:05)

DATE: __ __ __ __ __, 20 __ (For example, Jan. 15, 2013)

INSTRUCTIONS FOR COMPLETING THIS QUESTIONNAIRE

Most questions are followed by a list of answers. Please choose the answer that is right for you and indicate your choice in one of the boxes to the left.

FOR EXAMPLE:

Which of the following best describes the reason you have chosen your subjects while in school?

1. [ ] I will need them to go further in school
2. [ ] They will help me get the sort of job I want later on
3. [x] I like them and find them interesting
4. [ ] I am good at them
5. [ ] My friends will be taking them
<table>
<thead>
<tr>
<th>The first few questions are about your background and school life.</th>
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<tbody>
<tr>
<td><strong>A1.</strong> How old are you?</td>
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<th><strong>A2.</strong> Are you male or female?</th>
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<th><strong>A3.</strong> What grade are you in?</th>
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<tr>
<th><strong>A4.</strong> Not everyone lives with both parents in one home. Some people spend part of their time in one home, and the other part of their time in another home. Please choose one of the following statements that best describes your living situation.</th>
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<tr>
<th><strong>A5.</strong> Who lives with you in your main home? (Please CHECK ALL THAT APPLY.)</th>
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<tr>
<th><strong>A6.</strong> How long have you lived in Canada?</th>
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<th><strong>A7.</strong> Which of the following best describes your background? (You may choose more than one category.) Are you...?</th>
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<th><strong>A8.</strong> What language do you usually speak at home?</th>
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<th><strong>A9.</strong> About how many hours a day do you usually spend on social media websites such as Facebook, Twitter, MySpace, Instagram, either posting or browsing?</th>
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</table>
A10-s. On average, how many HOURS A WEEK do you spend working for pay outside the home, during the school year?
1. 5 hours or less a week
2. 6 to 10 hours a week
3. 11 to 15 hours a week
4. 16 to 20 hours a week
5. More than 20 hours a week
6. Don't work for pay outside the home

For the next 3 questions, please tell us whether you agree or disagree with the following statements.

A11. I feel safe in my school.
1. Strongly agree
2. Somewhat agree
3. Somewhat disagree
4. Strongly disagree

A12. I feel close to people at this school.
1. Strongly agree
2. Somewhat agree
3. Somewhat disagree
4. Strongly disagree

A13. I feel like I am part of this school.
1. Strongly agree
2. Somewhat agree
3. Somewhat disagree
4. Strongly disagree

A14. At school, how worried are you that someone will harm you, threaten you, or take something from you?
1. Very worried
2. Somewhat worried
3. Not very worried
4. Not at all worried

A15. Some people like school very much while others don't. How do you feel about going to school?
1. I like school very much
2. I like school quite a lot
3. I like school to some degree
4. I don't like school very much
5. I don't like school at all

A16. On average, what marks do you usually get in school? (Please choose only one answer.)
1. 90% - 100% (Mostly A+)
2. 80% - 89% (Mostly As or A-)
3. 70% - 79% (Mostly Bs)
4. 60% - 69% (Mostly Cs)
5. 50% - 59% (Mostly Ds)
6. below 50% (Mostly Fs)

A17. How do you usually travel to school? (Please choose only one answer.)
1. By car, van, truck, SUV (as a passenger)
2. By car, van, truck, SUV (as a driver)
3. By school bus
4. By public bus
5. By walking
6. By bicycling
7. By subway or streetcar
8. Other

A18. How do you usually travel home from school? (Please choose only one answer.)
1. By car, van, truck, SUV (as a passenger)
2. By car, van, truck, SUV (as a driver)
3. By school bus
4. By public bus
5. By walking
6. By bicycling
7. By subway or streetcar
8. Other

The next few questions are about your parents. By "parents", "mother", or "father", we mean whoever you consider your parents to be. They could be your birth parents, adoptive parents, stepparents, or foster parents.

A19. Were your parents born in Canada?
1. Both parents were born in Canada
2. One parent was born in Canada
3. Neither parent was born in Canada

A20. What is the highest level of education your father completed?
1. Graduated university
2. Attended university
3. Graduated college
4. Attended college
5. Graduated high school
6. Attended high school
7. Did not attend high school
8. Don't know
9. No father

A21. What is the highest level of education your mother completed?
1. Graduated university
2. Attended university
3. Graduated college
4. Attended college
5. Graduated high school
6. Attended high school
7. Did not attend high school
8. Don't know
9. No mother
A22. How well would you say you are getting along with your mother?
1  I am getting along very well with my mother
2  I am getting along OK with my mother
3  I am not getting along well with my mother
4  No mother

A23. How well would you say you are getting along with your father?
1  I am getting along very well with my father
2  I am getting along OK with my father
3  I am not getting along well with my father
4  No father

A24. In your free time away from home, how often does at least one of your parents (or your guardians) know where you are?
1  Always
2  Usually
3  Sometimes
4  Rarely
5  Never

A25. Imagine this ladder below shows how Canadian society is set up. At the top of the ladder are people who are the “best off” – they have the most money, the most education, and the jobs that bring the most respect. At the bottom are the people who are “worst off” – they have the least money, little education, no job or jobs that no one wants. Now think about your family. Please check off the numbered box that best shows where you think your family would be on this ladder.

10  Best off
09
08
07
06
05
04
03
02
01  Worst off

A25a. Have you or your family ever been involved with any Children’s Aid Society, as clients?
1  Yes
2  No
3  Don’t know

The next section is about tobacco, alcohol and other drugs. Please answer all the questions, even if you have never tried these drugs.

B1. In the LAST 12 MONTHS, how often did you smoke CIGARETTES?
01  Smoked a few puffs to a whole cigarette in the last 12 months
02  Smoked more than one cigarette, but not every day
03 1 or 2 cigarettes a day
04 3 to 5 cigarettes a day
05 6 to 10 cigarettes a day
06 11 to 15 cigarettes a day
07 16 to 20 cigarettes a day
08 21 to 29 cigarettes a day
09 30 or more cigarettes a day
10 Smoked, but not in the last 12 months
11 Never smoked cigarettes in lifetime

B2. Which of the following statements best describes your use of cigarettes IN YOUR LIFETIME?
1  Never had a cigarette, not even one puff, in my life
2  Smoked from a few puffs to a whole cigarette in my life
3  Only 2 to 3 cigarettes in my life
4  More than 3, but fewer than 100 cigarettes in my life
5 100 or more cigarettes in my life, but none in the last month
6 100 or more cigarettes in my life and some during the last month, but not every day
7 100 or more cigarettes in my life and at least 1 cigarette every day during the last month

B3. In the LAST 12 MONTHS, how often did you drink ALCOHOL — liquor (rum, whiskey, etc.), wine, beer, coolers?
01  Had a sip of alcohol to see what it’s like
02  Drank only at special events (for example, holidays or at weddings)
03  Once a month or less often
04 2 or 3 times a month
05  Once a week
06 2 or 3 times a week
07 4 or 5 times a week
08 Almost every day – 6 or 7 times a week
09 Drank, but not in the last 12 months
10 Never drank alcohol in lifetime
**For the following questions, if you do not know what a drug is or have never heard of it, please choose only the “Don’t know” box.**

### B4. In the **LAST 12 MONTHS**, how often did you use **CANNABIS** (also known as marijuana, “weed”, “pot”, “grass”, hashish, “hash”, hash oil, etc.)?

1. 1 or 2 times  
2. 3 to 5 times  
3. 6 to 9 times  
4. 10 to 19 times  
5. 20 to 39 times  
6. 40 or more times  
7. Used, but not in the last 12 months  
8. Never used in lifetime  
9. Don’t know what cannabis is

### B5. In the **LAST 12 MONTHS**, how often did you use the drug **“SPICE”** (also known as “K2”, “K3”, “Blaze”, “Black Mamba”, “legal weed”, “fake pot”)?

1. 1 or 2 times  
2. 3 to 5 times  
3. 6 to 9 times  
4. 10 to 19 times  
5. 20 to 39 times  
6. 40 or more times  
7. Used, but not in the last 12 months  
8. Never used in lifetime  
9. Don’t know what “Spice” is

### B6. In the **LAST 12 MONTHS**, how often did you use a **COUGH OR COLD MEDICINE** from a drug store, such as Robitussin DM, Benylin DM (also known as “robos”, “dex”, “DXM”) in order to get high?

1. 1 or 2 times  
2. 3 to 5 times  
3. 6 to 9 times  
4. 10 to 19 times  
5. 20 to 39 times  
6. 40 or more times  
7. Used, but not in the last 12 months  
8. Never used cough/cold medicine to “get high”

### B8-s. In the **LAST 12 MONTHS**, how often did you use psilocybin or mescaline (also known as “MAGIC MUSHROOMS”, “shrooms”, “mesc”, etc.)?

1. 1 or 2 times  
2. 3 to 5 times  
3. 6 to 9 times  
4. 10 to 19 times  
5. 20 to 39 times  
6. 40 or more times  
7. Used, but not in the last 12 months  
8. Never used in lifetime  
9. Don’t know what these drugs are

### B9-s. In the **LAST 12 MONTHS**, how often did you use **LSD** or “acid”?

1. 1 or 2 times  
2. 3 to 5 times  
3. 6 to 9 times  
4. 10 to 19 times  
5. 20 to 39 times  
6. 40 or more times  
7. Used, but not in the last 12 months  
8. Never used in lifetime  
9. Don’t know what LSD is

### B10-s. In the **LAST 12 MONTHS**, how often did you use **COCAINE** (also known as “coke”, “blow”, “snow”, “powder”, “snort”, etc.)?

1. 1 or 2 times  
2. 3 to 5 times  
3. 6 to 9 times  
4. 10 to 19 times  
5. 20 to 39 times  
6. 40 or more times  
7. Used, but not in the last 12 months  
8. Never used in lifetime  
9. Don’t know what cocaine is

### B11-s. In the **LAST 12 MONTHS**, how often did you use **cocaine** in the form of **“CRACK”?**

1. 1 or 2 times  
2. 3 to 5 times  
3. 6 to 9 times  
4. 10 to 19 times  
5. 20 to 39 times  
6. 40 or more times  
7. Used, but not in the last 12 months  
8. Never used in lifetime  
9. Don’t know what “crack” is
B12. In the LAST 12 MONTHS, how often did you use MDMA or “ECSTASY” (also known as “E”, “X”)?

1  □ 1 or 2 times
2  □ 3 to 5 times
3  □ 6 to 9 times
4  □ 10 to 19 times
5  □ 20 to 39 times
6  □ 40 or more times
7  □ Used, but not in the last 12 months
8  □ Never used in lifetime
9  □ Don’t know what “ecstasy” is

B13. In the LAST 12 MONTHS, how often did you use METHAMPHETAMINE or CRYSTAL METHAMPHETAMINE (also known as “speed”, “crystal meth”, “crank”, “ice”, etc.)?

1  □ 1 or 2 times
2  □ 3 to 5 times
3  □ 6 to 9 times
4  □ 10 to 19 times
5  □ 20 to 39 times
6  □ 40 or more times
7  □ Used, but not in the last 12 months
8  □ Never used in lifetime
9  □ Don’t know what these drugs are

B14. In the LAST 12 MONTHS, how often did you use HEROIN (also known as “H”, “junk”, “smack”, etc.)?

1  □ 1 or 2 times
2  □ 3 to 5 times
3  □ 6 to 9 times
4  □ 10 to 19 times
5  □ 20 to 39 times
6  □ 40 or more times
7  □ Used, but not in the last 12 months
8  □ Never used in lifetime
9  □ Don’t know what heroin is

C1. In the LAST 12 MONTHS, how often did you use PAIN RELIEF PILLS (such as Percocet, Percodan, Tylenol #3, Demerol, OxyNeo, OxyContin, codeine) WITHOUT a prescription or because a doctor told you to take them? (We do not mean regular Tylenol, Advil, or Aspirin that anyone can buy in a drugstore.)

1  □ 1 or 2 times
2  □ 3 to 5 times
3  □ 6 to 9 times
4  □ 10 to 19 times
5  □ 20 to 39 times
6  □ 40 or more times
7  □ Used with a prescription, but not in the last 12 months
8  □ Never used with a prescription in lifetime
9  □ Don’t know what these pain relief pills are

C2. In the LAST 12 MONTHS, how often did you use PAIN RELIEF PILLS (such as Percocet, Percodan, Tylenol #3, Demerol, OxyNeo, OxyContin, codeine) WITHOUT a prescription or without a doctor telling you to take them? (We do not mean regular Tylenol, Advil, or Aspirin that anyone can buy in a drugstore.)

1  □ 1 or 2 times
2  □ 3 to 5 times
3  □ 6 to 9 times
4  □ 10 to 19 times
5  □ 20 to 39 times
6  □ 40 or more times
7  □ Used without a prescription, but not in the last 12 months
8  □ Never used without a prescription in lifetime
9  □ Don’t know what these pain relief pills are

C3. In the LAST 12 MONTHS, how often did you use OXYCONTIN or OXYNEO (also known as “oxy”, “OC”) WITHOUT a prescription or without a doctor telling you to take it?

1  □ 1 or 2 times
2  □ 3 to 5 times
3  □ 6 to 9 times
4  □ 10 to 19 times
5  □ 20 to 39 times
6  □ 40 or more times
7  □ Used without a prescription, but not in the last 12 months
8  □ Never used without a prescription in lifetime
9  □ Don’t know what this drug is

C4. Sometimes doctors give medicine to students who are hyperactive or have problems concentrating in school. This is called Attention Deficit Hyperactivity Disorder (ADHD).

In the LAST 12 MONTHS, how often did you use medicine to treat ADHD (such as Ritalin, Concerta, Adderall, Dexedrine) WITH a prescription or because a doctor told you to take it?

1  □ Once a day
2  □ Twice a day
3  □ 3 times a day
4  □ 4 times a day
5  □ Used with a prescription, but not in the last 12 months
6  □ Never used with a prescription in lifetime
7  □ Don’t know what this medicine is
C5. In the **LAST 12 MONTHS**, how often did you use medicine that is usually used to treat ADHD (such as Ritalin, Concerta, Adderall, Dexedrine) **WITHOUT a prescription** or without a doctor telling you to take it?

1. □ 1 or 2 times
2. □ 3 to 5 times
3. □ 6 to 9 times
4. □ 10 to 19 times
5. □ 20 to 39 times
6. □ 40 or more times
7. □ Used without a prescription, but not in the **last 12 months**
8. □ Never used without a prescription in lifetime
9. □ Don’t know what this medicine is

C8-s. In the **LAST 12 MONTHS**, how often did you use MODAFINIL (such as Alertec, Provigil), which is a prescription stay-awake drug, **WITHOUT a prescription** or without a doctor telling you to take it?

1. □ 1 or 2 times
2. □ 3 to 5 times
3. □ 6 to 9 times
4. □ 10 to 19 times
5. □ 20 to 39 times
6. □ 40 or more times
7. □ Used without a prescription, but not in the **last 12 months**
8. □ Never used without a prescription in lifetime
9. □ Don’t know what this drug is

C6-s. Sedatives or tranquilizers are sometimes prescribed by doctors to help people sleep, calm them down, or to relax their muscles.

In the **LAST 12 MONTHS**, how often did you use **SEDATIVES** or **TRANQUILIZERS** (such as Valium, Ativan, Xanax) **WITH a prescription** or because a doctor told you to take them?

1. □ 1 or 2 times
2. □ 3 to 5 times
3. □ 6 to 9 times
4. □ 10 to 19 times
5. □ 20 to 39 times
6. □ 40 or more times
7. □ Used with a prescription, but not in the **last 12 months**
8. □ Never used with a prescription in lifetime
9. □ Don’t know what sedatives are

The next few questions are about alcohol.

A “drink” of alcohol is a glass of wine, a bottle of beer, a cooler, a shot glass of liquor, or a mixed drink.

Please answer these questions even if you have never tried alcohol.

D2. When (if ever) did you first drink more than just a few sips of alcohol?

01. □ Grade 4 or before
02. □ Grade 5
03. □ Grade 6
04. □ Grade 7
05. □ Grade 8
06. □ Grade 9
07. □ Grade 10
08. □ Grade 11
09. □ Grade 12
10. □ Never drank more than a few sips of alcohol in lifetime

D3. In the **LAST 4 WEEKS**, how often did you drink alcohol (liquor, wine, beer, or coolers)?

1. □ Once or twice
2. □ Once or twice each week
3. □ 3 or 4 times each week
4. □ 5 or 6 times each week
5. □ Once each day
6. □ More than once each day
7. □ Did not drink alcohol in the last 4 weeks
8. □ Never drank alcohol in lifetime
D4. How many times in the LAST 4 WEEKS have you had 5 OR MORE DRINKS of alcohol on the SAME OCCASION?
1  [ ] Once
2  [ ] 2 times
3  [ ] 3 times
4  [ ] 4 times
5  [ ] 5 or more times
6  [ ] Did not drink alcohol in the last 4 weeks
7  [ ] Did not have five or more drinks of alcohol on the same occasion in the last 4 weeks
8  [ ] Never drank alcohol in lifetime

D5. How many times in the LAST 4 WEEKS has drinking alcohol MADE YOU DRUNK (that is, you had so much to drink that you could not do what you wanted to do, or you threw up)?
1  [ ] Once
2  [ ] 2 times
3  [ ] 3 times
4  [ ] 4 times
5  [ ] 5 or more times
6  [ ] Did not drink alcohol in the last 4 weeks
7  [ ] Not been drunk in the last 4 weeks
8  [ ] Never drank alcohol in lifetime

D6. How many drinks containing alcohol do you have on a typical day when you are drinking?
1  [ ] 1 drink
2  [ ] 2 to 3 drinks
3  [ ] 4 drinks
4  [ ] 5 to 7 drinks
5  [ ] 8 or more drinks
6  [ ] Don't drink alcohol
7  [ ] Never drank alcohol in lifetime

D6a. How often do you have 5 or more drinks on one occasion?
1  [ ] Never
2  [ ] Less than once a month
3  [ ] About once a month
4  [ ] About once a week
5  [ ] Daily or almost daily
6  [ ] Don't drink alcohol
7  [ ] Never drank alcohol in lifetime

D6b. How often during the LAST 12 MONTHS have you found that you were not able to stop drinking once you had started?
1  [ ] Never in the last 12 months
2  [ ] Less than once a month
3  [ ] About once a month
4  [ ] About once a week
5  [ ] Daily or almost daily
6  [ ] Don't drink alcohol
7  [ ] Never drank alcohol in lifetime

D6c. How often during the LAST 12 MONTHS have you not done things you were supposed to because of drinking?
1  [ ] Never in the last 12 months
2  [ ] Less than once a month
3  [ ] About once a month
4  [ ] About once a week
5  [ ] Daily or almost daily
6  [ ] Don't drink alcohol
7  [ ] Never drank alcohol in lifetime

D6d. How often during the LAST 12 MONTHS have you needed a first drink of alcohol in the morning to get yourself going after a heavy drinking session?
1  [ ] Never in the last 12 months
2  [ ] Less than once a month
3  [ ] About once a month
4  [ ] About once a week
5  [ ] Daily or almost daily
6  [ ] Don't drink alcohol
7  [ ] Never drank alcohol in lifetime

D6e. How often during the LAST 12 MONTHS have you had a feeling of guilt or remorse after drinking?
1  [ ] Never in the last 12 months
2  [ ] Less than once a month
3  [ ] About once a month
4  [ ] About once a week
5  [ ] Daily or almost daily
6  [ ] Don't drink alcohol
7  [ ] Never drank alcohol in lifetime

D6f. How often during the LAST 12 MONTHS have you been unable to remember what happened the night before because you had been drinking?
1  [ ] Never in the last 12 months
2  [ ] Less than once a month
3  [ ] About once a month
4  [ ] About once a week
5  [ ] Daily or almost daily
6  [ ] Don't drink alcohol
7  [ ] Never drank alcohol in lifetime

D6g. Have you or someone else been injured as a result of your drinking?
1  [ ] No
2  [ ] Yes, but not in the last 12 months
3  [ ] Yes, during the last 12 months
4  [ ] Don't drink alcohol
5  [ ] Never drank alcohol in lifetime
D6h. Has a relative or friend or a doctor or other health care worker been concerned about your drinking or suggested you cut down?

1  □ No
2  □ Yes, but not in the last 12 months
3  □ Yes, during the last 12 months
4  □ Don’t drink alcohol
5  □ Never drank alcohol in lifetime

D7e-s. In the LAST 12 MONTHS, did your family or friends tell you that you should cut down on your drug use?

1  □ Yes
2  □ No
3  □ Did not use drugs in last 12 months
4  □ Never used drugs in lifetime

D7-s. Have you been in a treatment program during the LAST 12 MONTHS because of your alcohol or drug use?

1  □ Yes, for alcohol only
2  □ Yes, for drugs only
3  □ Yes, for both alcohol and drugs
4  □ No

Now we have a few questions about illegal or prescription drugs.

D7a-s. In the LAST 12 MONTHS, did you use drugs to relax, feel better about yourself, or fit in?

1  □ Yes
2  □ No
3  □ Did not use drugs in last 12 months
4  □ Never used drugs in lifetime

D7b-s. In the LAST 12 MONTHS, did you use drugs while you were by yourself?

1  □ Yes
2  □ No
3  □ Did not use drugs in last 12 months
4  □ Never used drugs in lifetime

D7c-s. In the LAST 12 MONTHS, did you forget things you did while using drugs?

1  □ Yes
2  □ No
3  □ Did not use drugs in last 12 months
4  □ Never used drugs in lifetime

D7d-s. In the LAST 12 MONTHS, did you get into trouble while you were using drugs?

1  □ Yes
2  □ No
3  □ Did not use drugs in last 12 months
4  □ Never used drugs in lifetime

E1. When (if ever) did you first try cannabis (also known as marijuana, “weed”, “pot”, “grass”, hashish, “hash”, “hash oil”)?

01  □ Never tried cannabis in lifetime
02  □ Grade 4 or before
03  □ Grade 5
04  □ Grade 6
05  □ Grade 7
06  □ Grade 8
07  □ Grade 9
08  □ Grade 10
09  □ Grade 11
10  □ Grade 12

E2. In the LAST 4 WEEKS, how often (if ever) did you use cannabis (also known as marijuana, “weed”, “pot”, “grass”, hashish, “hash”, “hash oil”)?

1  □ Never used cannabis in lifetime
2  □ Did not use in the last 4 weeks
3  □ Used once or twice
4  □ Once or twice each week
5  □ 3 or 4 times each week
6  □ 5 or 6 times each week
7  □ Once each day
8  □ More than once each day

E2a. In the LAST 4 WEEKS, if you smoked marijuana, about how many joints or reefer did you typically smoke? (If you shared joints with others, count only the amount that YOU smoked.)

1  □ Never smoked marijuana in lifetime
2  □ Did not smoke marijuana in the last 4 weeks
3  □ Less than 1 joint
4  □ About 1 joint
5  □ About 2 to 3 joints
6  □ About 4 or more joints
Now we would like to know about cannabis use during the last 3 months.
Please answer the questions, even if you have never tried cannabis.

E2b-s. In the LAST 3 MONTHS, how often did the idea of missing a smoke of cannabis make you very anxious or worried?
1. □ Never used cannabis in lifetime
2. □ Did not use in the last 3 months
3. □ Never in the last 3 months
4. □ Sometimes
5. □ Often
6. □ Always or nearly always

E2c-s. In the LAST 3 MONTHS, how often was your use of cannabis out of control?
1. □ Never used cannabis in lifetime
2. □ Did not use in the last 3 months
3. □ Never in the last 3 months
4. □ Sometimes
5. □ Often
6. □ Always or nearly always

E2d-s. In the LAST 3 MONTHS, how much did you worry about your use of cannabis?
1. □ Never used cannabis in lifetime
2. □ Did not use in the last 3 months
3. □ Not at all in the last 3 months
4. □ A little
5. □ Quite a lot
6. □ A great deal

E2e-s. In the LAST 3 MONTHS, how often did you wish you could stop using cannabis?
1. □ Never used cannabis in lifetime
2. □ Did not use in the last 3 months
3. □ Never in the last 3 months
4. □ Sometimes
5. □ Often
6. □ Always or nearly always

E2f-s. How difficult would it be for you to stop or go without using cannabis?
1. □ Don’t use cannabis
2. □ Not difficult
3. □ Quite difficult
4. □ Very difficult
5. □ Impossible

The next section is about vehicles, meaning cars, vans, trucks, SUVs, or motorcycles.

G2. In the LAST 12 MONTHS, how often did you ride in a vehicle driven by someone who had been drinking alcohol?
01. □ Never
02. □ Once
03. □ 2 times
04. □ 3 times
05. □ 4 times
06. □ 5 times
07. □ 6 times
08. □ 7 times
09. □ 8 or more times
10. □ Not sure

G3. In the LAST 12 MONTHS, how often did you ride in a vehicle driven by someone who had been using drugs (other than alcohol)?
01. □ Never
02. □ Once
03. □ 2 times
04. □ 3 times
05. □ 4 times
06. □ 5 times
07. □ 6 times
08. □ 7 times
09. □ 8 or more times
10. □ Not sure

G4. In the LAST 12 MONTHS, have you driven a snowmobile, motor boat, Sea-doo, or all-terrain vehicle (ATV) within an hour of drinking 1 or more drinks of alcohol?
1. □ Did not drive a snowmobile, motor boat, Sea-doo, or ATV in the last 12 months
2. □ Yes
3. □ No

G5-s. What type of driver’s licence do you have now?
1. □ No driver’s licence of any type
2. □ Level One graduated licence (G1)
3. □ Level Two graduated licence (G2)
4. □ Full graduated licence (G)
5. □ Not sure
G6-s. Did you ever take, or are you currently taking, a driver education course with both in-class and on-road training?

<table>
<thead>
<tr>
<th></th>
<th>1. No</th>
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<tbody>
<tr>
<td></td>
<td>2. Yes, I’m currently taking a course</td>
</tr>
<tr>
<td></td>
<td>3. Yes, I’ve already taken a course</td>
</tr>
</tbody>
</table>

G7-s. In the LAST 12 MONTHS, how often were you in a car accident involving any kind of injury to you or to another person, or damage to the vehicle, while you were driving?

<table>
<thead>
<tr>
<th></th>
<th>1. No driver’s licence of any type</th>
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<tbody>
<tr>
<td></td>
<td>2. Never</td>
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<td>3. Once</td>
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<td>4. 2 times</td>
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<td>5. 3 times</td>
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<td></td>
<td>6. 4 or more times</td>
</tr>
</tbody>
</table>

G8-s. In the LAST 12 MONTHS, how often have you driven a vehicle within an hour of drinking 2 or more drinks of alcohol?

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<thead>
<tr>
<th></th>
<th>0. No driver’s licence of any type</th>
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<tbody>
<tr>
<td></td>
<td>02. Never</td>
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<td></td>
<td>03. Once</td>
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<td>04. 2 times</td>
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<td>05. 3 times</td>
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<td>06. 4 times</td>
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<td>07. 5 times</td>
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<td>08. 6 times</td>
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<td>09. 7 times</td>
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<td>10. 8 or more times</td>
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</table>

G9-s. In the LAST 12 MONTHS, how often have you driven a vehicle within an hour of using marijuana or hashish?

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<thead>
<tr>
<th></th>
<th>01. No driver’s licence of any type</th>
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<td></td>
<td>02. Never</td>
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<td>03. Once</td>
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<td>04. 2 times</td>
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<td>05. 3 times</td>
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<td>06. 4 times</td>
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<td>07. 5 times</td>
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<td>08. 6 times</td>
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<td>09. 7 times</td>
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<td></td>
<td>10. 8 or more times</td>
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</tbody>
</table>

1. How would you rate your physical health?

<table>
<thead>
<tr>
<th></th>
<th>1. Excellent</th>
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<tbody>
<tr>
<td></td>
<td>2. Very good</td>
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<td></td>
<td>3. Good</td>
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<td></td>
<td>4. Fair</td>
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<tr>
<td></td>
<td>5. Poor</td>
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</tbody>
</table>

2. On how many of the LAST 7 DAYS were you physically active for a total of AT LEAST 60 MINUTES each day? Please add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time. (Some examples are brisk walking, running, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football.) Please include both school and non-school activities.

<table>
<thead>
<tr>
<th></th>
<th>1. 0 days</th>
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<tr>
<td></td>
<td>2. 1 day</td>
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<td>3. 2 days</td>
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<td>4. 3 days</td>
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<td></td>
<td>5. 4 days</td>
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<td></td>
<td>6. 5 days</td>
</tr>
<tr>
<td></td>
<td>7. 6 days</td>
</tr>
<tr>
<td></td>
<td>8. 7 days</td>
</tr>
</tbody>
</table>

3. On how many of the LAST 5 SCHOOL DAYS did you participate in physical activity for AT LEAST 20 MINUTES that increased your heart rate and made you breathe hard some of the time IN PHYSICAL EDUCATION CLASS in your school?

<table>
<thead>
<tr>
<th></th>
<th>1. Not enrolled in a physical education class right now</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. 0 days</td>
</tr>
<tr>
<td></td>
<td>3. 1 day</td>
</tr>
<tr>
<td></td>
<td>4. 2 days</td>
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<td></td>
<td>5. 3 days</td>
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<td></td>
<td>6. 4 days</td>
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<tr>
<td></td>
<td>7. 5 days</td>
</tr>
</tbody>
</table>

4. In the LAST 7 DAYS, about how many hours a day, on average, did you spend: watching TV/movies, playing video/computer games, on a computer chatting, emailing, or surfing the Internet?

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<thead>
<tr>
<th></th>
<th>1. None</th>
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<tbody>
<tr>
<td></td>
<td>2. Less than 1 hour a day</td>
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<td></td>
<td>3. 1 to 2 hours a day</td>
</tr>
<tr>
<td></td>
<td>4. 3 to 4 hours a day</td>
</tr>
<tr>
<td></td>
<td>5. 5 to 6 hours a day</td>
</tr>
<tr>
<td></td>
<td>6. 7 or more hours a day</td>
</tr>
<tr>
<td></td>
<td>7. Not sure</td>
</tr>
</tbody>
</table>
The next 2 questions are about what you drank during the last 7 days. Think about all the meals and snacks you had from the time you got up until you went to bed. Think about the meals you ate at home, at school, at restaurants, or anywhere else.

15. In the LAST 7 DAYS, how often did you drink a can, bottle or glass of pop (such as regular Coke, Pepsi, Sprite), sport drink (such as Gatorade), or pre-sweetened tea or coffee (such as Iced Tea or Frappuccino)? (Do not include diet pop, 100% fruit juice, or plain water.)

1. □ 1 time in the last 7 days
2. □ 2 to 4 times in the last 7 days
3. □ 5 to 6 times in the last 7 days
4. □ Once each day
5. □ More than once each day
6. □ Did not drink any of these beverages in the last 7 days

18. What is your current height without shoes? Below is a list of heights in feet and inches, and the matching number in centimetres ("cm"). Please choose the height that is closest to yours.

- □ 4 feet 4 inches/132 cm or less
- □ 4 feet 5 inches/135 cm
- □ 4 feet 6 inches/137 cm
- □ 4 feet 7 inches/140 cm
- □ 4 feet 8 inches/142 cm
- □ 4 feet 9 inches/145 cm
- □ 4 feet 10 inches/147 cm
- □ 4 feet 11 inches/150 cm
- □ 5 feet 0 inches/152 cm
- □ 5 feet 1 inch/155 cm
- □ 5 feet 2 inches/157 cm
- □ 5 feet 3 inches/160 cm
- □ 5 feet 4 inches/163 cm
- □ 5 feet 5 inches/165 cm
- □ 5 feet 6 inches/168 cm
- □ 5 feet 7 inches/170 cm
- □ 5 feet 8 inches/173 cm
- □ 5 feet 9 inches/175 cm
- □ 5 feet 10 inches/178 cm
- □ 5 feet 11 inches/180 cm
- □ 6 feet 0 inches/183 cm
- □ 6 feet 1 inch/185 cm
- □ 6 feet 2 inches/188 cm
- □ 6 feet 3 inches/191 cm
- □ 6 feet 4 inches/193 cm
- □ 6 feet 5 inches/196 cm
- □ 6 feet 6 inches/198 cm

16. In the LAST 7 DAYS, how often did you drink a can of a high-energy caffeine drink, such as Redbull, Rockstar, Amp, Full Throttle, Monster, etc.?

1. □ 1 time in the last 7 days
2. □ 2 to 4 times in the last 7 days
3. □ 5 to 6 times in the last 7 days
4. □ Once each day
5. □ More than once each day
6. □ Did not drink a high-energy drink in the last 7 days, but did drink at least one in the last 12 months
7. □ Did not drink a high-energy drink in the last 7 days or in the last 12 months

19. What is your current weight without shoes? Below is a list of weights in pounds, and the approximate number in kilograms ("kg"). Please choose the weight that is closest to yours.

- □ 80 pounds/36 kg or less
- □ 81-85 pounds/37-39 kg
- □ 86-90 pounds/39-41 kg
- □ 91-95 pounds/41-43 kg
- □ 96-100 pounds/43-45 kg
- □ 101-105 pounds/46-48 kg
- □ 106-110 pounds/48-50 kg
- □ 111-115 pounds/50-52 kg
- □ 116-120 pounds/53-54 kg
- □ 121-125 pounds/55-57 kg
- □ 126-130 pounds/57-59 kg
- □ 131-135 pounds/59-61 kg
- □ 136-140 pounds/62-64 kg
- □ 141-145 pounds/64-66 kg
- □ 146-150 pounds/66-68 kg
- □ 151-155 pounds/68-70 kg
- □ 156-160 pounds/71-73 kg
- □ 161-165 pounds/73-75 kg
- □ 166-170 pounds/76-77 kg
- □ 171-175 pounds/77-79 kg
- □ 176-180 pounds/80-82 kg
- □ 181-185 pounds/82-84 kg
- □ 186-190 pounds/84-86 kg
- □ 191-195 pounds/87-89 kg
- □ 196-200 pounds/89-91 kg
- □ 201-205 pounds/91-93 kg
- □ 206-210 pounds/93-95 kg
- □ 211-215 pounds/95-97 kg
- □ 216-220 pounds/97-99 kg
- □ 221-225 pounds/100-102 kg
- □ 226-230 pounds/102-104 kg
- □ 231-235 pounds/105-107 kg
- □ 236-240 pounds/107-109 kg
- □ 241-245 pounds/110-111 kg
- □ 246-250 pounds/112-114 kg
- □ 251-255 pounds/114-116 kg
- □ 256-260 pounds/116-118 kg
- □ 261-265 pounds/118-120 kg
- □ 266-270 pounds/121-122 kg
- □ 271-275 pounds/123-125 kg
- □ 276-280 pounds/125-127 kg
- □ 281 pounds/127 kg or more

17. On how many of the LAST 5 SCHOOL DAYS did you eat breakfast, either at home, on the way to school, or at school before classes (more than a glass of milk or fruit juice)?

1. □ None
2. □ 1 to 2 days
3. □ 3 to 4 days
4. □ All 5 days
The next 3 questions are about head injuries that you may have had in your life. We are interested in any head injury that resulted in you being unconscious (knocked out) for at least 5 minutes, or you had to stay in the hospital for at least 1 night because of it.

**J10.** How many times IN YOUR LIFE have you had a head injury like this?
1. □ Never had a head injury like this in my life
2. □ Once
3. □ 2 times
4. □ 3 times
5. □ 4 times
6. □ 5 times
7. □ 6 or more times

**J11.** Did you have this type of head injury in the LAST 12 MONTHS?
1. □ Yes, I've had a head injury like this in the last 12 months
2. □ I've had a head injury like this in my life, but not in the last 12 months
3. □ Never had a head injury like this in my life

**J12.** If you had this type of head injury in the last 12 months, what was the cause of it? (If this happened more than once, think about just the last time it happened. Please choose only one answer.)
1. □ Did not have a head injury like this in the last 12 months
2. □ Never had a head injury like this in my life
3. □ Motor vehicle accident
4. □ Other vehicle accident (such as a snowmobile, ATV, tractor)
5. □ Bicycle accident
6. □ Sports injury (such as team sports, skateboarding, skiing, snowboarding)
7. □ Fell down by accident
8. □ Was in a fight with someone
9. □ Bullied (pushed) by someone
10. □ Other cause not listed above

In the next few questions, we would like to know how you have been feeling during the last 4 weeks.

**J1a.** How would you rate your mental or emotional health?
1. □ Excellent
2. □ Very good
3. □ Good
4. □ Fair
5. □ Poor

**J1b.** In the LAST 12 MONTHS, how many times did you see a doctor, nurse or counsellor about your mental or emotional health?
01. □ Did not see a doctor/nurse/counsellor about my emotional health in the last 12 months
02. □ Once
03. □ 2 times
04. □ 3 times
05. □ 4 times
06. □ 5 times
07. □ 6 times
08. □ 7 times
09. □ 8 times
10. □ 9 times
11. □ 10 or more times

**J1c.** In the LAST 12 MONTHS, have you phoned a telephone crisis helpline or gone on a website (such as “KidsHelpPhone.ca”) because you needed to talk to a counsellor about a problem?
1. □ Yes, I’ve phoned a helpline only
2. □ Yes, I’ve posted a question on a website only
3. □ Yes, I’ve phoned a helpline and posted a question on a website
4. □ No

**J1d.** In the LAST 12 MONTHS, was there a time when you wanted to talk to someone about a mental health or emotional problem you had, but did not know where to turn?
1. □ Yes
2. □ No

**J1e.** In the LAST 4 WEEKS, about how often did you feel tired out for no good reason?
1. □ None of the time
2. □ A little of the time
3. □ Some of the time
4. □ Most of the time
5. □ All of the time

**J1f.** In the LAST 4 WEEKS, about how often did you feel nervous?
1. □ None of the time
2. □ A little of the time
3. □ Some of the time
4. □ Most of the time
5. □ All of the time
J1g. In the **LAST 4 WEEKS**, about how often did you feel so nervous that nothing could calm you down?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1h. In the **LAST 4 WEEKS**, about how often did you feel hopeless?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1i. In the **LAST 4 WEEKS**, about how often did you feel restless or fidgety?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1j. In the **LAST 4 WEEKS**, about how often did you feel so restless you could not sit still?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1k. In the **LAST 4 WEEKS**, about how often did you feel depressed?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1l. In the **LAST 4 WEEKS**, about how often did you feel that everything was an effort?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1m. In the **LAST 4 WEEKS**, about how often did you feel so sad that nothing could cheer you up?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1n. In the **LAST 4 WEEKS**, about how often did you feel worthless?

1  □ None of the time  
2  □ A little of the time  
3  □ Some of the time  
4  □ Most of the time  
5  □ All of the time

J1o. In the **LAST 12 MONTHS**, did you ever seriously consider attempting suicide?

1  □ Yes  
2  □ No

J1p. In the **LAST 12 MONTHS**, did you actually attempt suicide?

1  □ Yes  
2  □ No

J1q-s. In the **LAST 12 MONTHS**, have you been prescribed medicine to treat anxiety or depression?

1  □ Yes, for anxiety only  
2  □ Yes, for depression only  
3  □ Yes, for both anxiety and depression  
4  □ No

The next 5 questions are about bullying.

**Bullying** is when one or more people tease, hurt or upset a weaker person on purpose, again and again. It is also bullying when someone is left out of things on purpose.

K1a. Since September, in what way were you bullied the most at school? (Please choose only one answer.)

1  □ Was not bullied at school since September  
2  □ Physical attacks (for example, beat you up, pushed or kicked you)  
3  □ Verbal attacks (for example, teased, threatened, spread rumours about you)  
4  □ Stole from you or damaged your things
K1b. Since September, how often have you been bullied at school?
1 □ Was not bullied at school since September
2 □ Daily or almost daily
3 □ About once a week
4 □ About once a month
5 □ Less than once a month

K1c. Since September, in what way did you bully other students the most at school? (Please choose only one answer.)
1 □ Did not bully other students since September
2 □ Physical attacks (for example, beat up, pushed, or kicked them)
3 □ Verbal attacks (for example, teased, threatened, or spread rumours about them)
4 □ Stole from them or damaged their things

K1d. Since September, how often have you taken part in bullying other students at school?
1 □ Did not bully other students since September
2 □ Daily or almost daily
3 □ About once a week
4 □ About once a month
5 □ Less than once a month

K1e. In the LAST 12 MONTHS, how many times did other people bully or pick on you through the Internet?
1 □ Don’t use the Internet
2 □ Never
3 □ Once
4 □ 2 to 3 times
5 □ 4 or more times

K2. The next section is about gambling or betting money. Please answer the questions even if you have never gambled.

K2a. How often (if ever) in the LAST 12 MONTHS, have you done each of the following? (Write “0” if you have not done it.)

a) Bet money on CARD games? ________ times
b) Bet money on DICE games? ________ times
c) Bet money on other GAMES OF SKILL (such as pool, darts, chess, bowling)? ________ times
d) Played BINGO for money? ________ times
e) Bet money in SPORTS POOLS? ________ times
f) Bought SPORTS LOTTERY tickets (such as Sports Select or Proline)? ________ times
g) Bought any other LOTTERY tickets, including instant lottery (such as 6-49, scratch cards, pull-tabs)? ________ times
h) Bet money on VIDEO GAMBLING MACHINES, SLOT machines, or any other gambling machines? ________ times
i) Bet money at a CASINO in Ontario? ________ times
j) Bet money over the INTERNET (on any game)? ________ times
k) Bet money in OTHER ways not listed above? ________ times

K2l. What is the largest amount of money you have gambled at one time (at any activity including lottery tickets) in the LAST 12 MONTHS?
1 □ $1 or less
2 □ $2 to $9
3 □ $10 to $49
4 □ $50 to $99
5 □ $100 to $199
6 □ $200 or more
7 □ Did not gamble in the last 12 months
8 □ Never gambled in lifetime
K2m-s. Has your betting, in the \textit{LAST 12 MONTHS}, ever caused any problems for you such as arguments with family and friends, or problems at school or work?

1. Yes
2. No
3. Did not gamble in the last 12 months
4. Never gambled in lifetime

K2n-s. In the \textit{LAST 12 MONTHS}, have you ever gambled more than you had planned to?

1. Yes
2. No
3. Did not gamble in the last 12 months
4. Never gambled in lifetime

K2o-s. In the \textit{LAST 12 MONTHS}, has anyone criticized your betting or told you that you had a gambling problem, regardless of whether you thought it was true or not?

1. Yes
2. No
3. Did not gamble in the last 12 months
4. Never gambled in lifetime

K2p-s. In the \textit{LAST 12 MONTHS}, have you had arguments with family or friends about the money you spend on gambling?

1. Yes
2. No
3. Did not gamble in the last 12 months
4. Never gambled in lifetime

K2q-s. In the \textit{LAST 12 MONTHS}, have you ever skipped or been absent from school or work due to betting activities?

1. Yes
2. No
3. Did not gamble in the last 12 months
4. Never gambled in lifetime

K2r-s. In the \textit{LAST 12 MONTHS}, have you borrowed money or stolen something in order to bet or to cover gambling debts?

1. Yes
2. No
3. Did not gamble in the last 12 months
4. Never gambled in lifetime

K3a. In the \textit{LAST 12 MONTHS}, how often did you play video games?

1. Every day or almost every day
2. 4 or 5 times a week
3. 2 or 3 times a week
4. Once a week
5. 2 or 3 times a month
6. Once a month or less often
7. Did not play video games in the last 12 months
8. Never played in lifetime

K3b. In the \textit{LAST 12 MONTHS}, on days when you played video games, about how many hours a day did you play?

1. Less than 1 hour a day
2. About 1 hour a day
3. 2 hours a day
4. 3 to 4 hours a day
5. 5 to 6 hours a day
6. 7 or more hours a day
7. Did not play video games in the last 12 months
8. Never played in lifetime

K3c. In the \textit{LAST 12 MONTHS}, when you were not playing video games, did you keep thinking about them (such as planning your next game, remembering past games)?

1. Yes
2. No
3. Don’t play video games

K3d. In the \textit{LAST 12 MONTHS}, did you spend an increasing amount of time playing video games?

1. Yes
2. No
3. Don’t play video games
K3e. In the **LAST 12 MONTHS**, did you try to cut back or stop playing video games, or did you play for longer than you had planned to?

1. Yes  
2. No  
3. Don’t play video games

K3f. In the **LAST 12 MONTHS**, did you get restless or irritated when you could not play video games?

1. Yes  
2. No  
3. Don’t play video games

K3g. In the **LAST 12 MONTHS**, did you play video games more often when you felt bad (sad, angry or nervous) or had problems?

1. Yes  
2. No  
3. Don’t play video games

K3h. In the **LAST 12 MONTHS**, when you lost in a game or did not get the results you wanted, did you keep playing to achieve your target?

1. Yes  
2. No  
3. Don’t play video games

K3i. In the **LAST 12 MONTHS**, did you skip school or work, or lie or steal, or argue with someone so that you could play video games?

1. Yes  
2. No  
3. Don’t play video games

K3j. In the **LAST 12 MONTHS**, did you ignore homework, go to bed late, or spend less time with family and friends because of your video game playing?

1. Yes  
2. No  
3. Don’t play video games

K3k. In the **LAST 12 MONTHS**, did you ever hide your video game playing from your family or friends?

1. Yes  
2. No  
3. Don’t play video games

K4. How often (if ever) in the **LAST 12 MONTHS** have you done each of the following? (Write “0” if you have not done it.)

- a) Taken a car, truck, or SUV for a ride without the owner’s permission? _______ times
- b) Banged up or damaged something (on purpose) that did not belong to you? _______ times
- c) Sold marijuana or hashish? _______ times
- d) Taken things worth $50 or less that did not belong to you? _______ times
- e) Taken things worth more than $50 that did not belong to you? _______ times
- f) Beat up or hurt anyone (on purpose), not counting fights you may have had with a brother or sister? _______ times
- g) Broken into a locked building other than your own home? _______ times
- h) Carried a weapon, such as a gun or knife (not for hunting)? _______ times
- i) Run away from your home (left home without the permission of one or both of your parents)? _______ times
- j) Set something on fire that you weren’t supposed to? _______ times
- k) Driven a car, truck, or SUV in a street race or drag race? _______ times

K5a. In the **LAST 12 MONTHS**, how many times were you in a physical fight on school property?

1. Never  
2. Once  
3. 2 or 3 times  
4. 4 or 5 times  
5. 6 or 7 times  
6. 8 or 9 times  
7. 10 or 11 times  
8. 12 or more times
K5b. In the **LAST 12 MONTHS**, how many times has someone threatened or injured you with a weapon, such as a gun, knife, or club on school property?

1  □  Never  
2  □  Once  
3  □  2 or 3 times  
4  □  4 or 5 times  
5  □  6 or 7 times  
6  □  8 or 9 times  
7  □  10 or 11 times  
8  □  12 or more times

---

**Just a few final questions...**

L1. Overall, how easy did you find the questionnaire to understand?

1  □  Not at all easy  
2  □  Not very easy  
3  □  Fairly easy  
4  □  Very easy

L2. What about the length of the questionnaire, did you find it . . .

1  □  Much too long  
2  □  A bit too long  
3  □  About right  
4  □  A bit too short

L3. Do you think the questions in this survey make most students...

1  □  Very uncomfortable  
2  □  Somewhat uncomfortable  
3  □  Not at all uncomfortable

L4. What are the first 3 digits of your postal code?

___  ___  ___

---

Thank you for participating in this provincial survey!

Please indicate the time you finished.

___  ___ :  ___  ___  (For example, 10:45)
Appendix E.

*Example of the Drug Use Screening Inventory-Revised.*

<table>
<thead>
<tr>
<th>Ordinarily, how many times each month have you used each of the drugs listed below in the past year?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Alcohol</td>
</tr>
<tr>
<td>2. Amphetamines/stimulants/&quot;uppers&quot;</td>
</tr>
<tr>
<td>3. Cocaine/crack</td>
</tr>
<tr>
<td>4. Prescription diet pills</td>
</tr>
<tr>
<td>5. Over the counter medications</td>
</tr>
<tr>
<td>6. Heroin/morphine/opiates</td>
</tr>
<tr>
<td>7. Methadone</td>
</tr>
<tr>
<td>8. Prescription pain killer pills</td>
</tr>
<tr>
<td>9. Barbiturate</td>
</tr>
<tr>
<td>10. Quaaludes</td>
</tr>
<tr>
<td>11. Tranquilizer Pills</td>
</tr>
<tr>
<td>12. LSD/Hallucinogens</td>
</tr>
<tr>
<td>13. Ecstasy</td>
</tr>
<tr>
<td>14. PCP</td>
</tr>
<tr>
<td>15. Marijuana</td>
</tr>
<tr>
<td>16. Glue</td>
</tr>
<tr>
<td>17. Gasoline or other fumes</td>
</tr>
<tr>
<td>18. Smoking Tobacco</td>
</tr>
<tr>
<td>19. Chewing Tobacco</td>
</tr>
<tr>
<td>20. Anabolic Steroids</td>
</tr>
</tbody>
</table>

21. Which drug caused you the most problems? (circle one)

None, Cocaine/crack, Gasoline or other fumes, Heroin/morphine/opiates, Methadone, Over the counter drugs, Prescription diet pills, Prescription pain killer pills, Smoking Tobacco, Anabolic Steroids, Barbiturate, Ecstasy, Glue, LSD/Hallucinogens, Marijuana, PCP, Quaaludes, Tranquilizer Pills, Alcohol, Amphetamines/stimulants/uppers, Chewing Tobacco

22. Which drug do you prefer the most? (circle one)

None, Cocaine/crack, Gasoline or other fumes, Heroin/morphine/opiates, Methadone, Over the counter drugs, Prescription diet pills, Prescription pain killer pills, Smoking Tobacco, Anabolic Steroids, Barbiturate, Ecstasy, Glue, LSD/Hallucinogens, Marijuana, PCP, Quaaludes, Tranquilizer Pills, Alcohol, Amphetamines/stimulants/uppers, Chewing Tobacco

129
<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Have you had a craving or very strong desire for alcohol or drugs?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Have you had to use more and more drugs or alcohol to get the effect you want?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>25. Have you felt that you could not control your alcohol or drug use?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>26. Have you felt that you were &quot;hooked&quot; on alcohol or drugs?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>27. Have you missed out on activities because you spend too much money on drugs or alcohol?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>28. Did you break rules, miss curfew, or break the law because you were high on alcohol or drugs?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>29. Did you change rapidly from very happy to very sad or from very sad to very happy because of drugs?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>30. Did you have a car accident after using alcohol or drugs?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>31. Have you accidentally hurt yourself or someone else after using alcohol or drugs?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>32. Have you had a serious argument or fight with a friend or a family member because of your drinking or drug use?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>33. Have you had trouble getting along with any of your friends because of alcohol or drug use?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>34. Have you experienced any withdrawal symptoms following use of alcohol or drugs (e.g., headaches, nausea, vomiting, shaking)?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>35. Have you had a problem remembering what you had done while you were under the effects of drugs or alcohol?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>36. Did you drink large quantities of alcohol when you went to parties?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>37. Did you have trouble resisting using alcohol or drugs?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>38. Have you ever told a lie in your lifetime?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>39. Did you argue a lot?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>40. Did you brag a lot?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>41. Did you tease or do harmful things to animals?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>42. Did you yell a lot?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>43. Have you been stubborn?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>44. Were you suspicious of other people?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>45. Did you swear or use dirty language a lot?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>46. Did you tease others a lot?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>47. Did you have a bad temper?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>48. Have you been very shy?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Question</td>
<td>Yes</td>
<td>No</td>
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<td>------------------------------------------------------------------------</td>
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<tr>
<td>Did you threaten to hurt people?</td>
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<tr>
<td>Did you talk louder than most other people?</td>
<td></td>
<td></td>
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<tr>
<td>Were you easily upset?</td>
<td></td>
<td></td>
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<tr>
<td>Did you do things a lot without first thinking about the consequences?</td>
<td></td>
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<tr>
<td>Did you do risky or dangerous things a lot?</td>
<td></td>
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<tr>
<td>Did you take advantage of people?</td>
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<td></td>
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<tr>
<td>Did you generally feel angry?</td>
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<td></td>
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<tr>
<td>Did you spend most of your free time by yourself?</td>
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<td></td>
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<tr>
<td>Were you a loner?</td>
<td></td>
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<tr>
<td>Were you vary sensitive to criticism?</td>
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<tr>
<td>In your lifetime, are your table manners better in a restaurant than at home?</td>
<td></td>
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<tr>
<td>Have you had a physical exam or been under a doctor’s care?</td>
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<tr>
<td>Have you had any accidents or injuries that still bother you?</td>
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<tr>
<td>Did you either sleep too much or too little?</td>
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<tr>
<td>Have you either lost or gained more than 10 pounds?</td>
<td></td>
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<tr>
<td>Did you have less energy than you think you should have?</td>
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<tr>
<td>Did you have trouble with your breathing or with coughing?</td>
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<tr>
<td>Did you have any concerns about sex or trouble with your sex organs?</td>
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<tr>
<td>Have you had sex with someone who shot up drugs?</td>
<td></td>
<td></td>
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<tr>
<td>Have you had trouble with abdominal pain or nausea?</td>
<td></td>
<td></td>
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<tr>
<td>Have your eye whites ever turned yellow?</td>
<td></td>
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<tr>
<td>In your lifetime, did you ever feel that you wanted to swear?</td>
<td></td>
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<tr>
<td>Have you intentionally damaged someone else’s property?</td>
<td></td>
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<tr>
<td>Have you stolen things?</td>
<td></td>
<td></td>
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<tr>
<td>Have you gotten into physical fights?</td>
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<tr>
<td>Have you been a fidgety person?</td>
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<td></td>
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<tr>
<td>Have you been restless and unable to sit still?</td>
<td></td>
<td></td>
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<tr>
<td>Did you get frustrated easily?</td>
<td></td>
<td></td>
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<tr>
<td>Question</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
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<td>----</td>
</tr>
<tr>
<td>77. * Did you have trouble concentrating?</td>
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<tr>
<td>78. * Did you feel sad a lot?</td>
<td></td>
<td></td>
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<tr>
<td>79. * Did you bite your fingernails?</td>
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<tr>
<td>80. * Did you have trouble sleeping?</td>
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<td></td>
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<tr>
<td>81. * Have you been nervous?</td>
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<td></td>
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<tr>
<td>82. * Did you get easily frightened?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83. * Did you worry a lot?</td>
<td></td>
<td></td>
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<tr>
<td>84. * Did you have trouble getting your mind off things?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85. * Did people stare at you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>86. * Did you hear things that no one else around you heard?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>87. * Did you have special powers nobody else has?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>88. * Were you afraid to be around people?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>89. * Did you often feel like you wanted to cry?</td>
<td></td>
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<tr>
<td>90. * Did you have so much energy that you did not know what to do with yourself?</td>
<td></td>
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</tr>
<tr>
<td>91. * Have you ever felt tempted to steal something in your lifetime?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92. * Were you disliked by others?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93. * Were you usually unhappy with how well you did in activities with your friends?</td>
<td></td>
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</tr>
<tr>
<td>94. * Was it difficult to make friends in a new group?</td>
<td></td>
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</tr>
<tr>
<td>95. * Did people take advantage of you?</td>
<td></td>
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</tr>
<tr>
<td>96. * Were you afraid to stand up for your rights?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>97. * Was it hard for you to ask for help from others?</td>
<td></td>
<td></td>
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<tr>
<td>98. * Were you easily influenced by other people?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99. * Did you prefer doing things with people much older or younger than you?</td>
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<td></td>
</tr>
<tr>
<td>100. * Did you worry about how your actions would affect others?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>101. * Did you have difficulty standing up for your opinions?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102. * Did you have trouble saying &quot;no&quot; to people?</td>
<td></td>
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<tr>
<td>103. * Did you feel uncomfortable if someone gave you a compliment?</td>
<td></td>
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<tr>
<td>104. * Did people see you as being unfriendly?</td>
<td></td>
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</tr>
<tr>
<td>Question</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>105. Did you avoid eye contact when talking to people?</td>
<td></td>
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<tr>
<td>106. Has your mood ever changed in your lifetime?</td>
<td></td>
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<tr>
<td>107. Has a member of your family (mother, father, brother, or sister) ever used drugs to get high like marijuana, cocaine, or heroin?</td>
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<tr>
<td>108. Has a member of your family used alcohol to the point of causing problems at home, work, or with friends?</td>
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<tr>
<td>109. Has a member of your family ever been arrested?</td>
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<td>114. Were your parents or spouse unaware of what you really think or feel about things that are important to you?</td>
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<tr>
<td>115. Did you argue with your parents or your spouse or other family members a lot?</td>
<td></td>
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<tr>
<td>116. Were your parents or your spouse often unaware of where you were and what you were doing?</td>
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<tr>
<td>117. Were your parents or your spouse away from home most of the time?</td>
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<tr>
<td>118. Did you feel that either your parents or your spouse don't care about you?</td>
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<tr>
<td>119. Were you unhappy about your living arrangements?</td>
<td></td>
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<tr>
<td>120. Did you feel in danger at home?</td>
<td></td>
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<tr>
<td>121. In your lifetime, did you ever get angry?</td>
<td></td>
<td></td>
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<tr>
<td>122. Did you dislike school?</td>
<td></td>
<td></td>
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<tr>
<td>123. Did you have trouble concentrating in school or when studying?</td>
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<td>124. Were your grades below average?</td>
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<td>127. Have you thought seriously about quitting school?</td>
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<tr>
<td>128. Did you often not do your school assignments?</td>
<td></td>
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<tr>
<td>129. Did you often feel sleepy in class?</td>
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<tr>
<td>130. Were you often late for class?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>131. Did you have different friends at school this year than you did last year?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>132. Did you feel irritable and upset when in school?</td>
<td></td>
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<tr>
<td>133. Were you bored in school?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>134. Were your grades in school worse than they used to be?</td>
<td></td>
<td></td>
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<tr>
<td>135. Did you feel in danger at school?</td>
<td></td>
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<tr>
<td>136. Have you failed a grade in school?</td>
<td></td>
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<tr>
<td>137. Did you feel unwelcome in school clubs or extracurricular activities?</td>
<td></td>
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<tr>
<td>138. Have you missed or been late to school because of alcohol or drugs?</td>
<td></td>
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</tr>
<tr>
<td>139. Have you been in trouble at school because of alcohol or drugs?</td>
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<tr>
<td>140. Have alcohol or drugs interfered with your homework or school assignments?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>141. Have you been suspended?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>142. In your lifetime, did you ever put things off that you needed to do?</td>
<td></td>
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</tr>
<tr>
<td>143. Have you had a paying job that you were fired from?</td>
<td></td>
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<tr>
<td>144. Have you stopped working at a job because you just didn't care?</td>
<td></td>
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<tr>
<td>145. Did you need help from others to go about finding a job?</td>
<td></td>
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<tr>
<td>146. Have you been frequently absent or late for work?</td>
<td></td>
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</tr>
<tr>
<td>147. Did you find it difficult to complete work tasks?</td>
<td></td>
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<tr>
<td>148. Have you made money doing something that was against the law?</td>
<td></td>
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<tr>
<td>149. Have you used alcohol or drugs while working on a job?</td>
<td></td>
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<tr>
<td>150. Have you been fired from a job because of drugs?</td>
<td></td>
<td></td>
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<tr>
<td>151. Did you have trouble getting along with bosses?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>152. Did you mostly work so that you can get money to buy drugs?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>153. In your lifetime, are you more happy if you win than lose a game?</td>
<td></td>
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</tr>
<tr>
<td>154. Did any of your friends regularly use alcohol or drugs?</td>
<td></td>
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</tr>
<tr>
<td>155. Did any of your friends sell or give drugs away?</td>
<td></td>
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<tr>
<td>156. Did any of your friends lie a lot?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>157. Did your parents or spouse dislike your friends?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>158. Have any of your friends been in trouble with the law?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>159. Were most of your friends older than you?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Youth Past Year Time Frame**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>160. * Did your friends cut school or work a lot?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>161. * Did your friends get bored at parties when there was no alcohol served?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>162. * Have your friends brought drugs to parties?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>163. * Have your friends stolen anything from a store or damaged property on purpose?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>164. * Did you belong to a gang?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165. * Were you bothered by problems you were having with a friend?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>166. * Was there no friend to confide in?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>167. * Compared to most people, did you have few friends?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>168. * Have you ever in your lifetime been talked into doing something you didn't want to do?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>169. * Compared to most people, did you do less sports?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170. * Did you usually stay out late on nights when you had to go to school or work the next morning?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>171. * On a typical day, do you watch more than two hours of TV?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>172. * Did you go to bars with your friends on a regular basis - at least twice a week, or were the parents absent at most of the parties you went to?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>173. * Did you exercise less than most people you know?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>174. * Was your free time spent just hanging out with friends?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>175. * Were you bored most of the time?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>176. * Did you do most of your recreation or leisure activities alone?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>177. * Did you use alcohol or drugs for recreational reasons?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>178. * Compared to most people, were you less involved in hobbies or outside interests?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>179. * Were you dissatisfied with how you spend your free time?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180. * Did you get tired very quickly when you exerted yourself?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>181. * Have you ever bought anything in your lifetime that you did not need?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**OFFICE USE ONLY**

Date of Completion ___________________

**NOTES:**
### Domain I: SU

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have you had a craving or very strong desire for alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>2. Have you had to use more and more drugs or alcohol to get the effect you want?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>3. Have you felt that you could not control your alcohol or drug use?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>4. Have you felt that you were &quot;hooked&quot; on alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>5. Have you missed out on activities because you spend too much money on drugs or alcohol?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>6. Did you break rules, miss curfew, or break the law because you were high on alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>7. Did you change rapidly from very happy to very sad or from very sad to very happy because of drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>8. Did you have a car accident after using alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>9. Have you accidentally hurt yourself or someone else after using alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>10. Have you had a serious argument or fight with a family member because of your drinking or drug use?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>11. Have you had trouble getting along with any of your friends because of alcohol or drug use?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>12. Have you experienced any withdrawal symptoms following use of alcohol or drugs (e.g., headaches, nausea, vomiting, shakiness)?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>13. Have you had a problem remembering what you said while you were under the effects of drugs or alcohol?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>14. Did you drink large quantities of alcohol when you went to parties?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>15. Did you have trouble resisting using alcohol or drug?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>16. Have you ever told a lie?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

### Domain II: BP

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Did you argue a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>18. Did you drink a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>19. Did you use or do harmful things to animals?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>20. Did you yell a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>21. Have you been stubborn?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>22. Were you suspicious of other people?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>23. Did you swear or use dirty language a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>24. Did you tease others a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>25. Did you have a bad temper?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>26. Have you been very shy?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>27. Did you threaten to hurt people?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>28. Did you talk louder than most other people?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>29. Were you easily upset?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>30. Did you do things a lot without thinking about the consequences?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>31. Did you do risky or dangerous things a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>32. Did you take advantage of people?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>33. Did you generally feel angry?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>34. Did you spend more of your free time by yourself?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>35. Were you a loner?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>36. Were you very sensitive to criticism?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>37. Are your table manners better in a restaurant than at home?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

### Domain III: HS

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>38. Have you had a physical exam or been under a doctor's care?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>39. Have you had any accidents or injuries that still bother you?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>40. Did you either sleep too much or too little?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>41. Have you either lost or gained more than 10 pounds?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>42. Did you feel less energy than you think you should have?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>43. Did you have trouble with your breathing or with coughing?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>44. Did you have any concerns about sex or trouble with your sex organs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>45. Have you had sex with someone who used drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>46. Have you had trouble with abdominal pain or nausea?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>47. Have your eye whites ever turned yellow?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>48. Do you ever feel that you want to swear?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>
INSTRUCTIONS

Answer ALL of the following questions. Even if a question does not apply exactly, answer according to whether it is MOSTLY YES / TRUE or MOSTLY NO / FALSE.

Answer the questions as they apply to you within the past year and leading up to the present time. If a question does not apply to you, answer NO.

Circle YES or NO.

**Domain IV: P D**

49. Have you intentionally damaged someone else’s property?
   - YES
   - NO

50. Have you stolen things?
   - YES
   - NO

51. Have you gotten into a physical fight?
   - YES
   - NO

52. Have you been a bully or bully?
   - YES
   - NO

53. Have you been restless and unable to sit still?
   - YES
   - NO

54. Did you get frustrated easily?
   - YES
   - NO

55. Did you have trouble concentrating?
   - YES
   - NO

56. Did you feel sad a lot?
   - YES
   - NO

57. Did you bite your fingernails?
   - YES
   - NO

58. Did you have trouble sleeping?
   - YES
   - NO

59. Have you been nervous?
   - YES
   - NO

60. Did you get easily frightened?
   - YES
   - NO

61. Did you worry a lot?
   - YES
   - NO

62. Did you have trouble getting your mind off things?
   - YES
   - NO

63. Did people scare you?
   - YES
   - NO

64. Did you have things that no one else around you heard?
   - YES
   - NO

65. Did you have special powers no one else had?
   - YES
   - NO

66. Were you afraid to be around people?
   - YES
   - NO

67. Did you often feel like you wanted to cry?
   - YES
   - NO

68. Did you have so much energy that you did not know what to do with yourself?
   - YES
   - NO

69. Have you ever felt tempted to steal something?
   - YES
   - NO


**Domain VI: F S**

66. Has a parent or spouse ever used marijuana or cocaine?
   - YES
   - NO

67. Has a member of your family used a drug to the point of causing problems at home, work, or with friends? (YES)
   - YES
   - NO

68. Has a member of your family been arrested? (YES)
   - YES
   - NO

69. Did you have frequent arguments with your children, parents or spouse which involved yelling and screaming? (YES)
   - YES
   - NO

70. Did your family hardly do things together? (YES)
   - YES
   - NO

71. Were your parents or spouse aware of your interests and dislikes? (YES)
   - YES
   - NO

72. Were there no clear rules about what you can or cannot do? (YES)
   - YES
   - NO

73. Did your parents or spouse give you what you really think or feel about things that are important to you? (YES)
   - YES
   - NO

74. Did you argue with your spouse or other family members a lot? (YES)
   - YES
   - NO

75. Were your parents or spouse aware of where you went and what you were doing? (YES)
   - YES
   - NO

76. Were your parents or spouse away a lot of the time? (YES)
   - YES
   - NO

77. Did you feel that either your parents or your spouse didn’t care about you? (YES)
   - YES
   - NO

78. Were you unhappy about your living arrangements? (YES)
   - YES
   - NO

79. Did your family change a lot? (YES)
   - YES
   - NO

80. Did you ever get angry? (YES)
   - YES
   - NO


CONTINUE ON THE NEXT PAGE ▶
### INSTRUCTIONS

Answer ALL of the following questions. Even if a question does not apply exactly, answer according to whether it is MOSTLY YES (TRUE) or MOSTLY NO (FALSE).

Answer the questions as they apply to you within the past year and leading up to the present time. If a question does not apply to you, answer NO.

Circle YES or NO.

<table>
<thead>
<tr>
<th>Domain VII: S P</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>130. Did you dislike school?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>131. Did you have trouble concentrating in school or when studying?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>132. Were your grades below average?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>133. Did you cut school more than two days a month?</td>
<td>YES</td>
<td>NO</td>
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<tr>
<td>134. Were you absent from school a lot?</td>
<td>YES</td>
<td>NO</td>
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<tr>
<td>135. Have you thought seriously about quitting school?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>136. Did you often not do your school assignments?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>137. Did you often feel sleepy in class?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>138. Were you often late for class?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>139. Did you have different friends at school this year than you did last year?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>140. Did you feel irritable and upset in school?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>141. Were you bored in school?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>142. Were your grades in school worse than they used to be?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>143. Did you feel in danger at school?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>144. Have you bailed a grade in school?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>145. Did you feel un欢迎 in school clubs or extracurricular activities?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>146. Have you missed or been late to school because of alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>147. Have you been in trouble at school because of alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>148. Have alcohol or drugs interfered with your homework or school assignments?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>149. Have you been suspended?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>150. Do you ever put things off that you need to do?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain VIII: W A</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>151. Have you had a paying job that you were fired from?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>152. Have you stopped working at a job because you just didn’t care?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>153. Did you need help from others to get about finding a job?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>154. Have you been frequently absent or late for work?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>155. Did you find it difficult to complete work tasks?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>156. Have you made money doing something that was against the law?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>157. Have you used alcohol or drugs while working on a job?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>158. Have you been fired from a job because of drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>159. Did you have trouble getting along with bosses?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>160. Did you mostly work so that you can get money to buy drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>161. Are you more happy if you win than lose a game?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain IX: P R</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>162. Did any of your friends regularly use alcohol or drugs?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>163. Did any of your friends sell or give drugs away?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>164. Did any of your friends lie a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>165. Did your parents or spouse dislike your friends?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>166. Have any of your friends been in trouble with the law?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>167. Were most of your friends older than you?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>168. Did your friends cut school or work a lot?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>169. Did your friends get bored at parties where there was no alcohol served?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>170. Have your friends brought drugs to parties?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>171. Have your friends stolen anything from a store or damaged property on purpose?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>172. Did you belong to a gang?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>173. Were you bothered by problems you were having with a friend?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>174. Was there no friend to confide in?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>175. Compared to most people, did you have few friends?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>176. Have you ever been talked into doing something you didn’t want to do?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domain X: L/R</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>177. Compared to most people, did you do less sports?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>178. Did you usually stay out late or out on weekends when you had to go to school or work the next morning?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>179. On a typical day, do you watch more than two hours of TV?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>180. Did you go to bars with your friends on a regular basis at least twice a week?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>181. Did you exercise less than most people you know?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>182. Was your free time spent just hanging out with friends?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>183. Were you bored most of the time?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>184. Did you do most of your recreative or leisure activities alone?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>185. Did you use alcohol or drugs for recreational reasons?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>186. Compared to most people, were you less involved in hobbies or outside interests?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>187. Were you dissatisfied with how you spent your free time?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>188. Did you get tired very quickly when you exercised yourself?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>189. Have you ever bought anything that you did not need?</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

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### Drug & Alcohol Use Frequency

1. Ordinarily how many times each month have you used each of the drugs listed below in the past year? (please check)

<table>
<thead>
<tr>
<th>Drug</th>
<th>0 times</th>
<th>1-10 times</th>
<th>10-20 times</th>
<th>20+ times</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Alcohol</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>B. Amphetamines/pills 'speeds'</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>C. Oxycontin</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>D. Prescription non-opioid pills</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>E. Over the counter prescription</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>F. Non-opioid opioid</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>G. Methadone</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>H. Prescription painkiller pills</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>I. Barbiturates</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>J. Guanine</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>K. Tranquilizers</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>L. LSD/ Hallucinogens</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>M. Ecstasy</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>N. PCP</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>O. Marijuana</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>P. Glue</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Q. Gasoline or other fuels</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>R. Smoking tobacco</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>S. Chewing tobacco</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>T. Anabolic Steroids</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

2. Which drug caused you the most problems? (circle one) A B C D E F G H I J K L M N O P Q R S T

3. Which drug do you prefer the most? (circle one) A B C D E F G H I J K L M N O P Q R S T

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Appendix F.

*Example of the Likelihood to Use Substances Questionnaire.*

1) If you were given the opportunity, what is the likelihood you would smoke a cigarette?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

2) If you were given the opportunity, what is the likelihood you would drink alcohol?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

3) If you were given the opportunity, what is the likelihood you would use cannabis?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

4) If you were given the opportunity, what is the likelihood you would use Spice?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

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5) If you were given the opportunity, what is the likelihood you would use cough/cold medicine to get high?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

6) If you were given the opportunity, what is the likelihood you would use adrenochromes?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

7) If you were given the opportunity, what is the likelihood you would use mushrooms?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

8) If you were given the opportunity, what is the likelihood you would use LSD?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
9) If you were given the opportunity, what is the likelihood you would use cocaine?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

10) If you were given the opportunity, what is the likelihood you would use crack cocaine?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

11) If you were given the opportunity, what is the likelihood you would use ecstasy?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

12) If you were given the opportunity, what is the likelihood you would use meth?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
13) If you were given the opportunity, what is the likelihood you would use heroin?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

14) If you were given the opportunity, what is the likelihood you would use pain relief pills without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

15) If you were given the opportunity, what is the likelihood you would use Oxycontin without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

16) If you were given the opportunity, what is the likelihood you would use medicine prescribed to treat ADHD without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
17) If you were given the opportunity, what is the likelihood you would use a sedative without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

18) If you were given the opportunity, what is the likelihood you would use a sedative without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

19) If you were given the opportunity, what is the likelihood you would use a stay-awake drug without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

20) If you were given the opportunity, what is the likelihood you would drive without a license?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
21) If you were given the opportunity, what is the likelihood you would bully someone over the internet?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

22) If you were given the opportunity, what is the likelihood you would play video games?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

23) If you were given the opportunity, what is the likelihood you would stand up for someone who was being bullied?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

24) If you were given the opportunity, what is the likelihood you would join a study group?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
25) If you were given the opportunity, what is the likelihood you would help the homeless?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

26) If you were given the opportunity, what is the likelihood you would help a charity organization?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

27) If you were given the opportunity, what is the likelihood you would be a leader of a team or student organization?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

28) If you were given the opportunity, what is the likelihood you would set something on fire that shouldn't be ignited?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
29) If you were given the opportunity, what is the likelihood you would steal something from someone?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

30) If you were given the opportunity, what is the likelihood you would call the police if your friend was in trouble and you were doing something illegal?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

31) If you were given the opportunity, what is the likelihood you would spend time with an elderly neighbor?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

32) If you were given the opportunity, what is the likelihood you would publicly advocate for a disadvantaged group?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
33) If you were given the opportunity, what is the likelihood you would teach or read to kids younger than you?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not

34) If you were given the opportunity, what is the likelihood you would tell someone popular you didn't want to drink or do drugs?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not
Appendix G.

Example of the Post-Peer Manipulation Questionnaire.

1) Some people like school very much while others don't. How do you feel about going to school?

1= I like school very much
2= I like school quite a lot
3= I like school to some degree
4= I don't like school very much
5= I don't like school at all

2) How well would you say you are getting along with your mother?

1= I am getting along very well with my mother
2= I am getting along OK with my mother
3= I am not getting along well with my mother
4= My mother is not in the picture

3) How well would you say you are getting along with your father?

1= I am getting along very well with my father
2= I am getting along OK with my father
3= I am not getting along well with my father
4= My father is not in the picture

4) In the LAST 12 MONTHS, how often did you SMOKE CIGARETTES?

1= A few puffs to a whole cigarette in the last 12 months
2= More than 1 cigarette, but not every day
3= 1-2 cigarettes a day
4= 3-5 cigarettes a day
5= 6-10 cigarettes a day
6= 11-15 cigarettes a day
7= 16-20 cigarettes a day
8= 21-29 cigarettes a day
9= 30+ cigarettes a day
10= Smoked, but not in the last 12 months
11= Never smoked cigarettes in my lifetime
5) If you were given the opportunity, what is the likelihood you would smoke a cigarette?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

6) In the LAST 12 MONTHS how often did you drink ALCOHOL liquor (vodka, rum, whiskey, etc.), wine, beer, coolers?

1= Had a sip of alcohol to see what it's like
2= Drank only at special events (for example, holidays or at weddings)
3= Once a month or less often
4= 2-3 times a month
5= Once a week
6= 2-3 times a week
7= 4-5 times a week
8= Almost every day, 6-7 times a week
9= Drank, but not in the last 12 months
10= Never drank alcohol

7) If you were given the opportunity, what is the likelihood you would drink alcohol?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

8) In the LAST 12 MONTHS how often did you use CANNABIS (also known as marijuana, weed, pot, grass, hashish, hash oil, etc)?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what cannabis is
9) If you were given the opportunity, what is the likelihood you would use cannabis?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

10) In the LAST 12 MONTHS how often did you use SPICE (also known as K2, K3, Blaze, Black Mamba, legal weed, fake pot)?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what Spice is

11) If you were given the opportunity, what is the likelihood you would use Spice?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

12) In the LAST 12 MONTHS, how often did you use a COUGH OR COLD MEDICINE from a drug store, such as Robitussin DM, Benylin DM (also known as robos, dex, DXM) in order to get high?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime to get high
13) If you were given the opportunity, what is the likelihood you would use cough/cold medicine to get high?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not

14) In the LAST 12 MONTHS, how often did you use ADRENOCHROMES (also known as wagon wheels, dreens)?

1= 1-2 times  
2= 3-5 times  
3= 6-9 times  
4= 10-19 times  
5= 20-39 times  
6= 40+ times  
7= Used, but not in the last 12 months  
8= Never used in lifetime  
9= Don't know what adrenochromes are

15) If you were given the opportunity, what is the likelihood you would use adrenochromes?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not

16) In the LAST 12 MONTHS, how often did you use psilocybin or mescaline (also known as MAGIC MUSHROOMS, shrooms, mesc, etc)?

1= 1-2 times  
2= 3-5 times  
3= 6-9 times  
4= 10-19 times  
5= 20-39 times  
6= 40+ times  
7= Used, but not in the last 12 months  
8= Never used in lifetime  
9= Don't know what these drugs are
17) If you were given the opportunity, what is the likelihood you would use mushrooms?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

18) In the LAST 12 MONTHS, how often did you use LSD or acid?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what LSD is

19) If you were given the opportunity, what is the likelihood you would use LSD?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

20) In the LAST 12 MONTHS, how often did you use COCAINE (also known as coke, blow, snow, powder, snort, etc)?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what cocaine is
21) If you were given the opportunity, what is the likelihood you would use cocaine?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

22) In the LAST 12 MONTHS, how often did you use cocaine in the form of CRACK?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what crack is

23) If you were given the opportunity, what is the likelihood you would use crack cocaine?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

24) In the LAST 12 MONTHS, how often did you use MDMA or ECSTASY (also known as E or X)?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what ecstasy is
25) If you were given the opportunity, what is the likelihood you would use ecstasy?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

26) In the LAST 12 MONTHS, how often did you use METHAMPHETAMINE or CRYSTAL METHAMPHETAMINE (also known as speed, crystal meth, crank, ice, etc)?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what these drugs are

27) If you were given the opportunity, what is the likelihood you would use meth?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

28) In the LAST 12 MONTHS, how often did you use HEROIN (also known as H, junk, smack, etc)?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used, but not in the last 12 months
8= Never used in lifetime
9= Don't know what heroin is
29) If you were given the opportunity, what is the likelihood you would use heroin?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

30) In the LAST 12 MONTHS, how often did you use PAIN RELIEF PILLS (such as Percocet, Percodan, Tylenol #3, Demerol, OxyNeo, OxyContin, codeine) WITH A PRESCRIPTION or because a doctor told you to take them (we do not mean Tylenol, Motrin, Advil, etc)?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used with a prescription, but not in the last 12 months
8= Never used with a prescription in lifetime
9= Don't know what these pain relief pills are

31) In the LAST 12 MONTHS, how often did you use PAIN RELIEF PILLS (such as Percocet, Percodan, Tylenol #3, Demerol, OxyNeo, OxyContin, codeine) WITHOUT A PRESCRIPTION or without a doctor telling you to take them? (We don't mean Tylenol, Motrin, Advil, etc).

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used without a prescription, but not in the last 12 months
8= Never used without a prescription in lifetime
9= Don't know what these pain relief pills are
32) If you were given the opportunity, what is the likelihood you would use pain relief pills without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

33) In the LAST 12 MONTHS, how often did you use OXYCONTIN or OXYNEO (also known as oxy, OC) WITHOUT a prescription or without a doctor telling you to take it?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used without a prescription, but not in the last 12 months
8= Never used without a prescription in lifetime
9= Don't know what this drug is

34) If you were given the opportunity, what is the likelihood you would use Oxycontin without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
35) In the LAST 12 MONTHS, how often did you use medicine to treat ADHD (such as Ritalin, Concerta, Adderall, Dexedrine) WITH A PRESCRIPTION or because a doctor told you to take it?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used with a prescription, but not in the last 12 months
8= Never used with a prescription in lifetime
9= Don't know what this medicine is

36) In the LAST 12 MONTHS, how often did you use medicine that is usually used to treat ADHD (such as Ritalin, Concerta, Adderall, Dexedrine) WITHOUT A PRESCRIPTION or without a doctor telling you to take it?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used without a prescription, but not in the last 12 months
8= Never used without a prescription in lifetime
9= Don't know what this medicine is

37) If you were given the opportunity, what is the likelihood you would use medicine prescribed to treat ADHD without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
38) In the LAST 12 MONTHS, how often did you use SEDATIVES or TRANQUILLIZERS (such as Valium, Ativan, Xanax) WITH A PRESCRIPTION or because a doctor told you to take them?

1= 1-2 times  
2= 3-5 times  
3= 6-9 times  
4= 10-19 times  
5= 20-39 times  
6= 40+ times  
7= Used with a prescription, but not in the last 12 months  
8= Never used with a prescription in lifetime  
9= Don't know what sedatives are

39) In the LAST 12 MONTHS, how often did you use SEDATIVES or TRANQUILLIZERS (such as Valium, Ativan, Xanax, also known as tranqs, downers, etc) WITHOUT A PRESCRIPTION or without a doctor telling you to take them?

1= 1-2 times  
2= 3-5 times  
3= 6-9 times  
4= 10-19 times  
5= 20-39 times  
6= 40+ times  
7= Used without a prescription, but not in the last 12 months  
8= Never used without a prescription in lifetime  
9= Don't know what sedatives are

40) If you were given the opportunity, what is the likelihood you would use a sedative without a prescription?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not
41) In the LAST 12 MONTHS, how often did you use MODAFINIL (such as Alertec, Provigil) which is a prescription stay-away drug WITHOUT A PRESCRIPTION or without a doctor telling you to take it?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used without a prescription, but not in the last 12 months
8= Never used without a prescription in lifetime
9= Don't know what this drug is

42) If you were given the opportunity, what is the likelihood you would use a sedative without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

43) In the LAST 12 MONTHS, how often did you use MODAFINIL (such as Alertec, Provigil) which is a prescription stay-away drug WITHOUT A PRESCRIPTION or without a doctor telling you to take it?

1= 1-2 times
2= 3-5 times
3= 6-9 times
4= 10-19 times
5= 20-39 times
6= 40+ times
7= Used without a prescription, but not in the last 12 months
8= Never used without a prescription in lifetime
9= Don't know what this drug is
44) If you were given the opportunity, what is the likelihood you would use a stay-awake drug without a prescription?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

45) When (if ever) did you first drink more than just a few sips of alcohol?

1= Grade 4 or before
2= Grade 5
3= Grade 6
4= Grade 7
5= Grade 8
6= Grade 9
7= Grade 10
8= Grade 11
9= Grade 12
10= Never drank more than a few sips of alcohol in lifetime

46) In the LAST 4 WEEKS, how often did you drink alcohol (liquor, wine, beer, or coolers)?

1= Once or twice
2= Once or twice each week
3= 3-4 times each week
4= 5-6 times each week
5= Once each day
6= More than once each day
7= Did not drink alcohol in the last 4 weeks
8= Never drank alcohol in lifetime

47) How many times in the LAST 4 WEEKS has drinking MADE YOU DRUNK (that is, you had so much to drink that you could not do what you wanted to, or you threw up)?

1= Once
2= 2 times
3= 3 times
4= 4 times
5= 5 times
6= Did not drink alcohol in the last 4 weeks
7= Did not have 5 or more drinks of alcohol on the same occasion in the last 4 weeks
8= Never drank alcohol in lifetime
48) How many drinks containing alcohol do you have on a typical day when you are drinking?

1 = 1 drink  
2 = 2-3 drinks  
3 = 4 drinks  
4 = 5-7 drinks  
5 = 8 or more drinks  
6 = Don't drink alcohol  
7 = Never drank alcohol in lifetime

49) How often do you have 5 or more drinks on one occasion?

1 = Never  
2 = Less than once a month  
3 = About once a month  
4 = About once a week  
5 = Daily or almost daily  
6 = Don't drink alcohol  
7 = Never drank alcohol in lifetime

50) In the LAST 12 MONTHS, did you use drugs to relax, feel better about yourself, or fit in?

1 = Yes  
2 = No  
3 = Did not use drugs in the last 12 months  
4 = Never used drugs in lifetime

51) In the LAST 12 MONTHS, did you use drugs while you were by yourself?

1 = Yes  
2 = No  
3 = Did not use drugs in the last 12 months  
4 = Never used drugs in lifetime

52) In the LAST 12 MONTHS, did you forget things you did while using drugs?

1 = Yes  
2 = No  
3 = Did not use drugs in the last 12 months  
4 = Never used drugs in lifetime
53) In the LAST 12 MONTHS, did you get into trouble while you were using drugs?

1= Yes
2= No
3= Did not use drugs in the last 12 months
4= Never used drugs in lifetime

54) In the LAST 12 MONTHS, did your family or friends tell you that you should cut down on your drug use?

1= Yes
2= No
3= Did not use drugs in the last 12 months
4= Never used drugs in lifetime

55) When (if ever) did you first try cannabis (also known as marijuana, weed, pot, grass, hashish, hash, hash oil)?

1= Never tried cannabis in lifetime
2= Grade 4 or before
3= Grade 5
4= Grade 6
5= Grade 7
6= Grade 8
7= Grade 9
8= Grade 10
9= Grade 11
10= Grade 12

56) In the LAST 4 WEEKS, how often (if ever) did you use cannabis (also known as marijuana, weed, pot, grass, hashish, hash, hash oil)?

1= Never used cannabis in lifetime
2= Did not use in the last 4 weeks
3= Used once or twice
4= Once or twice each week
5= 3-4 times each week
6= 5-6 times each week
7= Once each day
8= More than once each day
57) In the LAST 4 WEEKS, if you smoked marijuana, about how many joints or reefers did you typically smoke? (If you shared joints with others, count only the amount that YOU smoked.)

1= Never smoked marijuana in lifetime
2= Did not smoke marijuana in the last 4 weeks
3= Less than 1 joint
4= About 1 joint
5= About 2-3 joints
6= About 4 or more joints

58) In the LAST 3 MONTHS, how often did the idea of missing a smoke of cannabis make you very anxious or worried?

1= Never used cannabis in lifetime
2= Did not use in the last 3 months
3= Never in the last 3 months
4= Sometimes
5= Often
6= Always or nearly always

59) In the LAST 3 MONTHS, how often was your use of cannabis out of control?

1= Never used cannabis in lifetime
2= Did not use in the last 3 months
3= Never in the last 3 months
4= Sometimes
5= Often
6= Always or nearly always

60) In the LAST 3 MONTHS, how much did you worry about your use of cannabis?

1= Never used cannabis in lifetime
2= Did not use in the last 3 months
3= Not at all in the last 3 months
4= A little
5= Quite a lot
6= A great deal

61) In the LAST 3 MONTHS, how often did you wish you could stop using cannabis?

1= Never used cannabis in lifetime
2= Did not use in the last 3 months
3= Never in the last 3 months
4= Sometimes
5= Often
6= Always or nearly always
62) How difficult would it be for you to stop or go without using cannabis?

1= Don't use cannabis
2= Not difficult
3= Quite difficult
4= Very difficult
5= Impossible

63) In the LAST 12 MONTHS, how often did you ride in a vehicle driven by someone who had been drinking alcohol?

1= Never
2= Once
3= 2 times
4= 3 times
5= 4 times
6= 5 times
7= 6 times
8= 7 times
9= 8 or more times
10= Not sure

64) In the LAST 12 MONTHS, how often did you ride in a vehicle driven by someone who had been using drugs (other than alcohol)?

1= Never
2= Once
3= 2 times
4= 3 times
5= 4 times
6= 5 times
7= 6 times
8= 7 times
9= 8 or more times
10= Not sure

65) In the LAST 12 MONTHS, have you driven a snowmobile, motor boat, Sea-doo, or all-terrain vehicle (ATV) within an hour of drinking 1 OR MORE DRINKS of alcohol?

1= Did not drive any of the above in the last 12 months
2= Yes
3= No
66) What type of driver's license do you have now?
1= No driver's license of any type
2= Learner's permit
3= Restricted driver's license
4= Graduated driver's license
5= Not sure

67) Did you ever take, or are you currently taking, a driver education course with both in-class and on-road training?
1= No
2= Yes, I'm currently taking a course
3= Yes, I've already taken a course

68) In the LAST 12 MONTHS, how often were you in a car accident involving any kind of injury to you or another person, or damage to the vehicle while YOU WERE DRIVING?
1= No driver's license of any type
2= Never
3= Once
4= 2 times
5= 3 times
6= 4 or more times

69) In the LAST 12 MONTHS, how often have you driven a vehicle within an hour of drinking 2 OR MORE DRINKS of alcohol?
1= No driver's license of any type
2= Never
3= Once
4= 2 times
5= 3 times
6= 4 times
7= 5 times
8= 6 times
9= 7 times
10= 8 or more times
70) In the LAST 12 MONTHS, how often have you driven a vehicle within an hour of using MARIJUANA OR HASHISH?

1= No driver's license of any type
2= Never
3= Once
4= 2 times
5= 3 times
6= 4 times
7= 5 times
8= 6 times
9= 7 times
10= 8 or more times

71) If you were given the opportunity, what is the likelihood you would drive without a license?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

72) Since September, in what way were you bullied THE MOST AT SCHOOL? (Please choose only one answer.)

1= Was not bullied at school since September
2= Physical attacks (beaten up, pushed, kicked)
3= Verbal attacks (teased, threatened, rumors spread)
4= Stole from you or damaged your things

73) Since September, how often have you been bullied at school?

1= Was not bullied at school since September
2= Daily or almost daily
3= About once a week
4= About once a month
5= Less than once a month
74) Since September, in what way did YOU bully other students THE MOST AT SCHOOL? (Please choose only one answer.)

1= Did not bully other students since September
2= Physical attacks (beat up, pushed, kicked)
3= Verbal attacks (teasing, threatening, spread rumors)
4= Stole from them or damaged their things

75) Since September, how often have you taken part in bullying other students at school?

1= Did not bully other students since September
2= Daily or almost daily
3= About once a week
4= About once a month
5= Less than once a month

76) In the LAST 12 MONTHS, how many times did other people bully or pick on you through the internet?

1= Don't use the internet
2= Never
3= Once
4= 2-3 times
5= 4 or more times

77) If you were given the opportunity, what is the likelihood you would bully someone over the internet?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

78) In the LAST 12 MONTHS, how often did you play video games?

1= Every day or almost every day
2= 4-5 times a week
3= 2-3 times a week
4= Once a week
5= 2-3 times a month
6= Once a month or less
7= Did not play video games in the last 12 months
8= Never played in lifetime
79) If you were given the opportunity, what is the likelihood you would play video games?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not

80) If you were given the opportunity, what is the likelihood you would stand up for someone who was being bullied?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not

81) If you were given the opportunity, what is the likelihood you would join a study group?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not

82) If you were given the opportunity, what is the likelihood you would help the homeless?

1= Definitely would  
2= Very likely  
3= Pretty likely  
4= Not sure  
5= Not that likely  
6= Very unlikely  
7= Definitely would not
83) If you were given the opportunity, what is the likelihood you would help a charity organization?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

84) If you were given the opportunity, what is the likelihood you would be a leader of a team or student organization?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

85) If you were given the opportunity, what is the likelihood you would set something on fire that shouldn't be ignited?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

86) If you were given the opportunity, what is the likelihood you would steal something from someone?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
87) If you were given the opportunity, what is the likelihood you would call the police if your friend was in trouble and you were doing something illegal?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

88) If you were given the opportunity, what is the likelihood you would spend time with an elderly neighbor?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

89) If you were given the opportunity, what is the likelihood you would publicly advocate for a disadvantaged group?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

90) If you were given the opportunity, what is the likelihood you would teach or read to kids younger than you?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not
91) If you were given the opportunity, what is the likelihood you would tell someone popular you didn't want to drink or do drugs?

1= Definitely would
2= Very likely
3= Pretty likely
4= Not sure
5= Not that likely
6= Very unlikely
7= Definitely would not

For the following questions, please respond whether the question applies to you over the PAST YEAR.

92) Which drug caused you the most problems?

1= Alcohol
2= Amphetamines/stimulants/uppers
3= Cocaine/crack
4= Prescription diet pills
5= Over the counter diet pills
6= Heroin/morphine/opiates
7= Barbituats
8= Quaaludes
9= Tranquillizer pills
10= LSD/hallucinogens
11= Ecstasy
12= PCP
13= Marijuana
14= Glue
15= Gasoline or other fumes
16= Smoking tobacco
17= Chewing tobacco
18= Anabolic steroids
93) Which drug did you prefer the most?

1= Alcohol
2= Amphetamines/stimulants/uppers
3= Cocaine/crack
4= Prescription diet pills
5= Over the counter diet pills
6= Heroin/morphine/opiates
7= Barbituats
8= Quaaludes
9= Tranquillizer pills
10= LSD/hallucinogens
11= Ecstasy
12= PCP
13= Marijuana
14= Glue
15= Gasoline or other fumes
16= Smoking tobacco
17= Chewing tobacco
18= Anabolic steroids

94) Have you had a problem remembering what you had done while you were under the effects of drugs or alcohol?

1= Yes
2= No

95) Did you drink large quantities of alcohol when you went to parties?

1= Yes
2= No

96) Did you have trouble resisting alcohol or drugs?

1= Yes
2= No

97) Have you ever told a lie?

1= Yes
2= No

98) Did you argue a lot?

1= Yes
2= No
99) Did you brag a lot?
1= Yes
2= No

100) Did you tease or do harmful things to animals?
1= Yes
2= No

101) Did you yell a lot?
1= Yes
2= No

102) Have you been stubborn?
1= Yes
2= No

103) Were you suspicious of other people?
1= Yes
2= No

104) Did you swear or cuss a lot?
1= Yes
2= No

105) Did you tease others a lot?
1= Yes
2= No

106) Did you have a bad temper?
1= Yes
2= No

107) Have you been very shy?
1= Yes
2= No
108) Did you threaten to hurt people?
1= Yes
2= No

109) Did you talk louder than most people
1= Yes
2= No

110) Were you easily upset?
1= Yes
2= No

111) Did you do things a lot without first thinking about the consequences?
1= Yes
2= No

112) Did you do risky or dangerous things a lot?
1= Yes
2= No

113) Did you take advantage of people?
1= Yes
2= No

114) Did you generally feel angry?
1= Yes
2= No

115) Did you spend most of your free time by yourself?
1= Yes
2= No

116) Were you a loner?
1= Yes
2= No
117) Were you very sensitive to criticism?
1= Yes
2= No

118) Are your table manners better in a restaurant than at home?
1= Yes
2= No

119) Have you intentionally damaged someone else's property?
1= Yes
2= No

120) Have you stolen things?
1= Yes
2= No

121) Have you gotten into physical fights?
1= Yes
2= No

122) Were you easily influenced by other people?
1= Yes
2= No

123) Did you prefer doing things with people much older or younger than you?
1= Yes
2= No

124) Did you worry about how your actions would affect others?
1= Yes
2= No

125) Did you have difficulty standing up for your opinions?
1= Yes
2= No
126) Did you have trouble saying "no" to people?

1= Yes
2= No

127) Did you dislike school?

1= Yes
2= No

128) Did you have trouble concentrating in school or when studying?

1= Yes
2= No

129) Were your grades below average?

1= Yes
2= No

130) Did you cut school more than 2 days a month?

1= Yes
2= No

131) Were you absent from school a lot?

1= Yes
2= No

132) Have you thought seriously about quitting school?

1= Yes
2= No

133) Did you often not do your school assignments?

1= Yes
2= No

134) Did any of your friends regularly use alcohol or drugs?

1= Yes
2= No
135) Did any of your friends sell or give drugs away?
1= Yes
2= No

136) Did any of your friends lie a lot?
1= Yes
2= No

137) Did your parents or significant other dislike your friends?
1= Yes
2= No

138) Have any of your friends been in trouble with the law?
1= Yes
2= No

139) Were most of your friends older than you?
1= Yes
2= No

140) Did your friends get bored at parties when there was no alcohol served?
1= Yes
2= No

141) Have your friends brought drugs to parties?
1= Yes
2= No

142) Have your friends stolen anything from a store or damaged property on purpose?
1= Yes
2= No

143) Did you go to bars with your friends on a regular basis at least twice a week?
1= Yes
2= No
144) Did you use alcohol or drugs for recreational reasons?

1 = Yes
2 = No
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